

Social Exclusion and Insurance Failure for the Poorest: On Informal Finance through Social Networks in Kenya's Smallholder Sector

Heidi Hogset, Ph. D. candidate
Department of Applied Economics and Management
Cornell University, Ithaca, New York

April, 2005

Abstract

This study looks at informal finance through social networks among smallholder farmers in Kenya. This paper explores the patterns of economic transfers within networks, and characterizes recipients and providers of informal credit and insurance, as well as the relationship between them and the purposes such transfers serve.

Participation in transfer networks depends on one's resources. The poor engage in frequent, low-value transfers in kind and in exchange labor. The poorest do not engage in cash transfers. Those of intermediate wealth engage more actively in transfers in kind, but not cash. The rich (or non-poor) are also active in transfer networks, and it is they who are able to raise large cash amounts through social networks, either as loans or gifts. As people get wealthier, they engage more in cash transfers and less in transfers in kind. People who have access to formal financial services, i.e., formal banks or Savings and Credit Cooperatives (SACCOs) participate less in transfers through networks. Those who are able to save in banks are less vulnerable to shocks.

Women are more active than men in Rotating Savings and Credit Associations (ROSCAs), and they also engage more frequently in bilateral transactions within networks, especially for transfers in kind. Transfer networks are correctly perceived as kinship-based and family members are important sources of unearned income (remittances). Transfers through networks are important for consumption smoothing, in addition to investments in income-generating activities and payment of school fees, but not for assistance when a household member is seriously ill.

The failure of social networks to provide support during sickness and death is particularly disturbing viewed in light of the ongoing AIDS crisis which is keenly felt in the villages where the study took place.

Acknowledgements

This research was made possible with a grant from the Social Science Research Council, with funding from John D. and Catherine T. MacArthur Foundation, and grants from Mario Einaudi Center for International Studies and Cornell International Institute for Food, Agriculture, and Development. Partial funding was also provided by US Agency for International Development through grant LAG-A-00-96-90016-00 to the Broadening Access and Strengthening Input Market Systems/ Collaborative Research Support Program (BASIS CRSP), and the Strategies and Analysis for Growth and Access (SAGA) cooperative agreement, number HFM-A-00-01-00132-00, as well as the Coupled Natural and Human Systems Program of the Biocomplexity Initiative of the National Science Foundation, grant BCS - 0215890 (Pell).

I thank members of the SSRC network for helpful comments on an earlier draft of this paper. The views expressed here and any remaining errors are the author's and do not represent any official agency.

Introduction

African smallholder farmers have limited access to formal financial markets. Instead, smallholders may turn to informal financial markets. Better access to financial services is widely assumed to be necessary to combat poverty, and the last couple of decades have seen a multitude of microfinance schemes targeting the poor. Policymakers in less developed countries and within the donor community are searching for institutional innovations and policy interventions in financial markets that can improve financial services that are available to the poor and help unleash untapped growth potential. Low-cost approaches to policy intervention in these markets could be to find ways to either assist or complement the informal financial services people do have access to. But to do that, policymakers need a better understanding of how informal financial markets actually work.

The most important sources of informal finance in rural Africa are (or have been) (i) interlinked contracts, where input purchases and output sales are made through the same marketing channels, (ii) private money lenders, and (iii) transfers within social networks. Much of the interlinked inputs and outputs trade used to take place within inefficient parastatals, which were targeted for dismantling during the structural adjustment process of the last 25 years. As a result, this source of credit has diminished in importance during the last couple of decades (Kherallah *et al.* 2000). Furthermore, this source of credit only applies to a limited range of purposes directly relevant to the objectives of the parastatals. Private moneylenders are known to charge very high interest rates (Aleem 1993), at levels that often preclude the use of credit from this source for financing investments in smallholder farming. So for the purposes considered in this paper, i.e., consumption smoothing and investments in farm productivity, credit through social networks may be the most important source available to smallholders in Africa.

Borrowing through social networks takes two main forms - either as a collective arrangement often organized as a Rotating Savings- and Credit Association (ROSCA), in Kenya popularly known as a “merry-go-round”, or as bilateral transfers between individual social network members. The former is a wide-spread, well-organized institution that has been shown to be important within the kinship-based rural economy in sub-Saharan Africa, while the latter tends to be very informal, with

no written contracts, and no explicit agreements about the terms of repayment, rather in the spirit of generalized reciprocity (van den Brink and Chavas 1991). Udry (1994) found in a study of bilateral informal credit through social networks in Northern Nigeria that both duration of loans and repayment amounts tended to be state contingent, with more favorable terms for borrowers who had experienced adverse shocks. Thus, he made the very interesting observation that informal credit could not be clearly distinguished from informal insurance. Indeed, the most important role of this kind of informal finance may be to complement the more rigid ROSCAs in situations of emergencies, i.e., to couple informal credit with informal insurance.

Whether we consider this market as one of credit or insurance, it does not offer people an opportunity to earn significant interest on loans, and the principle of reciprocity may matter more in the long run than the interpersonal balance of payments. The costs of borrowing through networks are then not so much associated with a markup on the loan itself, as with the development and maintenance of the network as such.

Economic research on social solidarity has generally modeled traditional insurance in terms of game theory, searching for feasibility constraints for insurance arrangements in an informal context without the possibility of exogenous contract enforcement. Starting with a homogenous rural village as the risk-pooling unit that insures its members, more recent research has turned its attention to social networks as a more plausible unit of study. An insurance arrangement's ability to insure depends (i) on the degree of risk and income pooling among the participants and (ii) on their covariance of risk. Coate and Ravallion (1993) characterize the conditions under which risk and income pooling are feasible within the context of an uncooperative game, modeling the effects of risk aversion and discount rates. These are feasibility constraints that participants in these arrangements have little power to influence. In comparison, the covariance of risk within a group that collectively self-insures is easier to influence - the more numerous and dispersed the participants are, the less covariant the risk. However, De Weerd (2002) found that poor households in Tanzania have less dense networks than the non-poor, making them more vulnerable to idiosyncratic risk.

A study on informal finance through social networks may inform both (i) further innovation of institutions within the micro-finance sector and (ii) policies intended to empower the poor and improve their access to financial services of any kind. Institutional design in the micro-finance sector is based on assumptions about social mechanisms that govern interaction within social networks and underpin informal institutions, including borrowing, lending and informal insurance. The efficiency of such institutions depends on the validity of these assumptions. The micro-finance literature provides many examples of micro-finance schemes that have failed exactly because the social mechanisms the institutional design presumed proved not to function in the environment in which they were introduced (Morduch 2000; Osterloh 2004).

But the consequences of such institutional failures are not necessarily evenly distributed across the income distribution. Where resources available for micro-finance schemes are limited, it is desirable to design public micro-finance programs that will complement informal finance through social networks, avoid crowding-out of beneficial services provided by these extant institutions, and particularly to avoid exclusion of the most vulnerable from financial services.

Hypotheses

The dependent variables of this study are frequencies and quantities of economic transfers between social network members, whether in cash, in kind, or as unpaid exchange labor. Ordinary market exchanges, i.e., provision of goods or services in exchange for a normal payment, are not considered. This study cannot determine if the market for informal finance through social networks is constrained, be it on the supply side or the demand side, except for a few respondents in given situations. But it can relate bilateral transfers to other sources of finance, including ROSCAs and commercial bank services. The main objective of the study is to identify suppliers and demanders of this type of finance, and to determine what characterizes the apparent winners and losers in this market, as well as to quantify transfers and derive some general impression of the existence and degree of income pooling among network members.

The informal finance market is non-anonymous in the sense that an agent's identity influences her participation in the market. Moreover, network contacts are by

nature not instantaneous, but rather relationships that evolve over time and exhibit various degrees of stability, ranging from strictly temporary to relatively stable. The quantity of non-market economic transfers is assumed to be a function of i) characteristics of the recipient, ii) characteristics of the provider, and iii) characteristics of the relationship between them, including the structure of the social network surrounding their relationship. Within the three above mentioned categories of explanatory variables, I more specifically hypothesize that:

1. The probability that two individuals will establish a transfer relationship is a function of
 - a) the nature of the social tie between them, whether it is conducive to economic transfers, e.g., family tie, friendship, or other relationship that supports mutual trust and generosity,
 - b) the degree of social closure between them, i.e., the number of third parties who have relationships to both of them,
 - c) the physical distance between them, and
 - d) the strategic potential of the relationship, i.e., whether a person is viewed as someone who can provide special benefits to his or her network contacts in the future.

2. The quantity of economic transfers that an individual is willing to provide to a social network member depends on her capacity to supply transfers and the recipient's ability to reciprocate such favors, both of which are functions of
 - a) their physical capital, such as size of land holding, and property rights over those assets,
 - b) their human capital, i.e., education,
 - c) how their assets are utilized, i.e., whether they have off-farm earnings, raise cash crops, etc.,
 - d) their financial capital, mainly access to formal financial services, and
 - e) their social position as determined by gender, age, and occupation or political role.

Discussion of Hypothesized Relationships

I assume that a provider of transfers goes through a two-stage decision process, where she first decides whether to provide anything, then decides how much to provide. The decision to provide something may be evidence of either a temporary or a lasting transfer relationship. I assume that a lasting transfer relationship requires a mutual desire to maintain such a relationship, and that a temporary transfer relationship is established when the decision to provide a transfer is spurred by a temporary situation and the provider and the beneficiary do not mutually want to nurture a lasting transfer relationship in the future. Temporary and more stable transfer relationships cannot be distinguished in the data, although repeated interaction between the same two individuals can be taken as evidence of a lasting relationship. A high frequency of interaction within the same dyadic relationship suggests a relationship of some intensity. Lasting relationships with low frequency of transfers are not captured by the data due to the limited recall period (twelve months). But temporary relationships may exhibit different characteristics that can be a source of unexplained variability.

I assume that lasting transfer relationships are most likely to emerge between individuals who have strong social ties with each other, such as a family tie, friendship, or a multiplex social relationship, i.e., multiple simultaneous relationships between the same two persons. The degree of social closure within a social environment, or between two individuals, also contributes to strengthening the ties between them, and decreases the social distance between them (Coleman 1988). But regardless of these contributing factors, the establishment of a lasting transfer relationship is *chosen* (endogenously) not exogenously determined, and unobservable factors are always involved when the choice is made, or when the commitment is renewed.

The shorter the physical distance between the recipient and the provider, the more likely it is that the contact is exogenously determined, such as between neighbors, and therefore not evidence of a strong social tie. Conversely, a network contact that is maintained despite a long distance is more likely to represent a close relationship, such as a family tie, or an old relationship that was established in the past, when the individuals lived closer to one another. But of course distance in itself prevents social contact, and will make social ties weaken over time, all else held equal.

I assume that new ties are more likely to be established between individuals who spend considerable time in the same environment, i.e., individuals separated by a short physical distance.

An individual who holds a high social position that is associated with wealth, power, or knowledge, is in a position to offer services that go beyond those ordinary network members can provide. A wealthy person (e.g., a business owner or someone with a salaried occupation) can offer larger economic transfers than others, a powerful person (e.g., a civil servant or a village chief) can assist when somebody needs a service from a public office, and an expert of some kind (e.g., a teacher or an extension officer) can give advice on various issues, including problems related to farm production and other income-generating activities. I therefore assume that people will strategically seek to include such individuals in their social networks, maybe wooing them with services that create a sense of indebtedness, whereby they can establish patron-client relationships for mutual benefits (Platteau 1995).

One of the challenges of the formal financial sector is how to handle asymmetric information. Some recent financial sector innovations targeting the poor, seek to exploit the ability of close-knit local communities to overcome such problems through social monitoring of people's behavior and social enforcement mechanisms that can induce desired behavior. While the transparency and social control of a village community may be commonly overestimated, a combination of physical proximity and a high degree of social closure reduces the cost of monitoring each other's behavior, and thereby decreases the incidence of moral hazard, i.e., hidden, unwanted behavior. Thus, physically distant relations, even those involving family ties, have a handicap that may reduce the probability that a transfer relationship will be maintained, or that will reduce the frequency and quantity of transfers within the relationship.

Informal insurance can be provided both on terms of specific reciprocity, such as children supporting their elderly parents in return for the services the parents provided the children at a younger age, or in terms of generalized reciprocity, as when those who provide transfers for a funeral do not necessarily expect that the beneficiaries are the same people as the ones who will provide transfers to them when it is their time to have a funeral. This kind of generalized reciprocity may also come

into action when villages, for example, collectively raise money to support a student's education. In the case of specific reciprocity, the recipient's ability to reciprocate may be evaluated before the quantity of the transfer is determined, in addition to the recipient's likelihood to repay, when the transfer is considered to be a loan. Thus, I expect the observed quantities of transfers to be a function of variables that can explain such abilities. To the extent these explanatory variables represent permanent features of the beneficiary of transfers, observed transfers can be taken as measures of a person's long-run access to informal finance through social networks.

The expected relationships for standard economic variables such as physical and human capital, wealth and income, are relatively straight forward. Individuals who are economically better off should be able to provide larger loans and less likely to default on loans, and should therefore be the providers of larger or more frequent loans, as well as be trusted with larger loans, while they probably need to borrow less often. Being an active lender signals ability to honor loans, and also establishes relationships of patronage, which can be mobilized for raising loans when needed. Thus, socioeconomic measures are relevant explanatory variables for the study of both recipients and providers of transfers.

There are reasons to expect that gender might interact with all of the suggested explanatory variables. Studies from Africa have found that males and females tend to establish separate social networks, and that they in particular insure with people of their own gender (Goldstein 2000). Thus, in an environment where gender interacts with occupational choice and selection into key roles, one should expect the composition of men's and women's social networks to differ with respect to density of persons with access to special resources, such as knowledge, power, and wealth. Such differences may be of particular importance to unmarried household heads, if they tend to be excluded from opportunities to tap into networks dominated by the opposite sex.

Age may also interact with these variables, in particular due to life-cycle factors. The young poor can be perceived as being temporarily poor, but expected to improve their income over time, while elderly poor are more likely perceived as being permanently poor, and thus their consumption emergencies may be perceived as of a more chronic nature. But social networks evolve over time, and the elderly are likely

to have richer networks, including younger family members who by local custom have an obligation to support older relatives, especially parents. As with gender, the effect of age on the ability to raise economic transfers is therefore unclear ex ante.

Econometric Model

The main questions I want my data to answer are (a) who engage in economic transfers through social networks as recipients or providers, and (b) what determines the frequencies and quantities of such transfers. I seek to answer these questions by modeling the decision made by a provider of transfers, which can easily be decomposed into a sequence of two decisions: (i) whether to provide anything at all to a particular person (participation), and (ii), if yes, how much to provide (level). I assume these two decisions are interlinked, and determined by the same explanatory variables, so an identification problem may arise.

However, the decisions have separate dependent variables: (i) the existence of transfers (binary), and (ii) the frequency of transfers and quantity of the largest transfer. The frequency of transfers, i.e., the number of transfers the last 12 months, is a count variable, left censored at zero, dominated by observations of five or less. I assume the decision to participate may be repeated each time a potential lender is being approached by a potential borrower, so the frequency of transfers may be a good measure of a lender's propensity to lend to a particular person, and may therefore be a better candidate for determining the participation decision than a binary variable that simply takes the value 1 if a transfer occurs, and 0 otherwise. The quantity of the largest transfer the last 12 months is a continuous variable that is left censored at zero. Aggregate amounts transferred between the participants cannot be determined from the data, but are bounded upwards by the product of the frequency of transfers and the largest amount.

This means the dependent variables fall into three categories that each requires its own estimation model, Probit or Logit for the binary dependent variables, Poisson or negative binomial for the count dependent variables, and Tobit for the censored dependent variables. The choice between Probit and Logit is inherently a choice between distributions, but the standard assumption is always that the disturbances are homoskedastic and normally distributed. The Tobit model requires that this assumption holds. Therefore, this assumption should be tested. The choice between

the discrete distributions is not similarly guided by a baseline distribution, and often becomes simply a matter of convenience. Few authors discuss the problems and advantages of the negative binomial distribution, but some hold against the Poisson distribution the very strong restriction it imposes on the data, that the mean and the disturbance be the same (the Poisson distribution is defined as a discrete distribution with mean and variance both equal to a parameter λ). The sequential nature of the decision process suggests that I should consider a nested model. With three categories of transfers, i.e., cash, in kind, and labor, I will ideally want to estimate a multivariate, nested model, combining both Probit or count and Tobit estimations in separate stages.

Components of this package are discussed in the econometric literature. Looking at a single-equation censored regression (Tobit) model, McDonald and Moffitt (1980) suggest a method to analyze effects on the censored, but continuous, dependent variable for limit (zero) and non-limit observations separately. They decompose changes in the conditional mean into two parts by differentiating it as follows:

$$E[y|\mathbf{x}] = \text{Prob}[y = 0] \cdot 0 + \text{Prob}[y > 0] \cdot E[y|\mathbf{x}, y > 0]$$

$$\Rightarrow \quad \partial E[y|\mathbf{x}]/\partial \mathbf{x} = \text{Prob}[y > 0] \cdot \partial E[y|\mathbf{x}, y > 0]/\partial \mathbf{x} + E[y|\mathbf{x}, y > 0] \cdot \partial \text{Prob}[y > 0]/\partial \mathbf{x}$$

But this decomposition requires that both the parameters and the variables determining participation are the same as those determining level, which I find overly restrictive for my case, as I assume that the people who are most likely to participate in a transfer network, are not necessarily the ones who can provide the largest quantities of transfers. Cragg (1971) suggests an alternative, “double hurdle” model that allows the determination of the size of a variable when it is not zero to depend on different parameters or variables than those determining the probability of its being non-zero. In his specification, Cragg distinguishes between models where the decision maker chooses participation first, or chooses level first, and discusses testing between the various sequences of decisions. In his specification, the participation decision is represented by a Probit model, and the level decision by a “standard” (OLS) regression, estimating these models sequentially. Both Lee (1994) and Lee (1992) state that in these sequential/nested models, the variables used as regressors may be the same in both steps; in general, no exclusion restrictions are required for identification.

A selection model may be an alternative to Cragg's model, and the most common among those is Heckman's selection, or "treatment", model (Heckman 1979). This model accounts for the selection bias that occurs when variables are only observed for the subset of a sample that is selected into a "treatment", in this case into participation in transfers. The variables in question in this case are the frequency and amounts of transfers and their in particular purposes. The conditional Tobit regression in stage two of Cragg's model is of course only applicable to the subset of the sample with observed transfers.

Several authors have proposed procedures for testing whether the Cragg specification holds against a standard unconditional Tobit model (Lin and Schmidt 1984; Melenberg and van Soest 1996). This paper applies a simplified version of their tests that is suggested in Greene (2000, p. 915). To test for the Tobit conditions, (i.e., homoskedasticity and normality), this paper applies tests suggested by Pagan and Vella (1989). Heckman (1979) suggested a test for his model himself, which will be applied here.

The Data

The data used in this study were collected during 2003-2004 in two sites in Kenya: Manyatta Division in Embu District, and the former Madzoo Division (now divided between several new political entities) in Vihiga District, in Eastern and Western Provinces, respectively. Both sites enjoy high, bimodal rainfall patterns, and are considered high-potential areas for agricultural production. Both sites are also extremely densely populated areas. But the ethnicity of the population differs between the two sites, with Embu dominated by the Embu tribe, while the population in Vihiga belongs to the Luhya tribe¹. These two tribes are culturally different, with different languages and histories, including different histories of interaction with the English during colonial times. Embu also has somewhat more favorable economic conditions than Vihiga, because of generally less degraded soil, and better market access. Embu is situated about 120 km from Kenya's capital city, Nairobi, while Vihiga is about 400 km from Nairobi, but about 25 km from Kenya's third largest city, Kisumu.

¹ The concept of a tribe is highly politicized in Kenya, and disregards basic identifiers of ethnicity, such as language. Members of the Embu tribe speak a dialect of the Kikuyu language, but they insist they are not Kikuyus, while the Luhya tribe is rather a cluster of tribes speaking languages that are related but not mutually intelligible. Yet, they are referred to as one tribe. Thus, one may question what the term "tribe" means in this context.

The sample of research subjects was given in both sites, as this study was conducted under the umbrella of a larger interdisciplinary study, which I will here refer to as the BASIS study, involving about 120 households in each site². The objective of this larger study is to investigate the dynamic interactions between subsistence agriculture and the natural resource base it depends on, and it involves building a panel data set for the sample households. In both sites a procedure of cluster sampling within multiple villages had been employed. The Vihiga sample was originally surveyed for an unrelated study in 1989, which serves as a baseline for the new study now nearing completion. The sample households in Embu were chosen because they were surveyed in 1998, also here for an unrelated study, but offering an opportunity to save time on creating a panel. This means there exists a large data set about the same households that complements the data collected specifically for this study. Data from the BASIS study that have been used in analyses presented here were collected in 2002, and they contain information about the households' assets, including farm size and areas under various crops, as well as detailed input and output data for the farm operations, a household census, and data on access to credit and how households cope with adverse shocks.

The data collected specifically for this study are a network data set, where the respondents were asked to identify the people they engage in borrowing and lending with (the "exchange" or "transfer" network), the people they like to discuss issues of farming with (the "communication" or "friends" network), and their geographically proximate neighbors. Then they were asked a set of questions about each of these network contacts. The questionnaire uses a 12-month recall period. A subset of the sample was selected for a follow-up round ("snowballing"), where the people identified as network contacts in the first round were tracked down and interviewed, using the same questionnaire as in the first round. Within each household, the person who had the main responsibility for day-to-day farm management decisions was selected for interviews. This person is not necessarily the household head. In many households both spouses were farm managers, either working together, or having separate enterprises. Therefore, about one tenth of the sampled households were

² This study started as a socioeconomic study with funding from BASIS CRSP, but was later incorporated into an interdisciplinary study with additional funding from NSF.

selected for interviews with both spouses, selected among those where both spouses are farm managers.

The respondents were not asked all the same questions about themselves as about the network members, so the data about respondents and their network members do not mirror each other. Moreover, the rich complementary data set about the sample households that has been collected for the BASIS study does not include the network members. A summary of the variables used in data analysis here is found in Table 1. The variables marked with a capital B in the table are all data collected for the BASIS study. Except for the education variables, they are all household level data, and respondent-invariant. All other variables were collected for this study, and are respondent specific or specific to a respondent-network member pair.

For the sake of this study, the “density” of a social network is measured by the number of network members the respondent reports in total for the three categories of relationships or networks. Individuals who appear in more than one network are counted only once for the measure of network density. The variable “Multiplex relationship” takes the value 1 whenever the same person is listed more than once by the same respondent, and 0 otherwise. In the social network literature a multiplex relationship is defined as a relationship composed of several simultaneous relationships, as when two neighbors are also colleagues and belong to the same church, etc. Many multiplex relationships are of course not captured by the data, but whenever the same person appears in more than one of a respondent’s networks included in the study, there is at least one piece of evidence of a multiplex relationship. As with the multiplex relationships, the general connectedness of network members is poorly measured by the data. The variable “Household head has always lived here” serves as a proxy for general connectedness, but this is clearly a second best, since nearly half (46%) of the respondents are not household heads, so it refers to a different household member.

Descriptive Statistics: Credit, Insurance, and Social Networks

To supplement the summary statistics in table 1, and discuss how the variables should be interpreted, I now turn to a more detailed description of the data. A brief look at some joint frequencies and conditional means reveal some striking relationships that would be lost in regressions unless they were represented by appropriate interaction

terms. (Inclusion of interaction terms is often desirable, but problematic, due to the inevitable cost of degrees of freedom). I will also discuss some regression results here that are ancillary to the main thrust of this paper.

Access to Formal and Semi-Formal Finance

Information about the sample households' access to non-network finance comes from the BASIS data. Access to formal financial institutions is much better in Embu than in Vihiga. In Embu, 46 of the 114 surveyed households had received 55 formal loans during the last 5 years, while in Vihiga, 9 of the 125 households had received one formal loan each in the same period. In Embu, 92 households stated they had access to formal credit, double the number of households that had received loans.

In both sites, most of the loans were granted by cooperatives, while in Embu, many also borrowed from private money lenders (4) and ROSCAs (3). However, not one moneylender was listed as a transfer network member in the network study. Stated interest rates and repayment periods varied a lot, and very many respondents could not answer these questions. The most likely reason is that many respondents were not the household member who was in charge of the formal loan, and they only had sketchy information about such details. The most common type of collateral used was agricultural output (57% of all loans), but co-signatures and group guarantees were also common (18% and 13%, respectively).

Membership in ROSCAs

Membership in ROSCAs is very common within the sample, with many respondents being members of several ROSCAs simultaneously. About one-third of the men and two-thirds of the women are members of at least one ROSCA. But membership in more than two ROSCAs is only found among women. The largest observed number of memberships held by one person is five.

The results of a count (Poisson) analysis of the number of ROSCA memberships are presented in Table 2. Only individually significant coefficient estimates will be discussed. The coefficient estimates are positive for females and for being married to the one who owns the family farm, i.e., being the wife, as well as for household heads. Membership in ROSCAs is increasing in the level of education, with the coefficient estimates on having completed secondary school and having completed technical school or college both positive. The regression reveals a non-

linear relationship with age that is concave with a peak at around the age of 35-40, i.e., membership is declining in age for the elderly. A joint test of the estimated age coefficients is significant at the 5% level. The coefficient estimate on having a savings account in a commercial bank is negative, which perhaps reflects that ROSCAs serve as substitutes for commercial bank services.

The observed importance of ROSCAs for middle-aged, married women conforms with the findings of Anderson and Baland (2002), who proposed that it was driven by intrahousehold conflicts and married women's desire to protect their savings against claims from their husbands.

Shocks, Vulnerability, and Informal Insurance

Three variables reflect respondents' exposure to risk and failure to achieve adequate informal insurance. "Not recovered from earlier shock" ("earlier shock", for short) is a binary variable taking the value 1 for households who had experienced a serious shock during the last five years (1997-2002), like major crop loss or death of a household member, who stated the household had not yet recovered socioeconomically from this event. Almost all of the sample households had experienced serious shocks in this period, and 74% of all households had not yet recovered by 2002. "Not assisted with recent shock" ("recent shock", for short) is the answer to a similar question in the questionnaire that was fielded in 2003-2004, but with a one-year recall, and limited to shocks that the respondents needed to cope with alone, because nobody came to their assistance. Thus, these two variables measure similar types of shocks, but with a time lag. The "earlier shock" variable may reveal medium to long term consequences of shocks.

A separate binary variable was constructed if the recent shock was related to a case of serious illness in the household, "Seriously ill household member recently". About half of all recent shocks (52%) were due to illness, and many households with sick household members also experienced many emergencies (up to 5) in the same year, suggesting that their situation was especially precarious. Other respondents whose situation appeared to be precarious included those who had experienced a death in the household, and those who reported experiencing seasonal hunger the last year. Of those who suffered a shock recently, 30% did not ask for help. The main reason given for not asking for help, or why help was not granted when asked for, was

that nobody had the means to help. The most common coping strategies chosen in these situations, were selling farm (53%) or other (15%) assets, or reduce consumption (12%).

The results of a Probit estimation of the “earlier shock” variable on relevant regressors are presented in table 3. This regression reveals that in 2002 having a large proportion of the farmland planted in coffee was positively related to having not recovered from the earlier shocks, which may reflect the crisis that hit the coffee sector in the late 1990s following a combination of a collapse in world market prices and mismanagement of the coffee cooperatives. Almost all coffee growers in the sample were from Embu, and at the time of data collection there, coffee growers had not been paid for their deliveries for several years. So obviously they were among the more cash strapped households and therefore more vulnerable to shocks.

The coefficient estimate on network density is positive and highly significant, which is not expected. Indeed, informal insurance is among the expected benefits of having a large social network. I do not dare speculate why denser social networks are positively related to “earlier shock”, but I assume the two variables are both related to a third, excluded variable, like, for example, immobility.

Finally, “earlier shock” is associated with not having a savings account in a bank or being credit constrained in either the formal or the informal credit market. Of households where a household member had a savings account in a bank, 57% had not recovered from an “earlier shock”, while among those who did not have a savings account, 83% were in that situation. Thus, those who have a savings account in a bank are better insured against shocks than those who do not.

Bilateral Transfers

Economic transfers through social networks are generally small. In these data, cash transfers range from KShs 10 to 40000. The largest amount came from a network contact living in America. Only two transfers are recorded from providers living more than 500 km away, and none going to someone that distant. Only two cash transfers exceed KShs 10000, both received by respondents in Embu. The data reveal an asymmetry between transfers received and provided, with the former being on average much larger. In Embu the average is KShs 1087 receiving and 645 providing,

and in Vihiga it is KShs 521 receiving and 391 providing. Dropping the outliers³, the average for Embu receiving falls to KShs 919. Men both receive and provide larger amounts than women. The median cash transfer for women is KShs 200, while for men it is KShs 400, both receiving and providing.

Farm inputs constitute around 60% and consumption goods around 30% of all transfers in kind in the data, both receiving and providing. The third most frequent purpose of transfers in kind is ceremonial expenses, which mainly means funerals. Transfers in kind are typically not evaluated in terms of money, so many respondents were hard pressed to assign a monetary value to them, but they were asked to suggest an approximate amount they would have been willing to pay for the service provided by the borrowed item or for the goods provided. Obviously, these evaluations were very ad hoc and strongly influenced by unobservable factors, which may be a source of noise in the data.

Transfers in kind in the data range in value from KShs 10 to 50000, with average transfer in Embu being evaluated at KShs 239 when receiving and 105 when providing, and in Vihiga it is KShs 300 when receiving and 318 when providing. (The one extremely large value of a transfer in kind was the value of borrowing somebody's title deed to use it as collateral for a loan meant to bail a person out of prison). There are two observations greater than or equal to KShs 10000 receiving, both of them from Embu. Dropping them, we get an average value for transfers in kind received of 128 for Embu. Just as with cash transfers, men both receive and provide larger value transfers in kind. The median is KShs 100 for both men and women, but the 90 percentile for men is KShs 365 when receiving and 222 when providing, while for women it is KShs 183 when receiving and 133 when providing. There are no extreme observations on the providing site for either cash or kind.

Some respondents expressed having been unable to raise needed transfers for investments through their networks. These were presumably also credit constrained in the formal credit market. A variable representing these respondents for use in regressions was constructed labeled "Credit constrained, informal lending", taking the value 1 when they reported being credit constrained in the informal credit market (3% of respondents).

³ Observations exceeding KShs 10000, i.e., 1 observation for each of 3 of the 4 dependent variables.

Social Network Density and Composition

Network density is calculated as the sum of unique names listed by the same respondent as members of their social networks. Mean network density is 11.91 persons in Embu and 8.14 in Vihiga, while it is 10.25 for men and 9.73 for women. Thus, both site and gender influence network density, with the site effect being stronger. The interactions with site and gender are both contrary to expectations. The indigenous perceptions of the cultures in the two sites, is that the population in Embu exhibits a greater degree of independence and individuality than those in Vihiga, while women are believed to be more actively networking than men. If the variable “Household head has always lived here” picks up anything, it should be a continuous history of networking in the same environment, which should result in denser local networks, and indeed mean network density for members of households where household head had always lived in the same place is 10.70, while it is 8.93 for others.

Household surveys are typically addressed to a household head, who is assumed to be a major decision maker in the household, and be the household member who is best informed about household matters. Nonetheless, the respondents of household surveys are very often not the household head, and one may wonder what is gained or lost by that. The household census carried out under the BASIS project for this sample, identified 98 of my respondents as household heads, 33 as “the household head’s husband”, 87 as the first or second wife, and 24 as “other” or missing. Where the respondent was characterized as the “husband”, no other household member was assigned the role as household head. In accordance with entrenched perceptions among social scientists, I clustered household heads and husbands together under my variable “Household head (.. or husband)”, assuming a husband is the household head unless there is another, and older, adult male resident in the household who has that role. That is, if anyone has that role at all. But taking it for granted that the identification of a household member as its “head” is meaningful, requires belief in a unitarian model of the household, which has faced serious objections from many sources, especially regarding households in sub-Saharan Africa (Alderman *et al.* 1995; Duflo and Udry 2004; Handa 1994).

A final comment on headship regards land ownership. There are two variables capturing ownership, “Respondent owns the family farm” and “Respondent’s spouse

owns the family farm”. The ownership variables sort between household members, identifying who owns the holding, and who is married to the owner, while joint ownership is omitted. A few respondents are children or daughters-in-law or even grandchildren of the household head or owner, and do not fall into any of these categories. Ownership may proxy for bargaining power within the household, as well as social position outside the household. Owners are of both genders, with 33% of all female and 79% of all male respondents being the owners of their holdings. Seventyfive % of all household heads own their farms, and 77% of farm owners are household heads. Among those who answered that the spouse owned the farm, only one was male, while 32% of all female respondents answered it was the spouse who owned the family farm, i.e., they are the wives.

Traditional economies are typically kinship-based, but the definition of kinship varies between cultures. To identify the closest family ties, my respondents were asked if their network contacts were “family members”, defined as either a spouse or a next of kin, i.e., a parent, sibling, or a child. This is a very restrictive definition of kinship that may not be appropriate for the Kenyan context. But to determine what is appropriate, one needs to consider not only the cultural context, but also the relevance of kinship to one’s own study, and that has not been done for this study. So, using this definition, 22% of all network members were identified as family members. Family members constitute 14% of the respondents’ “friends” (those they “like to discuss issues of farming with”), 20% of their neighbors, and 28% of the people they engage in borrowing and lending with. The high percentage of family ties with neighbors is surely a result of the customs for land inheritance in the two sites, where land is divided between all sons when the parents die. The highest concentration of family members is as expected in the transfer networks, but even with the high concentration of family members observed among borrowers and lenders, they are still a small minority. Most members of transfer networks are either more distant relations or not relatives at all.

A brief check of the relationship between distance and family ties reveals that 80% of all network contacts living 10 km or more away who provide cash transfers are family members. Remittances from family members not resident in the surveyed households explain, at least partially, the observation that means of transfers are

asymmetric, with people receiving more than they provide. This represents a well-known trickle-down of earnings from urban to rural residents, and from the modern to the traditional economy. The net effect of this trickle-down is that the average amount for all cash transfers is 850 KShs receiving⁴, but only 553 providing, and the average value for transfers in kind is 260 KShs receiving and 171 providing.

Of the three categories of network contacts, the greatest overlap is between neighbors and transfer network members, and the least overlap is between neighbors and “friends”. Few respondents include their spouses among the people listed as network members. In some households, both spouses were interviewed. In most of those cases, the spouses did not list each other as network contacts. As an illustration, see figure 1, where family ties of the five married couples who were interviewed in the village Kitulu in Vihiga are graphed using the software Ucinet. One of the couples listed no family members among their network contacts, but the husband was listed by two others. Only one of the ten married respondents lists the spouse among her network contacts. This may either reflect a characteristic of marital relationships in these sites or a bias in the respondents’ reporting of network relations. Many may have assumed the spouse did not qualify as a “network contact”, although parents, siblings and children are included among listed network contacts, and thus must have been perceived as qualified.

Most network connections are between individuals of the same sex, and men’s networks are more uniformly same sex than women’s. Less than 60% of women’s network contacts were the same sex, versus over 80% for men. But both sexes usually list male household heads as neighbors, often even years after their deaths, perhaps especially when the new household head is female. When network contacts who are included only as neighbors are not counted, then over 65% of women’s network contacts are the same sex, while the figure for men remains unchanged.

Selection into Networks

In the network regressions that constitute the main body of this paper, the sample that is used is the total number of network contacts listed by the respondents, which also includes network relations that are not transfer relations, but “neighbors” and “friends”. But all are realized relations. Thus, the control group are realized network

⁴ The exchange rate at the time of data collection was about KShs 75 per US dollar.

relations that are not transfer relations. A better control group would be unrealized but possible relations, but typically, there is no data available about such a control group. Here, I have an extensive data set about a random sample of farmers from each of nearly 20 villages, some, but only few of whom listed each other as network contacts. But given that farmers who live in the same village certainly know each other, and share similar circumstances, they all could potentially have chosen each other as network contacts. This information can be used to study endogenous network formation by matching all possible dyads between persons from the same village, whether observed or not.

Results of a regression using these data are presented in table 4. The dependent variable is a binary variable that takes the value 1 if the combination of ego and other exists in the network data as a realized network relationship, and 0 otherwise. The explanatory variables used, are characteristics of the chooser, or ego, such as social capital, physical assets, and education, and whether the other shares the same features. A problem with these data is that the original sampling procedure was based on sampling of households, not individuals, and the selection of respondents within households has not been unbiased. The respondents are either the household head or the household member who has the main responsibility for making farm management decisions. Thus, these data are obviously biased, and the results they produce should be interpreted with this bias in mind.

The results presented in table 4 suggest that women network more actively than men, but bear in mind that women are underrepresented in the data, and selection of women into the data is a function of characteristics that are not neutral to their propensity to network, so here there is an obvious endogeneity problem. People coming from households that receive remittances or have savings accounts in banks apparently network less than others, suggesting that the propensity to network with sample farmers is diminishing in access to cash. But those who have not yet recovered from an earlier shock are also less likely to network with sample farmers. This may be an indication of social exclusion.

Very many of the variables representing shared traits are significant. Apparently, people prefer to network with persons of the same sex and age, and the same wealth and education level. The “Both are household heads” variable is also

significant, but again some caution is warranted. Selection into the sample is not independent of whether the person is household head, so once again an endogeneity problem arises. Interestingly, the coefficient estimate on “Difference in labor endowments” is positive. Since the labor endowment variable is not binary, I chose to let the relationship between dyads along this axis be represented by the absolute value of the difference between “Household labor days per month” for the two persons/ households involved. A positive coefficient here suggests that people from large households seek to network with people from small households, and vice versa. I will leave the interpretation of this result to the reader. Finally, while those who have not yet recovered from shocks apparently tend to network less, when they do, they tend to network with others who have also not yet recovered from shocks.

Econometric Testing and Model Selection

The Greene test for the Cragg specification versus a single unconditional Tobit model is a Lagrange Multiplier test based on the difference between the log likelihood of an unconditional Tobit, and the sum of the log likelihoods of a Probit and a conditional Tobit (Cragg). This difference multiplied by negative 2 is distributed χ^2 . Results of performing this test on this paper’s data are presented in Table 5. All the test statistics are negative, implying that the Cragg specification does not improve a single, unconditional Tobit model.

Estimation of a Heckman’s selection model is a 2-stage least squares procedure that includes estimation of an instrumental variable known as Heckman’s lambda. The coefficient on this variable in the second stage regression can be used to estimate the parameters of the selection bias. If there is no selection bias, this coefficient will be zero, and if it is, usual standard errors are appropriate, and an exact test of the null hypothesis that the coefficient is equal to zero can be performed using the t distribution (Heckman 1979). Results of fitting a Heckman’s selection model for each of the quantities of transfers variables are presented in Table 6. Heckman’s lambda is not significantly different from zero in any of these regressions, so there is no support for the hypothesis of selection bias for a Tobit model that ignores the process of selection into transfer networks. Thus, neither the test for Cragg’s specification nor Heckman’s selection model reveal any selection bias in the Tobit regressions for quantities of transfers.

These two results mean that selection bias for analysis of the transfers data has been rejected, but keep in mind that the control group, those who were not selected into transfers, are not random others, they are other members of the respondents' networks. This result can be taken as evidence that the main selection process takes place when the social network is formed, and not when social network members are selected into participation in transfers. Thus, a participation dummy that distinguishes transfer network members from other network members does not provide significant information about the selection into transfers. Following this result, I will not report the results of the Probit analyses. But given the data, neither a Heckman model nor a Tobit model, be it conditional or unconditional, will be biased. The choice between these models will then be driven by other features of the data, and not a concern for selection bias.

Purposes of transfers were only recorded for the largest transfer during the last year, so the purpose variables have no meaning except when associated with the particular transfers they relate to. This means they can only be evaluated in conditional regressions on quantities of the largest transfers. I have chosen here to use the results of the Heckman models for this purpose, since they need to be reported anyway, and their results are not biased.

The assumed relationship between the decisions to provide transfers in cash or kind implies that I also assume that univariate regressions carry their own biases. But bivariate regressions for both cash transfers and transfers in kind require that the same observations are included for both dependent variables, which excludes conditional regressions, since the observations that are missing vary between the dependent variables. Thus, the bivariate Tobit regressions for quantities of transfers must be unconditional, precluding the inclusion of the purpose variables here. To evaluate the purpose variables, a separate series of Tobit models, conditional on nonzero transfers, could be estimated, but they should not provide any information not already captured by the Heckman models. Hence, I will base my discussion of quantities of transfers on series of four Heckman models, one for each of the censored dependent variables, and on two bivariate Tobit estimations, one for transfers received, and one for transfers provided. The latter separation is natural, since decisions to provide are made by the

same decision maker, and decisions about transfers received are made for the same recipient.

Homoskedasticity and normality were only tested for the bivariate Tobit models, to ensure they met the Tobit criteria. The homoskedasticity test employed here is a method of moments test, based on the assumption of orthogonality between all regressors and the residuals. The normality test is a simple test of skewness and kurtosis, based on the assumption that $E(E(u^3|y)) = 0$ and $E(E(u^4|y) - 3\sigma^4) = 0$. Results of these tests are reported in Table 7. Homoskedasticity cannot be rejected for any of the variables used in the analysis. The test also shows that a normal distribution cannot be rejected. Thus, the Tobit model can be deemed appropriate for quantities of transfers.

No rigorous testing of different discrete distributions has been undertaken, but playing around with Poisson and negative binomial regressions led to the conclusion that Poisson regressions ran more smoothly, and generated results with better model fit. This distribution was therefore selected for the count regressions. Finally, three variables were assumed to exhibit non-linear relationships with the dependent variables. They were the respondent's age, the size of the respondent's land holding, and the distance between the respondent and the network contact. Attempts were made to select appropriate functional forms for these variables, but problems with collinearity and with making the multivariate regressions run placed constraints on the choice of functional forms, narrowing the choice down to a combination of a linear and a log linear term, which has been consistently used in all regressions.

Results

In this section, results are discussed variable by variable, organized by category, such as social capital, human capital, and physical assets, etc., going across the three relevant regressions. Assignment of variables into these categories is to some extent arbitrary, but I hope readers find it makes sense. All results on frequency of transfers are taken from the count (Poisson) regressions reported in tables 8.1-6, while the results on quantities of transfers are taken from the Heckman estimation reported in tables 6.1-4 and the bivariate, unconditional Tobit estimations reported in tables 9.1-2.

First, a few comments about the differences between the two sites, as revealed by the variable "Research site (1 = Embu)". The coefficient on this variable is positive

and highly significant for the number of labor days provided to network members. This may reflect the higher importance of cash crops in Embu, which means farmers in Embu experience more pronounced, correlated peaks in labor demand than those in Vihiga. For transfers in kind, the site coefficient is highly significant and positive for the number of transfers during the last year both receiving and providing. This means that there are more frequent transfers in kind among the Embu sample, an indication of the more active transfer networks there.

“Social Capital” Effects

The variables discussed here include social position within the household, i.e., “Household head (.. or husband)”, gender, age, and the proxy for general social connectedness, “Household head has always lived here”.

Females are significantly more active with transfers in kind, both receiving and providing such transfers more frequently, and females also receive more frequently cash transfers through networks. The latter may be because women have poorer access to formal financial services, and are therefore more dependent than men on social networks to get cash. Household heads provide more frequently transfers in kind and as exchange labor, but they do not receive transfers more frequently. Neither of these variables have any significant effects on quantities of transfers.

The regressions include both a linear and a log linear term for age, and in several regressions, non-linear relationships are found. Apparently, exchange labor is provided by the younger to the older, with the frequency of providing exchange labor decreasing at all ages and of receiving exchange labor increasing after an age somewhere in the thirties. But the very young farm managers also receive some exchange labor. It is natural to guess this may be related to support for young household heads in the establishment stage, but some farm managers who were included among respondents were orphaned teenagers living with their grandparents, so this observation may also be related to social insurance for the elderly and/or households that have lost their main agricultural workers. Quantities of transfers are not affected by age, except for quantities of cash transfers provided, which are increasing up to an age in the late forties (when investments in children’s education are at their costliest), and decreasing thereafter.

Households with long histories of networking within the same community, with household heads who have always lived there, are very actively engaged in transfers of labor, both receiving and providing. This effect is both very strong and highly significant for frequencies of labor transfers. They also receive more frequently and provide less frequently transfers in kind, an asymmetry that suggests these households may be among the poorer. This guess is further supported by the negative estimated coefficient on this variable for frequencies of cash transfers both received and provided. These households also provide significantly lower amounts of cash, another indication of poverty. This result is found in both the Heckman and the bivariate Tobit regression.

To summarize, the social capital variables are very important for patterns of participation in transfer networks, but not as much for quantities of transfers. Females engage more actively in transfers in kind, exchange labor goes from the young to the old, and the more immobile households are among the poorer.

Human Capital Effects

The variables discussed here are the three education variables used in the regressions, “Has no formal education”, “Has completed secondary school”, and “Has completed technical school or college”. The omitted categories are “Has completed primary school” (the largest group, 56% of the respondents), and “Has completed university” (the smallest group, 0.8% of the respondents). Of the respondents, 16% have no formal education, while 3.8% have completed technical school or college. The university graduates were excluded from regressions because they appear only sporadically in transactions data, and had to be omitted from most regressions anyway.

There are strong effects of human capital on frequencies of transfers in all categories. Those with no education and those who have completed technical school or college both participate less frequently in transfers in kind, both receiving and providing, while those who have completed secondary school participate more in transfers in kind, both receiving and providing. However, those with secondary school engage much less frequently in cash transfers, both receiving and providing, while for those with the highest education, the effect on frequency of cash transfers is weak (they have access to other sources of financial services), but they receive significantly

higher quantities of cash transfers. This effect appears in both the Heckman estimation and the bivariate Tobit estimation.

This pattern is a little unclear, but a suggested structure is that those with no formal education are poor, those with secondary school represent an intermediate wealth level, while those with technical school or college are the wealthiest people in the sample. Apparently, the poorest engage mostly in transfers in terms of exchange labor and not transfers in kind, those of intermediate wealth do not have the means to engage much in cash transfers but they are very actively engaged in transfers in kind, and the richest do not engage much in transfers through networks at all, because they have other, preferred options. But when they do, the richest receive the largest amounts of cash transfers from network contacts.

For frequency of labor transfers, the effects of human capital are quite striking, and may be interpreted as contradictory to the pattern just suggested. The strong and significant effects are for the highest education level (they provide more of it), and for the lowest education level (they receive more of it). To harmonize this with the suggested pattern, exchange labor may be interpreted as an important channel of social security provided by the wealthy to the poor, although this is a puzzling result.

Wealth, Tenure, and Household Assets

The variables discussed here are “Thatched roof”, “Brick house”, variables representing ownership of farm holding, farm size, cash crops, and household labor. “Thatched roof” is included as a proxy for poverty and “Brick house” as a proxy for wealth. Traditionally, people in both sites did not consider a home to be a permanent structure to be passed down through generations, but rather a personal item, maintained during the owner’s lifetime, and then left to the elements to crumble. The traditional building material is mud, fortified with wooden sticks, and in Vihiga, most sample households (82%) have mud houses. In Embu, wood structures have become common, and 70% of the sample households there live in wood houses. But brick houses are considered the best in both places, and represent a status symbol. In Embu, 11% of the respondents live in brick houses, vs. 15% in Vihiga. Thatch is the traditional roofing material, and has become uncommon in both sites. Only about 3% of the respondents live in houses with thatched roofs, and they presumably represent

the poorest among them. Most residential houses, including the fancy brick houses, have corrugated tin roofs.

The effects of “thatched roof” are weak, and may represent spurious correlations due to the very low number of non-zero observations. All else being equal, these presumably poor people provide more frequently transfers in kind, and provide less exchange labor. Residents in brick houses provide more frequently cash transfers, and both receive and provide more frequently transfers in kind. They receive significantly larger amounts of cash transfers, too, and residents in brick houses participate more in exchange labor, both ways. The bivariate Tobit estimation has a weakly significant, positive coefficient on values of transfers provided in kind for this group. This may mean the rich receive more cash, and that this results in a pass-through effect in terms of more frequent and higher value transfers in kind to others.

Those who own the family farms engage more in transfers of exchange labor, both ways, and they receive more frequently transfers in kind. This may be related to their responsibilities as main farm managers, to meet the demand for farm inputs and labor, especially during periods of peak labor requirements. Those who are married to the owner of the family farm (i.e., wives), provide more frequent cash transfers, and the effect of this variable on frequencies of transfers in kind is very strong, both receiving and providing. Wives also provide higher value transfers in kind, significant at the 5% level in the Heckman model. As noted earlier, married women also dominate ROSCAs. Thus, a pattern emerges of married women being very active within the market for economic transfers through social networks, both for bilateral transfers between network members and for transfers within groups, like a ROSCA. Receiving the pot of a ROSCA would not be captured by these data, but spending the pot on bilateral transfers would, and indeed some respondents reported helping fellow ROSCA members out when they had difficulties meeting the demands of the ROSCA (making the required contribution to the pot).

The coefficients on holding size (linear and log-linear terms to capture non-linear relationships) are not significant in most regressions, with two exceptions. The frequency of receiving cash transfers is diminishing in holding size, i.e., the area of cultivated land. This may be a wealth effect - the richer have access to other sources

of finance, and are not so active in transfer networks. The frequency of exchange labor received is higher for larger farms. This may reflect that larger farms are relatively more labor constrained, and also more engaged in cash cropping with associated correlated peaks in labor demand.

There is a very strong, positive effect of cash crops (both tea and coffee) on frequency of cash transfers provided, and both groups provide higher amounts of cash transfers. For tea growers the levels effect is significant in both the Heckman and the bivariate Tobit model, while for coffee growers it is only significant in the Tobit model. Tea growers also receive significantly higher amounts of cash transfers, also this significant in both models. This is clearly a wealth effect. Due to the crisis in the coffee sector, coffee growers tend to be among the more cash strapped, and interestingly, this makes it harder for them to find providers of cash transfers. In contrast, for transfers in kind, there is a strong, negative effect of being a coffee producer, but an equally strong, positive effect of being a tea producer, both receiving and providing. Tea growers also provide higher-value transfers in kind, significant in the bivariate Tobit model. Apparently, the most cash strapped retreat from the market for transfers in kind, as was seen also for those with no education, while those with the medium level of education are very active with transfers in kind. But despite being cash strapped, coffee growers nonetheless do provide cash transfers, even at high levels. This is another puzzling result, which will be commented further below.

The coefficients on both of the main livestock variables, “Raises cattle” and “Raises sheep or goats”, are negative for frequencies of transfers in kind, while for cattle owners, they are positive for frequencies of cash transfers, all of these both receiving and providing. It is especially strong and highly significant for cash transfers received by cattle owners. Owners of the smaller ruminants also engage less frequently in exchange labor, both ways, with the strongest effect for exchange labor received. The effects on exchange labor may be due to a positive correlation between small ruminants and having a high labor endowment (Pearson correlation coefficient of 0.37). Coefficients for levels of transfers are only significant for small ruminants, and it is negative for cash transfers received (in Tobit model) and positive (but weak) for cash transfers provided (in Heckman model).

The variable “Household labor days per month” is the sum of labor days per month provided to the family farm by household members at least 10 years of age. There is no corresponding variable for the households’ dependency ratio, so the labor variable is the only one providing information about household size. There are some highly significant effects of this variable, but coefficients are small, so the effects appear to be of little consequence. Perhaps the most interesting observation is that households with high labor endowments engage more frequently in exchange labor both ways.

The important relationships described here, are related to wealth and endowment effects on transfers. The wealthy, those with large farms and brick houses, receive less frequent, but higher amounts of cash transfers, and those with large households, large farms, or cash crops engage more in exchange labor.

Access to Formal and Semi-Formal Finance and Insurance

In this section, I will discuss the effects of some variables that were discussed in detail above. These variables include membership in ROSCAs, being a recipient of remittances, having a household member with a savings account in a bank, and/or who is a member in a local savings institution. Then, I will discuss the risk, vulnerability, and informal insurance variables, and finally, how the professed purposes of the transfers influence their levels.

The effects of these variables on quantities of transfers are almost totally absent, but there are many strong relationships on frequencies of transfers. Households that receive remittances receive cash transfers less frequently than others, but they provide cash transfers more frequently, suggesting some pass-through or trickle-down effect of remittances. But they provide less frequent transfers in kind, all else being equal. People receive more frequent cash transfers, and engage less in transfers in kind the more actively they participate in ROSCAs. Those who are most active in ROSCAs are also more active in transfers in terms of labor. Here it is useful to keep in mind that members of ROSCAs tend to be married women or household heads of either sex.

The coefficients on access to formal finance are inconsistent and difficult to make sense of. It may be because of the way formal finance interacts with other variables. Those who have either a savings account in a bank or is a member of a local

savings institution (SACCO) are all from Embu, and they all own cattle. A majority of both tea and coffee growers in Embu either have bank accounts or are members of a SACCO (70-80%). Thus, they have many characteristics of the wealthy. But they are not more likely than others to have a brick house, the status symbol used as a proxy for wealth here. Those who have savings accounts in banks receive more frequently both cash transfers and exchange labor and provide less frequently transfers in kind, while those who are members of SACCOs provide less cash and labor and receive less in kind. It looks like they in general participate less in transfer networks, perhaps because formal financial institutions are preferred options.

The variable “Credit constrained, formal lending” takes the value 1 for those who had applied for formal loans and been rejected, while “Credit constrained, informal lending” takes the value 1 for those who said they had tried to raise cash through social networks to finance an investment (usually on the farm), but had failed to get any. Both of these variables are associated with negative and highly significant coefficients for almost all types of transfers. The only exception is that the formally constrained are more likely to provide transfers in terms of exchange labor. But as a rule, the most credit constrained withdraw from transfer networks.

The “earlier shock” variable is positively associated with frequencies of transfers in kind and labor, both receiving and providing, suggesting that having suffered a shock increases people’s dependency on social networks. The “recent shock” variable is associated with a higher frequency of cash transfers received, a lower frequency of transfers in kind received, and higher frequencies of exchange labor both ways. The strong positive effect on cash transfers received is good news. It suggests that social networks do provide informal insurance, although when this variable is non-zero, it means the respondent was not adequately helped with the recent shock. And, perversely, households with a severely ill household member receive fewer cash transfers, and provide more of both cash and labor transfers, a pattern that is reminiscent of the transfer pattern for the cash strapped coffee producers - the more difficult your situation, the more you provide, and the less you receive, apparently.

Purposes of transfers were only included in the Heckman models. This is because purposes were only observed for non-zero transfers, and the absence of a

transfer cannot be taken as evidence there was no demand for transfers for such purposes as these variables represent. Thus, purposes of transfers could only be included in regressions that take into account the possibility of a selection bias, or that are at least conditional on having an observed transfer. The way the questionnaire was designed, purposes cannot be related to frequencies of transfers. Detailed information, including purposes, was only collected for the largest transfer within the dyad during the last 12 months. Thus, the purpose variables could not be used in the frequency regressions, either.

The excluded purposes are consumption, which is the most common purpose for transfers both in cash and in kind, and investment in a residential building. The latter was excluded from regressions because it appears only sporadically in the data, and had to be excluded from most regressions anyway. For transfers in kind received, there was a problem with poor model fit, perhaps due to some data outliers, so here there were very few significant coefficient estimates.

Quantities of transfers received, both in cash and kind, are larger if they are for farm investments, but transfers provided in cash for this purpose are smaller. This asymmetry may be due to the relatively low number of farm investments in the data, generating conditions for spurious correlations (e.g., if the data are dominated by a recipient of transfers who happened to make a big investment in the recall period). For cash transfers these coefficient estimates are highly significant. Transfers are smaller if they are for farm inputs, whether in cash or kind, and receiving or providing.

Transfers for investments in off-farm businesses are also asymmetric, with transfers being significant only when providing, but there are no opposite signs for receiving and providing. Transfers in cash are higher and in kind are lower when the purpose is off-farm business investments. This pattern may be due to the nature of the investment. Coefficient estimates for transfers for school fees are positive and highly significant for cash transfers both receiving and providing. Both off-farm business investments and school fees can be interpreted as investments in off-farm earnings potential.

All the coefficients on medical expenses are negative, the probably most disturbing finding of the study, given the ongoing AIDS crisis in both study sites, where it was often difficult to find any respondents, because they were too busy

attending funerals. Coefficients on ceremonial (funeral) expenses are also negative for cash transfers, both receiving and providing, but positive for transfers in kind provided. The negative coefficients on cash transfers, both for medical and ceremonial expenses are highly significant. The positive effect on transfers in kind provided for funerals is also strong and highly significant.

Social Network Contacts and Relationships

The “occupation” variables are answers to the question “is this person (i.e., the network contact) a key person in this village or your life, like ...” followed by examples, including village chief, school teacher, etc. I hoped this formulation would ensure respondents would not consider only the person’s main source of income, but also other roles, like being an elder, that are maybe associated with social status, but not necessarily income. Most network contacts were thus characterized as “none of the above”, because they were only ordinary farmers. More than 70% of the network contacts were “none of the above”. The most common key roles in the data are school teacher, extension officer, vet or representative of an agricultural coop, civil servant or military officer, and petty trader, shopkeeper or business owner. Others also included in regressions are priest, missionary or preacher, elder or chief, and politician or spokesperson. Information about the respondents’ relationship with their network contacts are captured in the variables “Multiplex relationship”, defined earlier, “Family member”, “Same sex”, and “Distance between residences in km”.

The names of extension officers typically came as answers to the question: “Who do you like to discuss issues of farming with?” I.e., extension officers belong to the “friends” network. Some of them were listed by many, up to 15 to 20 different respondents could list the same extension officer (nobody who were not extension officers were ever listed by more than 6 respondents). Few of these reported any borrowing or lending with them. As a result, coefficients on extension officers in the transfers regressions are consistently negative. This should not be taken as evidence of extension officers’ behavior as members of transfer networks - they were just not members of my respondents’ transfer networks.

In most rural neighborhoods in Kenya, the village school teacher is among the few with salaried employment, making them among the least cash constrained residents there. As a consequence, they are pulled into transfer networks. School

teachers engage more frequently in transfers in kind, both receiving and providing, and they provide higher level cash transfers. Teachers also provide more exchange labor. (For correct understanding of the tables, note that network contacts are recipients when respondents are providers, and vice versa).

There are fewer civil servants and military officers in the villages, but they are privileged not only by having high and steady cash incomes, but also because of their access to power. Thus, I would expect people to woo them as network contacts, and invest in network relationships with them as useful contacts to have whenever they need to deal with government offices. Conversely, I would expect civil servants to be interested in exploiting their position to elicit favors the other way.

And as expected, civil servants are the most visible members of these social networks. The civil servant variable is highly significant in almost all the regressions. They receive fewer transfers both in cash and in kind, but the transfers they receive are larger, at least in kind. They provide more frequent and higher level cash transfers. Levels of cash transfers they provide are highly significant in both the Heckman regression and the bivariate Tobit estimations. They also provide a little more exchange labor, but receive a lot more.

Many rural residents engage in petty trade to supplement their farm incomes, and if they succeed with that, they should be less cash constrained than the average subsistence farmer. However, when making purchases from petty traders, one quickly realizes that the cash amounts that pass through their hands are very small - they usually have great difficulties giving back the balance on even the smallest notes. But respondents did not distinguish between these petty traders and persons owning larger, more professional business operations, so this category is very diverse. It includes shopkeepers who let farmers buy farm inputs on credit. The coefficients on this variable are similar to those of civil servants, only with smaller effects, except for providing exchange labor. This category also provides more frequent and higher value transfers in kind than others, reflecting their role in provision of farm inputs.

Priests, missionaries and preachers, village elders and chiefs, and politicians and spokespersons are hardly visible at all in the regressions. The only exception worth mentioning is politicians and spokespersons, who engage very little in any kind of transfers, but the levels of cash transfers they receive are very much larger than

those of the control group. They also receive more frequent exchange labor. Both of the study sites are homes of powerful politicians. One former vice president comes from the same neighborhood as where the Vihiga data were collected, while a cabinet minister at the time of data collection comes from the study site in Embu. Neither of these shows up in the data, but politicians who do appear in these networks probably have connections to these national figures, or are able to call upon them in special circumstances.

In many studies of informal and semi-formal finance in rural communities, economic transfers through social networks are assumed to be clan or kinship based systems of economic support, but as mentioned above, in my data family members constitute less than one-third of all transfer network members. One important difference, though, is the very restrictive definition of family ties that has been applied here. The coefficients on family members are positive and highly significant for both frequencies and levels of transfers in all categories, although the levels effects are only significant in the bivariate Tobit models, and not in the Heckman models. The effect is particularly strong for levels of cash received, which may be due to remittances.

Multiplex relationships are expected to have a similar effect as family ties. And they do - the coefficients on this variable follow the exact same pattern as for the family variable. The coefficients on the same sex variable are positive and highly significant for frequencies of transfers in all categories, cash, kind, and labor, but only when providing transfers. For frequencies of transfers received, the coefficient is only significant for exchange labor. This asymmetry here is puzzling, because it really should be symmetric. If people prefer to provide transfers to persons of the same sex, they should also expect to receive transfers from the same sex. An even more puzzling asymmetry occurs for amounts of transfers in cash. They are higher for transfers provided (in the bivariate Tobit model), but lower for transfers received (in the Heckman model).

As discussed earlier, distance is related to remittances. More geographically distant network contacts are obviously not neighbors, and rarely listed as people the respondents like to discuss issues of farming with. They were mentioned because of the remittances they provide. A few respondents mentioned network members living

as far away as America, which makes them outliers with respect to distance. This turns up in the coefficients on distance in the regressions. Broadly speaking, frequencies of transfers are decreasing in distance when providing, but weakly increasing when receiving, an asymmetry that is related to the role of remittances from family members living outside the household. For quantities of transfers the results are contradictory between models for cash transfers provided, which are increasing in distances up to well over 1000 km in the Heckman model, but decreasing in distances above about 4 km in the bivariate Tobit model. For all the other categories of transfers, levels are increasing in distance within relevant ranges.

Summary of Main Findings

Among the most important findings is that participation in transfer networks is dependent on one's resources, and that the poorest mainly participate in frequent but low-value transactions, mostly in kind or as exchange labor. People of intermediate wealth engage more actively in transfers in kind than the poorer, but do not engage more in cash transfers. But as people get wealthier, they engage more in cash transfers and less in transfers in kind. Activity levels in transfer networks may also have a cultural component, as there are clear differences between the two study sites, with the population in Embu being more active, especially with transfers in kind. Resources also play a role in selection into networks. There is a tendency that people network with others who are similar to themselves with respect to social status, human capital, and wealth, etc. Social networks are not anonymous markets, and they are formed through an endogenous network formation process that has important implications for participants in them.

Women are more active in ROSCAs than men, especially married women, who may be using ROSCAs to protect their earnings against claims from husbands. Women are also more active in transfers in kind than men. Being credit constrained in either the formal or informal credit market leads to a withdrawal from transfer networks, but having access to formal finance, or to cash, has only little effect on participation in transfer networks, and virtually no effect on levels of transfers.

Education has a strong effect on participation in transfers, probably through the effect of education on wealth. Those with no formal education participate less in transfers, both in cash and in kind. Those with secondary school participate very

actively in transfers in kind, while it is those with technical school or college who receive the large amounts of cash, although they do not participate frequently in cash transfers. But those with the highest education level participate significantly less in transfers in kind.

The most common purpose of cash transfers is consumption, but when these villagers need to raise relatively large amounts of money, the purpose is often to pay school fees, and education of children clearly attracts large transfers. Bilateral transfers through networks are also valuable sources of finance for investments in income-generating activities. But network do not support households with seriously ill household members, only with funeral expenses.

The most important criterion for achieving support through social networks is if it includes the right people. Three categories of network members stand out as particularly valuable. They are civil servants and military officers, people with off-farm businesses, and teachers, all of whom have higher and steadier cash earnings than the average subsistence farmer, and are good sources of transfers, both in cash and kind. Teachers, civil servants and military officers provide the largest transfers.

It is correct to refer to transfer networks as kinship-based, because family members engage very frequently in transfers with each other, and they may be sources of large amounts of transfers, especially where a household receives regular remittances from a family member not resident in the household, often living quite far away. Multiplex relationships have similar effects as family ties, and may represent more distant relatives, who do not qualify as family members under the strict definition of family ties applied here.

Conclusions and Policy Implications

A primitive model of informal insurance depicts a rural village with identical households that engage in a village-wide risk and income pooling arrangement. But despite the apparent universality of poverty in the communities studied here, it is clear that their populations are not uniform, and they do not form village-wide networks. Social networks form as individuals choose whom to interact with, and in what way. Strong selection mechanisms sort the population into participants and non-participants of transfer networks. Some degree of income and asset pooling can be assumed based on the observation that the studied social networks engage quite intensely in transfers

in kind, dominated by transfers of goods and services that serve as farm inputs, such as borrowing farm implements, but also exchange purchased inputs for other goods or services. Transfers in kind are also important for consumption smoothing. But there are clearly groups who are excluded, as they appear to be unable to participate in certain types of transfers. In particular the poorest appear to be less active in these networks than those of intermediate or higher levels of wealth.

The most immobile households, whose household head has always lived in the same community, appear to share a disadvantage that makes people less active in transfers, and those with denser social networks are, paradoxically, less well insured, and therefore more vulnerable to shocks. Those who have no formal education also appear to be less active in transfer networks than others. Moreover, there is a negative effect of age on participation in transfer networks, perhaps contrary to expectations. Transfer networks provide the greatest benefits to wealthy households, and to those who have been able to include some key persons like civil servants in their networks, whose networks therefore consist of the most resourceful persons.

This study cannot determine if the market for transfers within social networks is constrained on the supply or demand side, but some observations may provide clues for educated guesses. In a situation where the rural villages under study are being devastated by an AIDS pandemic that keeps people busy with funerals, easily observable during data collection, it is disturbing to find that bilateral transfers through social networks are not forthcoming when households suffer serious illness. What people manage to raise transfers for through their networks is school fees for their children and investments in farms and off-farm businesses. This may reflect that people want to channel their resources into investments for the future, and not squander them unproductively, but it leaves out purposes that are of vital importance to the affected households. Clearly, supply of transfers is a function of the suppliers' motivation to supply, and not just the costs the demanders face and their immediate needs.

These findings suggest a need for targeted intervention to help the socially excluded, and to fill the social security void where social networks fail. The excluded can be identified as the poorest, the uneducated, and the elderly. Their needs for financial services include not only ways to finance investments in income-generating

activities, but also access to appropriate savings instruments, that can help them self insure. But no realistic measure of self insurance can insulate households from the effects of sickness and death. Since social networks appear to be of limited help in those situations, policies are needed to improve provision of health care. There is also reason for concern for the productive assets of households who suffer sickness and death, since the most common ways of coping in those situations are distress sales of exactly the assets surviving household members will need to overcome the loss of a family member. The customary slaughter of cattle for funerals among many Kenyans is another source of asset losses associated with the death of a household member, compounding the problems the surviving household members face following the loss of a loved one.

Figure 1. Five married couples in the village Kitulu in Vihiga district, and network contacts who are their family members. The couples are: 56_JGO (husband) and 56_GMG (wife), 59_EM (husband) and 59_AV (wife), 63_IA (husband) and 63_EMA (wife), 104_NA (husband) and 104_DAA (wife), and 117_EL (husband) and 117_RAL (wife). The arrows point from the network contacts to the respondents.

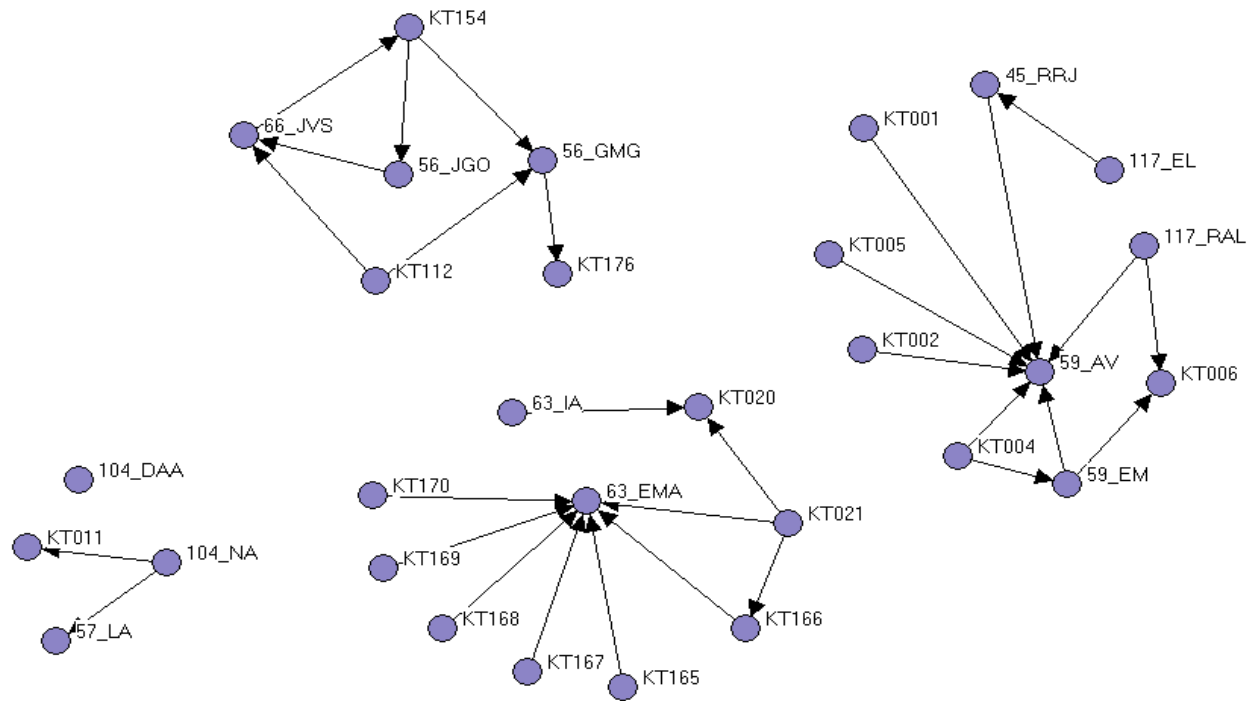


Table 1. Summary of unique variables. Means and standard deviations, minimum and maximum values.

Variable	N	Mean	Std Dev	Minimum	Maximum
<u>Respondent and household characteristics</u>					
B Household head or husband	239	0.5481	0.4987	0	1
Respondent is female	241	0.5768	0.4951	0	1
B Respondent's age in 2002	231	51.9524	15.4310	14	88
B Household head has always lived here	229	0.5895	0.4930	0	1
Density of respondent's network	241	9.9336	3.4934	3	18
B Has no formal education	239	0.1590	0.3664	0	1
B Has completed primary school	239	0.5649	0.4968	0	1
B Has completed secondary school	239	0.2008	0.4015	0	1
B Has completed technical school or college	239	0.0377	0.1908	0	1
B Has completed university	239	0.0084	0.0913	0	1
Number of ROSCA memberships	240	0.7917	1.0054	0	5
B HH member has savings account in bank	237	0.3376	0.4739	0	1
B HH member belongs to local savings inst.	237	0.3291	0.4709	0	1
B Credit constrained formal lending	239	0.5732	0.4956	0	1
Credit constrained informal lending	241	0.0290	0.1683	0	1
B Household receives remittances	239	0.4603	0.4995	0	1
B Not recovered from earlier shock	237	0.7384	0.4404	0	1
Not helped with recent shock	234	0.3034	0.4607	0	1
Seriously ill household member recently	241	0.1618	0.3691	0	1
Respondent owns the farm	241	0.5228	0.5005	0	1
Respondent's spouse owns farm	241	0.1867	0.3905	0	1
B Thatched roof	236	0.0297	0.1700	0	1
B Brick house	236	0.1314	0.3385	0	1
B Area of cultivated land in acres	238	1.9636	2.0635	0.1991	15
B Proportion of cultivated land under tea	238	0.0807	0.1673	0	0.8182
B Proportion of cultivated land under coffee	238	0.1182	0.1920	0	1.2356 *
B Raises cattle	235	0.8723	0.3344	0	1
B Raises sheep or goats	235	0.2426	0.4295	0	1
B Raises poultry	235	0.4596	0.4994	0	1
B Household labor days per month	236	40.9110	25.7343	0	140

B BASIS variables

* Proportions exceeding 1 are due to measurement errors

Variable	N	Mean	Std Dev	Minimum	Maximum
<u>Network member characteristics:</u>					
Same sex	2389	0.6815	0.4660	0	1
Multiplex relationship	2389	0.2026	0.4020	0	1
Family member	2383	0.2195	0.4140	0	1
Distance in km between residences	2374	19.6934	580.7680	0	20000
School teacher	2389	0.0469	0.2114	0	1
Priest, missionary or preacher	2389	0.0167	0.1283	0	1
Extension officer or vet, etc	2389	0.0486	0.2150	0	1
Civil servant or military officer	2389	0.0557	0.2293	0	1
Petty trader, shopkeeper or business owner	2389	0.0963	0.2950	0	1
Village elder or chief	2389	0.0117	0.1076	0	1
Spokesperson or politician	2389	0.0075	0.0865	0	1

For all binary variables, 1 = Yes, and 0 = No, unless otherwise indicated.

Table 2. Membership in Rotating Savings and Credit Associations (ROSCAs).
 Dependent variable is the number of ROSCAs the respondent is a member of. Poisson regression.

	Coef.	Std. Err.	z	P> z	
Constant	-8.8742	4.5672	-1.94	0.052	*
Research site (1 = Embu)	0.2966	0.4274	0.69	0.488	
Female	0.9914	0.2489	3.98	0.000	***
Household head (.. or husband)	0.4231	0.2335	1.81	0.070	*
Age in 2002	-0.0765	0.0365	-2.09	0.036	**
log(Age in 2002)	2.7695	1.6358	1.69	0.090	*
Density of respondent's network	0.0452	0.0312	1.45	0.147	
Has no formal education	-0.2733	0.3432	-0.80	0.426	
Has finished secondary school	0.5561	0.2035	2.73	0.006	***
Has finished technical school or college	0.6854	0.3842	1.78	0.074	*
Thatched roof	0.0715	0.4980	0.14	0.886	
Brick house	0.3476	0.2540	1.37	0.171	
Respondent owns the family farm	0.2113	0.2164	0.98	0.329	
Respondent's spouse owns the family farm	0.5894	0.2342	2.52	0.012	**
Area of cultivated land in acres	-0.1368	0.1078	-1.27	0.205	
log(Area of cultivated land)	0.2877	0.2141	1.34	0.179	
Proportion of cultivated land under tea	-0.2997	0.5644	-0.53	0.595	
Proportion of cultivated land under coffee	-0.2807	0.6528	-0.43	0.667	
Raises cattle	0.1692	0.2855	0.59	0.554	
Raises sheep or goats	-0.0220	0.2256	-0.10	0.922	
Household labor days per month	-0.0008	0.0044	-0.18	0.854	
Household receives remittances	0.0347	0.1873	0.19	0.853	
Savings account in bank	-0.5796	0.3219	-1.80	0.072	*
Member of local savings institution	0.1168	0.3263	0.36	0.720	
Credit constrained, formal lending	-0.1744	0.1964	-0.89	0.374	
Credit constrained, informal lending	-0.2285	0.6199	-0.37	0.712	
Not recovered from earlier shock	0.0757	0.2073	0.37	0.715	
Not helped with recent shock	0.2999	0.2390	1.25	0.210	
Seriously ill household member recently	0.2297	0.2620	0.88	0.381	

Codes that apply to all tables:

- *** Significant at the 1% level
- ** Significant at the 5% level
- * Significant at the 10% level

Table 3. Characterization of those whose recovery from shocks suffered in 1997-2002 has been slow, and who had not recovered by 2002. Dependent variable is “Has not recovered from earlier shock”, a binary variable. Probit estimation.

	Coef.	Std. Err.	z	P> z	
Constant	-0.3375	5.9045	-0.06	0.954	
Research site (1 = Embu)	-0.7812	0.5575	-1.40	0.161	
Female	0.0279	0.2904	0.10	0.923	
Age in 2002	0.0389	0.0472	0.82	0.410	
log(Age in 2002)	-0.6092	2.1208	-0.29	0.774	
Density of respondent's network	0.1390	0.0448	3.10	0.002	***
Has no formal education	-0.1419	0.3615	-0.39	0.695	
Has finished secondary school	-0.3669	0.2773	-1.32	0.186	
Has finished technical school or college	0.8534	0.8977	0.95	0.342	
Brick house	0.4230	0.3990	1.06	0.289	
Respondent owns the family farm	-0.1081	0.2870	-0.38	0.706	
Respondent's spouse owns the family farm	0.0756	0.3540	0.21	0.831	
Area of cultivated land in acres	-0.0709	0.1024	-0.69	0.489	
log(Area of cultivated land)	-0.0038	0.2555	-0.01	0.988	
Proportion of cultivated land under tea	0.5895	0.7676	0.77	0.442	
Proportion of cultivated land under coffee	2.2994	0.9989	2.30	0.021	**
Raises cattle	0.2515	0.3519	0.71	0.475	
Raises sheep or goats	0.2446	0.3123	0.78	0.433	
Household labor days per month	0.0030	0.0057	0.52	0.602	
Household receives remittances	0.1365	0.2465	0.55	0.580	
Number of ROSCA memberships	0.0789	0.1253	0.63	0.529	
Savings account in bank	-0.8153	0.4149	-1.97	0.049	**
Member of local savings institution	-0.4448	0.3871	-1.15	0.251	
Credit constrained, formal lending	0.6231	0.2645	2.36	0.018	**
Credit constrained, informal lending	1.4010	0.8397	1.67	0.095	*

Table 4. Matching of dyadic relationships within social networks, using as a control group a set of hypothetical, unrealized matches from the sample villages. Dependent variable is a binary variable that takes the value 1 if the dyad is among the observed network connections in the data. Probit estimation.

	Coef.	Std. Err.	z	P> z	
Constant	-3.0589	0.3205	-9.54	0.000	***
Household head has always lived here	0.0020	0.1050	0.02	0.984	
Female	0.2868	0.0918	3.12	0.002	***
Age in 2002	0.0040	0.0028	1.42	0.155	
Household head (.. or husband)	-0.0181	0.1957	-0.09	0.926	
Wife	0.2129	0.1830	1.16	0.245	
Brick house	-0.1442	0.1203	-1.20	0.231	
Thatched roof	-0.1770	0.2248	-0.79	0.431	
Household receives remittances	-0.2032	0.0904	-2.25	0.025	**
Has savings account in bank	-0.2551	0.1031	-2.47	0.013	**
Is member of a local savings institution	0.0552	0.1022	0.54	0.589	
Area of cultivated land in acres	0.0049	0.0229	0.21	0.832	
Is a tea grower	-0.1867	0.1270	-1.47	0.141	
Is a coffee grower	0.3674	0.3210	1.14	0.252	
Household labor days per month	-0.0018	0.0014	-1.36	0.175	
Raises cattle	0.0820	0.1929	0.43	0.671	
Raises sheep or goats	-0.0084	0.0928	-0.09	0.927	
Raises poultry	0.2988	0.3024	0.99	0.323	
Has no formal education	-0.1377	0.1089	-1.26	0.206	
Has completed secondary school	0.0512	0.1005	0.51	0.611	
Has completed technical school or college	0.0043	0.2041	0.02	0.983	
Has not recovered from earlier shock	-0.2379	0.1076	-2.21	0.027	**
Both have always lived here	-0.0444	0.1012	-0.44	0.661	
Same sex	0.2098	0.0666	3.15	0.002	***
Same age	0.1405	0.0645	2.18	0.029	**
Both are household heads	0.4880	0.1025	4.76	0.000	***
Both have brick houses	0.6528	0.2165	3.02	0.003	***
Both receive remittances	0.2189	0.1016	2.16	0.031	**
Difference in land endowments	-0.0091	0.0188	-0.48	0.630	
Difference in labor endowments	0.0030	0.0014	2.10	0.036	**
Both raise cattle	-0.0916	0.1575	-0.58	0.561	
Both raise sheep or goats	-0.1043	0.1229	-0.85	0.396	
Both raise poultry	0.3521	0.2206	1.60	0.110	
Both are tea growers	0.2584	0.1452	1.78	0.075	*
Both are coffee growers	0.3606	0.3029	1.19	0.234	
Neither has any formal education	0.0615	0.1619	0.38	0.704	
Both have secondary school	0.2427	0.1671	1.45	0.146	
Both have technical school or college	0.8061	0.4507	1.79	0.074	*
Neither has recovered from earlier shock	0.2415	0.0965	2.50	0.012	**

Table 5. Test for Cragg specification. The test statistic is a Lagrange Multiplier, distributed χ^2 , derived from the log likelihoods of Tobit and Probit estimations. The figures in the columns identified by model classifications are the log likelihoods.

Dependent variable	Truncated N	Unconditional Tobit	Conditional Tobit	Probit	Test statistic
Largest amount received in cash	489	-4967.7170	-4368.3207	-963.2122	-727.6318
Largest amount provided in cash	440	-4302.0931	-3657.5288	-950.5532	-611.9778
Largest value received in kind	732	-6060.5441	-5289.5139	-1203.8840	-865.7076
Largest value provided in kind	750	-6536.4293	-5566.5202	-1188.4839	-437.1496
Untruncated N (all models):	2119				
df (all models):	34				

Table 6.1. The respondent as a recipient of cash transfers. Dependent variable is the largest amount received in cash. Heckman's selection (treatment) model.

	Coeff.	Std.Err.	t-ratio	P-value	
Research site (1 = Embu)	56.0126	165.9970	0.34	0.736	
Female	17.0427	65.9788	0.26	0.796	
Household head (.. or husband)	37.3570	69.3206	0.54	0.590	
Age in 2002	-11.0007	9.4877	-1.16	0.246	
log(Age in 2002)	415.4720	459.8780	0.90	0.366	
Household head has always lived here	6.7597	61.8144	0.11	0.913	
Has no formal education	69.6252	72.9785	0.95	0.340	
Has finished secondary school	98.2751	63.1117	1.56	0.119	
Has finished technical school or college	343.8210	117.6200	2.92	0.003	***
Thatched roof	132.4110	161.9050	0.82	0.413	
Brick house	155.9790	71.9848	2.17	0.030	**
Respondent owns the family farm	51.8927	58.7549	0.88	0.377	
Respondent's spouse owns the family farm	-63.6506	72.6677	-0.88	0.381	
Area of cultivated land in acres	21.8808	20.9015	1.05	0.295	
log(Area of cultivated land)	1.1014	53.5912	0.02	0.984	
Proportion of cultivated land under tea	512.4020	148.1760	3.46	0.001	***
Proportion of cultivated land under coffee	101.9570	151.4460	0.67	0.501	
Raises cattle	52.6900	88.0843	0.60	0.550	
Raises sheep or goats	-67.6639	56.2920	-1.20	0.229	
Raises poultry	-34.1730	120.2330	-0.28	0.776	
Household labor days per month	-1.9908	0.9955	-2.00	0.046	**
Household receives remittances	7.4670	51.3627	0.15	0.884	
Number of ROSCA memberships	-13.6478	23.8925	-0.57	0.568	
Savings account in bank	6.0405	79.9214	0.08	0.940	
Member of local savings institution	-125.8470	74.7782	-1.68	0.092	*
Credit constrained, formal lending	-43.9234	50.8289	-0.86	0.388	
Credit constrained, informal lending	-192.8530	146.4170	-1.32	0.188	
Not recovered from earlier shock	57.4161	55.6581	1.03	0.302	
Not helped with recent shock	69.7808	69.5702	1.00	0.316	
Seriously ill household member recently	-44.3596	77.8953	-0.57	0.569	
School teacher	174.2110	100.8230	1.73	0.084	*
Priest, missionary or preacher	-52.8068	164.2920	-0.32	0.748	
Extension officer or vet, etc.	-106.1330	101.7030	-1.04	0.297	
Civil servant or military officer	190.9840	93.9872	2.03	0.042	**
Petty trader, shopkeeper or business owner	135.3850	73.8717	1.83	0.067	*
Village chief or elder	-75.6968	214.8050	-0.35	0.725	
Politician or spokesperson	23.7154	248.6730	0.10	0.924	
Distance in km	0.9116	0.0338	26.98	0.000	***
log(Distance in km)	55.0699	13.2784	4.15	0.000	***
Family member	83.5825	51.7998	1.61	0.107	
Same sex	-102.8250	46.8942	-2.19	0.028	**
Multiplex relationship	0.3221	53.6411	0.01	0.995	
Farm investment	806.1420	191.4440	4.21	0.000	***
Farm inputs	-421.6090	129.8040	-3.25	0.001	***
Off-farm business expenses	-67.5688	284.2370	-0.24	0.812	
School fees	1272.5700	145.8780	8.72	0.000	***
Medical expenses	-325.2230	118.7630	-2.74	0.006	***
Ceremonial expenses	-1263.5400	187.4040	-6.74	0.000	***
Heckman's lambda	409.0500	1653.3900	0.25	0.805	

Table 6.2. The respondent as a recipient of transfers in kind. Dependent variable is the largest amount received in kind. Heckman's selection (treatment) model.

	Coeff.	Std.Err.	t-ratio	P-value	
Research site (1 = Embu)	114.0830	257.2450	0.44	0.657	
Female	-97.0791	100.8830	-0.96	0.336	
Household head (.. or husband)	-92.8785	105.7880	-0.88	0.380	
Age in 2002	19.3260	14.4999	1.33	0.183	
log(Age in 2002)	-672.3390	702.5310	-0.96	0.339	
HH head has always lived here	4.0207	94.3367	0.04	0.966	
Has no formal education	-88.3831	110.9780	-0.80	0.426	
Has finished secondary school	-26.1925	96.2191	-0.27	0.785	
Has finished technical school or college	47.8351	179.1310	0.27	0.789	
Thatched roof	11.5542	247.8760	0.05	0.963	
Brick house	14.8158	109.7060	0.14	0.893	
Respondent owns the family farm	-15.7454	89.5155	-0.18	0.860	
Respondent's spouse owns the family farm	33.6685	111.2570	0.30	0.762	
Area of cultivated land in acres	8.9656	32.0021	0.28	0.779	
log(Area of cultivated land)	1.9045	82.2681	0.02	0.982	
Proportion of cultivated land under tea	116.8580	225.2850	0.52	0.604	
Proportion of cultivated land under coffee	161.6460	231.2680	0.70	0.485	
Raises cattle	6.8505	135.8390	0.05	0.960	
Raises sheep or goats	-72.5657	85.8698	-0.85	0.398	
Raises poultry	52.5137	185.4280	0.28	0.777	
Household labor days per month	-2.3551	1.5187	-1.55	0.121	
Household receives remittances	-1.9094	78.6502	-0.02	0.981	
Number of ROSCA memberships	-7.8614	36.4823	-0.22	0.829	
Savings account in bank	33.3615	122.0050	0.27	0.785	
Member of local savings institution	22.2486	114.0780	0.20	0.845	
Credit constrained, formal lending	73.5343	77.2546	0.95	0.341	
Credit constrained, informal lending	-13.5013	223.6460	-0.06	0.952	
Not recovered from earlier shock	42.9077	84.9586	0.51	0.614	
Not helped with recent shock	21.8135	106.5910	0.20	0.838	
Seriously ill household member recently	-45.0540	118.8990	-0.38	0.705	
School teacher	58.4849	152.6450	0.38	0.702	
Priest, missionary or preacher	-65.3832	250.8900	-0.26	0.794	
Extension officer or vet, etc.	-19.3707	156.2310	-0.12	0.901	
Civil servant or military officer	125.9530	143.0990	0.88	0.379	
Petty trader, shopkeeper or business owner	270.3470	112.5560	2.40	0.016	**
Village chief or elder	-24.9864	326.4720	-0.08	0.939	
Politician or spokesperson	-120.4050	380.4980	-0.32	0.752	
Distance in km	-0.0274	0.0513	-0.53	0.593	
log(Distance in km)	19.2400	20.2302	0.95	0.342	
Family member	1.6463	79.1805	0.02	0.983	
Same sex	-2.0824	71.4377	-0.03	0.977	
Multiplex relationship	-73.8630	85.6259	-0.86	0.388	
Farm investment	792.2530	410.0790	1.93	0.053	*
Farm inputs	-102.0840	125.7760	-0.81	0.417	
Off-farm business expenses	-377.1970	611.4270	-0.62	0.537	
School fees	-312.1390	725.7850	-0.43	0.667	
Medical expenses	-303.1750	409.4440	-0.74	0.459	
Ceremonial expenses	302.6970	323.8130	0.93	0.350	
Heckman's lambda	-2500.6400	2524.1500	-0.99	0.322	

Table 6.3. The respondent as a provider of cash transfers. Dependent variable is the largest value provided in cash. Heckman's selection (treatment) model.

	Coeff.	Std.Err.	t-ratio	P-value	
Research site (1 = Embu)	16.3988	73.5941	0.22	0.824	
Female	-47.4962	29.2118	-1.63	0.104	
Household head (.. or husband)	26.6352	30.7027	0.87	0.386	
Age in 2002	-7.3255	4.2047	-1.74	0.081	*
log(Age in 2002)	336.1060	203.8750	1.65	0.099	*
Household head has always lived here	-65.3664	27.3666	-2.39	0.017	**
Has no formal education	-3.2640	32.3251	-0.10	0.920	
Has finished secondary school	-10.4910	27.9165	-0.38	0.707	
Has finished technical school or college	-49.7981	51.9323	-0.96	0.338	
Thatched roof	-74.5870	71.6817	-1.04	0.298	
Brick house	6.3778	31.9367	0.20	0.842	
Respondent owns the family farm	-13.5081	26.0021	-0.52	0.603	
Respondent's spouse owns the family farm	2.3964	32.2163	0.07	0.941	
Area of cultivated land in acres	1.2432	9.2657	0.13	0.893	
log(Area of cultivated land)	15.5222	23.7427	0.65	0.513	
Proportion of cultivated land under tea	162.9850	65.3895	2.49	0.013	**
Proportion of cultivated land under coffee	7.6397	67.2769	0.11	0.910	
Raises cattle	48.7164	38.9348	1.25	0.211	
Raises sheep or goats	44.2185	24.8999	1.78	0.076	*
Raises poultry	46.7752	53.2568	0.88	0.380	
Household labor days per month	-1.3903	0.4392	-3.17	0.002	***
Household receives remittances	4.9289	22.7496	0.22	0.828	
Number of ROSCA memberships	-2.1966	10.6083	-0.21	0.836	
Savings account in bank	5.7744	35.3874	0.16	0.870	
Member of local savings institution	49.6623	33.0706	1.50	0.133	
Credit constrained, formal lending	-1.7602	22.4765	-0.08	0.938	
Credit constrained, informal lending	-13.5767	64.9169	-0.21	0.834	
Not recovered from earlier shock	-40.0126	24.7672	-1.62	0.106	
Not helped with recent shock	-26.0059	30.7408	-0.85	0.398	
Seriously ill household member recently	8.9465	34.4081	0.26	0.795	
School teacher	-21.8091	44.1910	-0.49	0.622	
Priest, missionary or preacher	48.3610	72.7205	0.67	0.506	
Extension officer or vet, etc.	-17.1280	44.9746	-0.38	0.703	
Civil servant or military officer	46.8570	41.5040	1.13	0.259	
Petty trader, shopkeeper or business owner	44.6444	32.6123	1.37	0.171	
Village chief or elder	77.9538	95.0986	0.82	0.412	
Politician or spokesperson	254.4580	110.2830	2.31	0.021	**
Distance in km	-0.0126	0.0149	-0.85	0.398	
log(Distance in km)	20.6297	5.8139	3.55	0.000	***
Family member	17.1048	22.9013	0.75	0.455	
Same sex	-3.0748	20.7778	-0.15	0.882	
Multiplex relationship	10.3162	23.8652	0.43	0.666	
Farm investment	-978.6310	119.7630	-8.17	0.000	***
Farm inputs	-284.4090	55.1481	-5.16	0.000	***
Off-farm business expenses	1734.8400	120.0250	14.45	0.000	***
School fees	297.9120	60.9540	4.89	0.000	***
Medical expenses	-339.5770	58.1927	-5.84	0.000	***
Ceremonial expenses	-429.5880	87.0664	-4.93	0.000	***
Heckman's lambda	416.7090	732.1990	0.57	0.569	

Table 6.4. The respondent as a provider of transfers in kind. Dependent variable is the largest value provided in kind. Heckman's selection (treatment) model.

	Coeff.	Std.Err.	t-ratio	P-value	
Research site (1 = Embu)	-28.3270	65.6807	-0.43	0.666	
Female	-4.2561	25.6887	-0.17	0.868	
Household head (.. or husband)	20.1077	27.0400	0.74	0.457	
Age in 2002	0.4085	3.6937	0.11	0.912	
log(Age in 2002)	-44.6421	178.9630	-0.25	0.803	
Household head has always lived here	-3.8959	24.0953	-0.16	0.872	
Has no formal education	13.2397	28.3697	0.47	0.641	
Has finished secondary school	53.4384	24.6432	2.17	0.030	**
Has finished technical school or college	24.3656	45.7874	0.53	0.595	
Thatched roof	-38.6046	63.0593	-0.61	0.540	
Brick house	27.0919	28.0597	0.97	0.334	
Respondent owns the family farm	31.5971	22.8386	1.38	0.167	
Respondent's spouse owns the family farm	58.1439	28.3583	2.05	0.040	**
Area of cultivated land in acres	-7.8047	8.1403	-0.96	0.338	
log(Area of cultivated land)	27.4993	20.8482	1.32	0.187	
Proportion of cultivated land under tea	70.8718	57.7348	1.23	0.220	
Proportion of cultivated land under coffee	33.9158	59.0438	0.57	0.566	
Raises cattle	35.0594	34.2735	1.02	0.306	
Raises sheep or goats	-21.5657	21.9252	-0.98	0.325	
Raises poultry	-15.1858	46.9019	-0.32	0.746	
Household labor days per month	0.3660	0.3872	0.95	0.345	
Household receives remittances	-3.6583	20.0093	-0.18	0.855	
Number of ROSCA memberships	-10.7623	9.3060	-1.16	0.247	
Savings account in bank	-20.9375	31.0673	-0.67	0.500	
Member of local savings institution	-12.7531	29.0961	-0.44	0.661	
Credit constrained, formal lending	15.8867	19.7108	0.81	0.420	
Credit constrained, informal lending	9.2876	57.0890	0.16	0.871	
Not recovered from earlier shock	10.1601	21.6460	0.47	0.639	
Not helped with recent shock	63.0247	27.0877	2.33	0.020	**
Seriously ill household member recently	-8.9633	30.2691	-0.30	0.767	
School teacher	-26.0598	38.9018	-0.67	0.503	
Priest, missionary or preacher	-26.5177	63.9858	-0.41	0.679	
Extension officer or vet, etc.	4.7868	39.9651	0.12	0.905	
Civil servant or military officer	79.4280	36.5062	2.18	0.030	**
Petty trader, shopkeeper or business owner	71.0636	28.7304	2.47	0.013	**
Village chief or elder	-13.2128	83.3048	-0.16	0.874	
Politician or spokesperson	32.4593	96.8322	0.34	0.737	
Distance in km	0.0002	0.0131	0.01	0.990	
log(Distance in km)	11.0894	5.1306	2.16	0.031	**
Family member	17.5658	20.0393	0.88	0.381	
Same sex	9.5549	18.2161	0.52	0.600	
Multiplex relationship	-2.2510	21.7281	-0.10	0.917	
Farm investment	-7.9259	95.4680	-0.08	0.934	
Farm inputs	-142.3340	33.4428	-4.26	0.000	***
Off-farm business expenses	-2156.2600	230.8280	-9.34	0.000	***
School fees	-221.6160	184.9940	-1.20	0.231	
Medical expenses	-268.4460	107.3300	-2.50	0.012	**
Ceremonial expenses	2796.8200	118.6380	23.57	0.000	***
Heckman's lambda	-383.0620	643.6700	-0.60	0.552	

Table 7. Test for Tobit conditions. Student's t statistics for the null hypotheses that each variable is homoskedastic, and that skewness and kurtosis conform with the standard normal distribution.

	I	II	III	IV
Constant	-0.3159	-0.1204	-0.4021	-0.3852
Research site (1 = Embu)	-0.1490	-0.1102	-0.1803	-0.2244
Female	-0.2300	-0.0851	-0.5304	-0.3764
Household head (.. or husband)	-0.2235	-0.0976	-0.1969	-0.0612
Age in 2002	-0.2159	-0.0751	-0.4900	-0.0912
log(Age in 2002)	-0.2446	-0.0893	-0.3522	-0.1011
HH head has always lived here	-0.1665	-0.0976	-0.5356	-0.0740
Has no formal education	-0.3425	-0.0123	-0.4312	-0.4263
Has finished secondary school	-0.2476	-0.4497	-0.0437	-0.0591
Has finished technical school or college	0.0083	-0.0099	-0.2025	0.0138
Thatched roof	-0.0610	-0.1387	-0.1367	-0.1388
Brick house	-0.0294	-0.0716	-0.1154	0.0021
Respondent owns the family farm	-0.1247	-0.3696	-0.1680	-0.1538
Respondent's spouse owns the family farm	-0.4424	-0.0181	-0.1789	-0.1722
Area of cultivated land in acres	-0.1171	-0.1074	-0.2175	-0.0361
log(Area of cultivated land)	-0.0436	-0.0426	-0.0768	-0.0062
Proportion of cultivated land under tea	-0.1742	-0.1669	-0.0325	-0.0194
Proportion of cultivated land under coffee	-0.2709	-0.1684	-0.3985	-0.5234
Raises cattle	-0.2444	-0.0926	-0.2975	-0.1027
Raises sheep or goats	-0.3985	-0.6051	-0.0712	-0.2661
Raises poultry	-0.5697	-0.0399	-0.5943	-0.0318
Household labor days per month	-0.5697	-0.0399	-0.5943	-0.0318
Household receives remittances	-0.4815	-0.0993	-0.4755	-0.1653
Number of ROSCAs member of	-0.1759	-0.0537	-0.3891	-0.0497
Savings account in bank	-0.2984	-0.2548	-0.3747	-0.0481
Member of local savings institution	-0.0963	-0.8047	-0.1170	-0.1549
Not recovered from earlier shock	-0.0945	-0.7874	-0.1113	-0.1501
Not helped with recent shock	-0.2890	-0.0703	-0.6185	-0.0899
Credit constrained, formal lending	-0.3713	-0.1127	-0.5670	-0.0195
Credit constrained, informal lending	-0.2318	-0.0472	-0.2046	-0.1638
Seriously ill household member recently	-0.0861	-0.1627	-0.0970	-0.1629
School teacher	-0.3007	-0.0964	-0.4250	-0.0081
Priest, missionary or preacher	-0.0239	-0.0859	-0.2159	-0.2060
Extension officer or vet, etc.	-0.1294	-0.1293	-0.1282	-0.1218
Civil servant or military officer	-0.2240	-0.2240	-0.2226	-0.2239
Petty trader, shopkeeper or business owner	-0.1103	0.0150	-0.0492	0.0145
Village chief or elder	-0.1363	-0.3053	-0.0400	-0.0236
Politician or spokesperson	-0.1078	-0.1079	-0.1079	-0.1079
Distance in km	-0.0865	-0.0816	-0.0261	-0.0865
log(Distance in km)	0.0287	-0.0091	-0.0330	-0.0025
Family member	0.0909	0.0782	0.4600	0.0409
Same sex	-0.0642	-0.0012	-0.0941	-0.0820
Multiplex relationship	-0.2722	-0.1117	-0.2163	-0.0799
Skewness	0.0254	0.0624	0.0960	0.0338
Kurtosis	0.0785	0.0584	0.0860	0.0486
Dependent variable model	I	Largest amount received in cash		
	II	Largest value received in kind		
	III	Largest amount provided in cash		
	IV	Largest value provided in kind		

Table 8.1. The respondent as a recipient of cash transfers. Poisson regression.
Dependent variable is the number of times last year the respondent received cash from the given network member.

a) Frequency of transfers in cash received	Coef.	Std. Err.	z	P> z	
Constant	3.4830	1.6439	2.12	0.034	**
Research site (1 = Embu)	0.0524	0.1549	0.34	0.735	
Female	0.1542	0.0847	1.82	0.069	*
Household head (.. or husband)	0.0871	0.0942	0.93	0.355	
Age in 2002	0.0370	0.0123	3.02	0.003	***
log(Age in 2002)	-1.8021	0.5848	-3.08	0.002	***
Household head has always lived here	-0.1945	0.0824	-2.36	0.018	**
Has no formal education	-0.0131	0.1037	-0.13	0.900	
Has finished secondary school	-0.5002	0.0925	-5.41	0.000	***
Has finished technical school or college	-0.3317	0.1865	-1.78	0.075	*
Thatched roof	0.2586	0.1991	1.30	0.194	
Brick house	-0.0975	0.1057	-0.92	0.356	
Respondent owns the family farm	0.0148	0.0763	0.19	0.846	
Respondent's spouse owns the family farm	-0.1309	0.1060	-1.23	0.217	
Area of cultivated land in acres	0.0200	0.0305	0.65	0.513	
log(Area of cultivated land)	-0.2271	0.0710	-3.20	0.001	***
Proportion of cultivated land under tea	0.1129	0.2000	0.56	0.572	
Proportion of cultivated land under coffee	-0.1451	0.2305	-0.63	0.529	
Raises cattle	0.4915	0.1188	4.14	0.000	***
Raises sheep or goats	-0.0153	0.0777	-0.20	0.844	
Household labor days per month	0.0007	0.0014	0.49	0.621	
Household receives remittances	-0.2014	0.0692	-2.91	0.004	***
Number of ROSCA memberships	0.0763	0.0315	2.43	0.015	**
Savings account in bank	0.3756	0.1151	3.26	0.001	***
Member of local savings institution	-0.1658	0.1032	-1.61	0.108	
Credit constrained, formal lending	0.0457	0.0704	0.65	0.516	
Credit constrained, informal lending	-0.0329	0.1963	-0.17	0.867	
Not recovered from earlier shock	0.0003	0.0761	0.00	0.997	
Not helped with recent shock	0.6489	0.0800	8.11	0.000	***
Seriously ill household member recently	-0.9689	0.1079	-8.98	0.000	***
School teacher	1.0457	0.0893	11.71	0.000	***
Priest, missionary or preacher	0.0369	0.2299	0.16	0.872	
Extension officer or vet, etc.	-1.7477	0.4118	-4.24	0.000	***
Civil servant or military officer	0.8036	0.0942	8.53	0.000	***
Petty trader, shopkeeper or business owner	0.2860	0.0896	3.19	0.001	***
Village chief or elder	0.6185	0.2655	2.33	0.020	**
Politician or spokesperson	-0.4903	0.4526	-1.08	0.279	
Distance in km	0.0001	0.0000	6.73	0.000	***
log(Distance in km)	0.0206	0.0151	1.37	0.171	
Family member	1.1049	0.0564	19.59	0.000	***
Same sex	0.0922	0.0641	1.44	0.150	
Multiplex relationship	0.5559	0.0637	8.72	0.000	***

Table 8.2. The respondent as a recipient of transfers in kind. Poisson regression.
Dependent variable is the number of times last year the respondent received transfers in kind from the given network member.

b) Frequency of transfers in kind received	Coef.	Std. Err.	z	P> z	
Constant	-2.1358	1.2001	-1.78	0.075	*
Research site (1 = Embu)	0.7422	0.1046	7.10	0.000	***
Female	0.3302	0.0591	5.58	0.000	***
Household head (.. or husband)	0.0804	0.0594	1.35	0.176	
Age in 2002	0.0025	0.0086	0.29	0.772	
log(Age in 2002)	0.1564	0.4189	0.37	0.709	
Household head has always lived here	0.2920	0.0607	4.81	0.000	***
Has no formal education	-0.1235	0.0619	-2.00	0.046	**
Has finished secondary school	0.1464	0.0604	2.42	0.015	**
Has finished technical school or college	-0.8119	0.1289	-6.30	0.000	***
Thatched roof	0.2604	0.1652	1.58	0.115	
Brick house	0.2458	0.0631	3.90	0.000	***
Respondent owns the family farm	0.2532	0.0597	4.24	0.000	***
Respondent's spouse owns the family farm	0.5376	0.0628	8.56	0.000	***
Area of cultivated land in acres	0.0033	0.0164	0.20	0.840	
log(Area of cultivated land)	-0.0128	0.0530	-0.24	0.810	
Proportion of cultivated land under tea	1.2258	0.1054	11.63	0.000	***
Proportion of cultivated land under coffee	-0.6723	0.1415	-4.75	0.000	***
Raises cattle	-0.2066	0.0951	-2.17	0.030	**
Raises sheep or goats	-0.1745	0.0493	-3.54	0.000	***
Household labor days per month	0.0076	0.0008	9.24	0.000	***
Household receives remittances	0.0111	0.0471	0.24	0.814	
Number of ROSCA memberships	-0.1085	0.0217	-5.01	0.000	***
Savings account in bank	0.0947	0.0643	1.47	0.141	
Member of local savings institution	-0.1754	0.0623	-2.81	0.005	***
Credit constrained, formal lending	-0.2589	0.0464	-5.58	0.000	***
Credit constrained, informal lending	-0.8971	0.1574	-5.70	0.000	***
Not recovered from earlier shock	0.3671	0.0473	7.76	0.000	***
Not helped with recent shock	-0.2443	0.0669	-3.65	0.000	***
Seriously ill household member recently	0.0674	0.0785	0.86	0.391	
School teacher	0.4315	0.0780	5.53	0.000	***
Priest, missionary or preacher	-0.3620	0.2034	-1.78	0.075	*
Extension officer or vet, etc.	-1.8697	0.2267	-8.25	0.000	***
Civil servant or military officer	0.1067	0.0788	1.35	0.176	
Petty trader, shopkeeper or business owner	0.2254	0.0676	3.33	0.001	***
Village chief or elder	-0.2679	0.2458	-1.09	0.276	
Politician or spokesperson	-0.8256	0.2806	-2.94	0.003	***
Distance in km	0.0001	0.0000	2.52	0.012	**
log(Distance in km)	-0.0141	0.0128	-1.10	0.270	
Family member	0.3029	0.0422	7.17	0.000	***
Same sex	0.0332	0.0426	0.78	0.435	
Multiplex relationship	1.0424	0.0387	26.95	0.000	***

Table 8.3. The respondent as a recipient of exchange labor. Poisson regression.
Dependent variable is the number of labor-days the respondent's household received from the given network member's household.

c) Number of labor days received	Coef.	Std. Err.	z	P> z	
Constant	-1.0058	2.1714	-0.46	0.643	
Research site (1 = Embu)	0.2242	0.1695	1.32	0.186	
Female	0.1581	0.1027	1.54	0.124	
Household head (.. or husband)	0.0578	0.1028	0.56	0.574	
Age in 2002	0.0420	0.0157	2.68	0.007	***
log(Age in 2002)	-1.5670	0.7571	-2.07	0.038	**
Household head has always lived here	0.9288	0.1142	8.13	0.000	***
Has no formal education	0.4548	0.1039	4.38	0.000	***
Has finished secondary school	-0.1587	0.1135	-1.40	0.162	
Has finished technical school or college	0.2341	0.1675	1.40	0.162	
Thatched roof	-14.3979	494.9473	-0.03	0.977	
Brick house	0.5983	0.1160	5.16	0.000	***
Respondent owns the family farm	0.3771	0.0949	3.97	0.000	***
Respondent's spouse owns the family farm	0.1674	0.1092	1.53	0.125	
Area of cultivated land in acres	0.0874	0.0333	2.62	0.009	***
log(Area of cultivated land)	-0.1455	0.1041	-1.40	0.162	
Proportion of cultivated land under tea	1.2426	0.1897	6.55	0.000	***
Proportion of cultivated land under coffee	1.1249	0.1884	5.97	0.000	***
Raises cattle	-0.0320	0.2460	-0.13	0.897	
Raises sheep or goats	-0.7614	0.0872	-8.73	0.000	***
Household labor days per month	0.0139	0.0015	9.37	0.000	***
Household receives remittances	-0.1095	0.0865	-1.26	0.206	
Number of ROSCA memberships	0.5363	0.0306	17.53	0.000	***
Savings account in bank	0.6116	0.1157	5.29	0.000	***
Member of local savings institution	-0.1685	0.1165	-1.45	0.148	
Credit constrained, formal lending	-0.1666	0.0897	-1.86	0.063	*
Credit constrained, informal lending	0.0039	0.2668	0.01	0.988	
Not recovered from earlier shock	0.2833	0.0906	3.13	0.002	***
Not helped with recent shock	0.5463	0.1160	4.71	0.000	***
Seriously ill household member recently	0.1550	0.1219	1.27	0.204	
School teacher	0.3420	0.1380	2.48	0.013	**
Priest, missionary or preacher	0.0832	0.3239	0.26	0.797	
Extension officer or vet, etc.	-1.2850	0.2731	-4.71	0.000	***
Civil servant or military officer	0.3661	0.1106	3.31	0.001	***
Petty trader, shopkeeper or business owner	0.4611	0.0983	4.69	0.000	***
Village chief or elder	-0.1485	0.3848	-0.39	0.699	
Politician or spokesperson	-0.6542	0.4147	-1.58	0.115	
Distance in km	-0.0103	0.0065	-1.59	0.112	
log(Distance in km)	0.0054	0.0210	0.26	0.797	
Family member	1.2441	0.0631	19.71	0.000	***
Same sex	0.3868	0.0751	5.15	0.000	***
Multiplex relationship	0.8472	0.0622	13.63	0.000	***

Table 8.4. The respondent as a provider of cash transfers. Poisson regression.
Dependent variable is the number of times last year the respondent provided cash to the given network member.

d) Frequency of transfers in cash provided	Coef.	Std. Err.	z	P> z	
Constant	-1.6032	1.8225	-0.88	0.379	
Research site (1 = Embu)	0.0976	0.1682	0.58	0.562	
Female	-0.1674	0.1022	-1.64	0.101	
Household head (.. or husband)	-0.1319	0.1029	-1.28	0.200	
Age in 2002	-0.0138	0.0139	-1.00	0.319	
log(Age in 2002)	0.2217	0.6466	0.34	0.732	
Household head has always lived here	-0.4177	0.0935	-4.47	0.000	***
Has no formal education	-0.1324	0.1144	-1.16	0.247	
Has finished secondary school	-0.1558	0.0940	-1.66	0.097	*
Has finished technical school or college	-0.0180	0.1575	-0.11	0.909	
Thatched roof	0.2400	0.2172	1.11	0.269	
Brick house	0.1736	0.1001	1.73	0.083	*
Respondent owns the family farm	0.1297	0.0897	1.45	0.148	
Respondent's spouse owns the family farm	0.2700	0.1045	2.58	0.010	**
Area of cultivated land in acres	0.0030	0.0291	0.10	0.919	
log(Area of cultivated land)	0.0427	0.0787	0.54	0.587	
Proportion of cultivated land under tea	0.7212	0.1976	3.65	0.000	***
Proportion of cultivated land under coffee	0.3649	0.2187	1.67	0.095	*
Raises cattle	0.2388	0.1299	1.84	0.066	*
Raises sheep or goats	0.0286	0.0845	0.34	0.735	
Household labor days per month	-0.0017	0.0015	-1.15	0.252	
Household receives remittances	0.4566	0.0775	5.89	0.000	***
Number of ROSCA memberships	-0.0326	0.0356	-0.92	0.360	
Savings account in bank	0.1526	0.1233	1.24	0.216	
Member of local savings institution	-0.3363	0.1094	-3.07	0.002	***
Credit constrained, formal lending	-0.4498	0.0764	-5.89	0.000	***
Credit constrained, informal lending	-0.4980	0.2209	-2.25	0.024	**
Not recovered from earlier shock	0.1361	0.0808	1.68	0.092	*
Not helped with recent shock	-0.0182	0.0978	-0.19	0.853	
Seriously ill household member recently	0.4022	0.1084	3.71	0.000	***
School teacher	-0.0290	0.1374	-0.21	0.833	
Priest, missionary or preacher	-0.0915	0.2735	-0.33	0.738	
Extension officer or vet, etc.	-1.3841	0.3216	-4.30	0.000	***
Civil servant or military officer	-0.6064	0.1686	-3.60	0.000	***
Petty trader, shopkeeper or business owner	-0.3872	0.1234	-3.14	0.002	***
Village chief or elder	0.2008	0.3102	0.65	0.517	
Politician or spokesperson	-0.6827	0.4527	-1.51	0.132	
Distance in km	-0.0472	0.0211	-2.24	0.025	**
log(Distance in km)	0.0590	0.0254	2.33	0.020	**
Family member	0.6640	0.0658	10.09	0.000	***
Same sex	0.6505	0.0812	8.01	0.000	***
Multiplex relationship	1.0333	0.0641	16.11	0.000	***

Table 8.5. The respondent as a provider of transfers in kind. Poisson regression.
Dependent variable is the number of times last year the respondent provided transfers in kind to the given network member.

e) Frequency of transfers in kind provided	Coef.	Std. Err.	z	P> z	
Constant	-10.5869	1.2765	-8.29	0.000	***
Research site (1 = Embu)	1.2128	0.1036	11.71	0.000	***
Female	0.3177	0.0579	5.49	0.000	***
Household head (.. or husband)	0.1524	0.0566	2.69	0.007	***
Age in 2002	-0.0524	0.0091	-5.76	0.000	***
log(Age in 2002)	3.0952	0.4458	6.94	0.000	***
Household head has always lived here	-0.1762	0.0569	-3.09	0.002	***
Has no formal education	-0.1320	0.0603	-2.19	0.029	**
Has finished secondary school	0.3985	0.0572	6.96	0.000	***
Has finished technical school or college	-0.5026	0.1286	-3.91	0.000	***
Thatched roof	1.3119	0.1128	11.63	0.000	***
Brick house	0.1249	0.0628	1.99	0.047	**
Respondent owns the family farm	-0.0342	0.0584	-0.59	0.558	
Respondent's spouse owns the family farm	0.8956	0.0586	15.28	0.000	***
Area of cultivated land in acres	0.0097	0.0149	0.65	0.517	
log(Area of cultivated land)	0.0115	0.0493	0.23	0.816	
Proportion of cultivated land under tea	1.4066	0.1041	13.51	0.000	***
Proportion of cultivated land under coffee	-0.5636	0.1440	-3.91	0.000	***
Raises cattle	-0.2445	0.0899	-2.72	0.007	***
Raises sheep or goats	-0.0979	0.0480	-2.04	0.041	**
Household labor days per month	0.0003	0.0008	0.40	0.692	
Household receives remittances	-0.2117	0.0480	-4.41	0.000	***
Number of ROSCA memberships	-0.1674	0.0212	-7.90	0.000	***
Savings account in bank	-0.2097	0.0641	-3.27	0.001	***
Member of local savings institution	0.0896	0.0627	1.43	0.153	
Credit constrained, formal lending	-0.3481	0.0442	-7.88	0.000	***
Credit constrained, informal lending	-0.8928	0.1590	-5.61	0.000	***
Not recovered from earlier shock	0.3983	0.0451	8.84	0.000	***
Not helped with recent shock	0.0822	0.0592	1.39	0.165	
Seriously ill household member recently	-0.0836	0.0738	-1.13	0.257	
School teacher	0.3765	0.0785	4.80	0.000	***
Priest, missionary or preacher	-0.4692	0.1993	-2.35	0.019	**
Extension officer or vet, etc.	-1.8205	0.2387	-7.63	0.000	***
Civil servant or military officer	-0.2375	0.0856	-2.77	0.006	***
Petty trader, shopkeeper or business owner	-0.1480	0.0724	-2.04	0.041	**
Village chief or elder	-0.2092	0.2331	-0.90	0.369	
Politician or spokesperson	-1.2338	0.3360	-3.67	0.000	***
Distance in km	-0.0006	0.0019	-0.32	0.749	
log(Distance in km)	-0.1179	0.0139	-8.46	0.000	***
Family member	0.5642	0.0385	14.67	0.000	***
Same sex	0.1211	0.0396	3.06	0.002	***
Multiplex relationship	0.9828	0.0364	26.97	0.000	***

Table 8.6. The respondent as a provider of exchange labor. Poisson regression. Dependent variable is the number of labor-days provided by the respondent's household to the given network member's household.

f) Number of labor days provided	Coef.	Std. Err.	z	P> z	
Constant	-1.3107	2.0377	-0.64	0.520	
Research site (1 = Embu)	0.5269	0.1715	3.07	0.002	***
Female	0.1464	0.1048	1.40	0.162	
Household head (.. or husband)	0.3447	0.1070	3.22	0.001	***
Age in 2002	0.0099	0.0152	0.65	0.517	
log(Age in 2002)	-1.4314	0.7142	-2.00	0.045	**
Household head has always lived here	1.4056	0.1184	11.88	0.000	***
Has no formal education	0.2237	0.1142	1.96	0.050	*
Has finished secondary school	0.2144	0.1093	1.96	0.050	*
Has finished technical school or college	1.0641	0.1428	7.45	0.000	***
Thatched roof	-1.4484	0.7186	-2.02	0.044	**
Brick house	0.8923	0.1184	7.53	0.000	***
Respondent owns the family farm	0.4579	0.0983	4.66	0.000	***
Respondent's spouse owns the family farm	0.0949	0.1233	0.77	0.441	
Area of cultivated land in acres	0.0547	0.0357	1.54	0.125	
log(Area of cultivated land)	-0.1296	0.1093	-1.19	0.235	
Proportion of cultivated land under tea	2.7133	0.1860	14.59	0.000	***
Proportion of cultivated land under coffee	1.3985	0.1973	7.09	0.000	***
Raises cattle	-0.0834	0.2266	-0.37	0.713	
Raises sheep or goats	-0.3991	0.0846	-4.72	0.000	***
Household labor days per month	0.0116	0.0016	7.16	0.000	***
Household receives remittances	0.0765	0.0850	0.90	0.368	
Number of ROSCA memberships	0.3335	0.0319	10.44	0.000	***
Savings account in bank	0.0365	0.1148	0.32	0.750	
Member of local savings institution	-0.4650	0.1111	-4.19	0.000	***
Credit constrained, formal lending	0.5219	0.0912	5.72	0.000	***
Credit constrained, informal lending	0.2136	0.2360	0.91	0.365	
Not recovered from earlier shock	0.2962	0.0904	3.28	0.001	***
Not helped with recent shock	0.7097	0.1157	6.13	0.000	***
Seriously ill household member recently	0.4896	0.1202	4.07	0.000	***
School teacher	0.0154	0.1432	0.11	0.915	
Priest, missionary or preacher	-0.1028	0.4167	-0.25	0.805	
Extension officer or vet, etc.	-0.9482	0.2730	-3.47	0.001	***
Civil servant or military officer	1.5028	0.0804	18.69	0.000	***
Petty trader, shopkeeper or business owner	0.4907	0.1052	4.66	0.000	***
Village chief or elder	-0.8247	0.5059	-1.63	0.103	
Politician or spokesperson	0.5238	0.2899	1.81	0.071	*
Distance in km	-0.0059	0.0066	-0.90	0.369	
log(Distance in km)	-0.1074	0.0207	-5.19	0.000	***
Family member	0.4420	0.0695	6.36	0.000	***
Same sex	0.8827	0.0898	9.83	0.000	***
Multiplex relationship	1.0106	0.0587	17.21	0.000	***

Table 9.1. The respondent as a recipient of transfers. Unconditional, Bivariate Tobit estimation. Dependent variables are a) the largest amount received in cash, and b) the largest value received in kind.

a) Amount received in cash.	Coeff.	Std.Err.	t-ratio	P-value	
Constant	562.0840	5802.5500	0.10	0.923	
Research site (1 = Embu)	-573.0310	766.1610	-0.75	0.455	
Female	-214.6510	294.5140	-0.73	0.466	
Household head (.. or husband)	10.4067	315.1820	0.03	0.974	
Age in 2002	-3.7130	42.1282	-0.09	0.930	
log(Age in 2002)	-919.7110	2022.1600	-0.45	0.649	
Household head has always lived here	157.6140	266.0030	0.59	0.553	
Has no formal education	147.9600	320.4130	0.46	0.644	
Has finished secondary school	-262.5810	280.3300	-0.94	0.349	
Has finished technical school or college	867.4780	508.0560	1.71	0.088	*
Thatched roof	402.1720	781.1930	0.51	0.607	
Brick house	511.1690	298.1100	1.71	0.086	*
Respondent owns the family farm	145.5410	254.2620	0.57	0.567	
Respondent's spouse owns the family farm	99.3522	344.1780	0.29	0.773	
Area of cultivated land in acres	-18.6241	138.1820	-0.13	0.893	
log(Area of cultivated land)	-50.9301	297.9930	-0.17	0.864	
Proportion of cultivated land under tea	1098.4100	597.1560	1.84	0.066	*
Proportion of cultivated land under coffee	390.9390	735.2900	0.53	0.595	
Raises cattle	460.6270	423.8540	1.09	0.277	
Raises sheep or goats	-555.7650	235.7350	-2.36	0.018	**
Raises poultry	-337.6320	597.9430	-0.56	0.572	
Household labor days per month	4.7735	3.9274	1.22	0.224	
Household receives remittances	-92.1436	228.3290	-0.40	0.687	
Number of ROSCA memberships	-77.7203	108.0650	-0.72	0.472	
Savings account in bank	241.1190	348.3070	0.69	0.489	
Member of local savings institution	69.2980	320.1650	0.22	0.829	
Credit constrained, formal	-42.1886	219.1140	-0.19	0.847	
Credit constrained, informal	-640.4420	723.7950	-0.88	0.376	
Not recovered from earlier shock	328.0180	250.4690	1.31	0.190	
Not helped with recent shock	390.5740	290.8240	1.34	0.179	
Seriously ill household member recently	-484.9790	340.7500	-1.42	0.155	
School teacher	1520.0600	347.7820	4.37	0.000	***
Priest, missionary or preacher	525.9160	689.2150	0.76	0.445	
Extension officer or vet, etc.	-1558.5500	716.2460	-2.18	0.030	**
Civil servant or military officer	1099.5700	304.3120	3.61	0.000	***
Petty trader, shopkeeper or business owner	700.2650	294.5550	2.38	0.017	**
Village chief or elder	1062.2400	951.6130	1.12	0.264	
Politician or spokesperson	-890.8180	1670.6600	-0.53	0.594	
Distance in km	0.9642	1.3083	0.74	0.461	
log(Distance in km)	278.1510	47.6543	5.84	0.000	***
Family member	1275.4500	212.7910	5.99	0.000	***
Same sex	195.3870	220.6860	0.89	0.376	
Multiplex relationship	1392.8200	230.8290	6.03	0.000	***

b) Value received in kind.	Coeff.	Std.Err.	t-ratio	P-value		
Constant	3154.4100	6248.9100	0.50	0.614		
Research site (1 = Embu)	263.1680	789.8570	0.33	0.739		
Female	78.5013	309.6860	0.25	0.800		
Household head (.. or husband)	-96.0880	304.6550	-0.32	0.752		
Age in 2002	44.4788	44.7999	0.99	0.321		
log(Age in 2002)	-2082.1500	2168.3700	-0.96	0.337		
Household head has always lived here	246.3950	281.0880	0.88	0.381		
Has no formal education	-102.4900	325.0700	-0.32	0.753		
Has finished secondary school	-111.7940	292.3690	-0.38	0.702		
Has finished technical school or college	-60.9868	507.4540	-0.12	0.904		
Thatched roof	83.4623	780.3890	0.11	0.915		
Brick house	93.8781	355.1030	0.26	0.791		
Respondent owns the family farm	148.5530	268.4120	0.55	0.580		
Respondent's spouse owns the family farm	44.5117	317.5950	0.14	0.889		
Area of cultivated land in acres	48.4349	101.0180	0.48	0.632		
log(Area of cultivated land)	-130.5380	246.5780	-0.53	0.597		
Proportion of cultivated land under tea	537.6090	697.4760	0.77	0.441		
Proportion of cultivated land under coffee	399.5050	754.5930	0.53	0.597		
Raises cattle	-93.7831	398.9080	-0.24	0.814		
Raises sheep or goats	-270.0970	266.5040	-1.01	0.311		
Raises poultry	-194.3780	601.0780	-0.32	0.746		
Household labor days per month	3.1423	4.5067	0.70	0.486		
Household receives remittances	7.4607	247.3300	0.03	0.976		
Number of ROSCA memberships	-20.4488	112.2860	-0.18	0.855		
Savings account in bank	277.3820	373.4410	0.74	0.458		
Member of local savings institution	-208.8500	360.9910	-0.58	0.563		
Credit constrained, formal	241.6700	238.6800	1.01	0.311		
Credit constrained, informal	-591.6190	734.1050	-0.81	0.420		
Not recovered from earlier shock	250.2720	260.3640	0.96	0.336		
Not helped with recent shock	191.1960	312.0000	0.61	0.540		
Seriously ill household member recently	-369.9390	355.1050	-1.04	0.298		
School teacher	175.4530	462.7720	0.38	0.705		
Priest, missionary or preacher	180.2600	710.6450	0.25	0.800		
Extension officer or vet, etc.	-1958.4600	678.3710	-2.89	0.004	***	
Civil servant or military officer	336.6340	372.8890	0.90	0.367		
Petty trader, shopkeeper or business owner	381.5580	338.5150	1.13	0.260		
Village chief or elder	-426.2370	960.0200	-0.44	0.657		
Politician or spokesperson	-475.3960	1966.9100	-0.24	0.809		
Distance in km	-0.0254	4.1531	-0.01	0.995		
log(Distance in km)	140.3260	62.4779	2.25	0.025	**	
Family member	660.5880	229.6930	2.88	0.004	***	
Same sex	78.9588	210.1980	0.38	0.707		
Multiplex relationship	1415.1400	250.9890	5.64	0.000	***	
	Sigma(1)	2358.4700	63.5541	37.11	0.000	***
	Sigma(2)	2147.3500	37.4931	57.27	0.000	***
	RHO(1,2)	0.2448	0.0638	3.84	0.000	***

Table 9.2. The respondent as a provider of transfers. Unconditional, bivariate Tobit estimation. Dependent variables are a) the largest amount provided in cash, and b) the largest value provided in kind.

a) Amount provided in cash.	Coeff.	Std.Err.	t-ratio	P-value	
Constant	3089.2400	3598.7400	0.86	0.391	
Research site (1 = Embu)	-420.7340	453.6130	-0.93	0.354	
Female	-195.3160	174.7400	-1.12	0.264	
Household head (.. or husband)	27.4760	183.8440	0.15	0.881	
Age in 2002	15.1895	26.5963	0.57	0.568	
log(Age in 2002)	-1350.5700	1264.1300	-1.07	0.285	
Household head has always lived here	-300.1790	164.7140	-1.82	0.068	*
Has no formal education	128.7810	188.1660	0.68	0.494	
Has finished secondary school	121.2740	159.2870	0.76	0.446	
Has finished technical school or college	282.4530	301.9870	0.94	0.350	
Thatched roof	250.9560	460.4290	0.55	0.586	
Brick house	195.7770	168.5630	1.16	0.245	
Respondent owns the family farm	17.1860	162.1260	0.11	0.916	
Respondent's spouse owns the family farm	141.1810	198.5940	0.71	0.477	
Area of cultivated land in acres	23.8637	54.8210	0.44	0.663	
log(Area of cultivated land)	76.0054	132.4430	0.57	0.566	
Proportion of cultivated land under tea	640.8090	360.4510	1.78	0.075	*
Proportion of cultivated land under coffee	723.9280	387.5180	1.87	0.062	*
Raises cattle	196.2330	239.3550	0.82	0.412	
Raises sheep or goats	34.8484	144.4650	0.24	0.809	
Raises poultry	-110.3550	347.7530	-0.32	0.751	
Household labor days per month	-1.2444	2.3717	-0.52	0.600	
Household receives remittances	-172.7220	138.0060	-1.25	0.211	
Number of ROSCA memberships	6.9159	60.4560	0.11	0.909	
Savings account in bank	122.9080	197.8530	0.62	0.534	
Member of local savings institution	96.7630	199.9990	0.48	0.629	
Credit constrained, formal	-43.2173	124.1460	-0.35	0.728	
Credit constrained, informal	-275.1520	358.7680	-0.77	0.443	
Not recovered from earlier shock	38.5170	145.3810	0.26	0.791	
Not helped with recent shock	174.4370	186.4960	0.94	0.350	
Seriously ill household member recently	-194.3350	195.7540	-0.99	0.321	
School teacher	-128.1000	252.4060	-0.51	0.612	
Priest, missionary or preacher	68.2812	392.8340	0.17	0.862	
Extension officer or vet, etc.	-1057.9100	350.2560	-3.02	0.003	***
Civil servant or military officer	-118.8180	206.1420	-0.58	0.564	
Petty trader, shopkeeper or business owner	-24.3676	171.3080	-0.14	0.887	
Village chief or elder	137.5220	511.2560	0.27	0.788	
Politician or spokesperson	-103.8120	629.9340	-0.16	0.869	
Distance in km	-53.1022	12.1363	-4.38	0.000	***
log(Distance in km)	220.3270	38.4102	5.74	0.000	***
Family member	730.1180	118.7710	6.15	0.000	***
Same sex	266.6900	126.6270	2.11	0.035	**
Multiplex relationship	1004.0200	131.5690	7.63	0.000	***

b) Value provided in kind.	Coeff.	Std.Err.	t-ratio	P-value		
Constant	-95.2876	1915.8000	-0.05	0.960		
Research site (1 = Embu)	-159.6360	249.1280	-0.64	0.522		
Female	24.3677	102.8080	0.24	0.813		
Household head (.. or husband)	65.2636	103.4270	0.63	0.528		
Age in 2002	3.5498	14.0383	0.25	0.800		
log(Age in 2002)	-253.3080	669.4650	-0.38	0.705		
Household head has always lived here	76.5305	91.9901	0.83	0.405		
Has no formal education	111.2340	114.8510	0.97	0.333		
Has finished secondary school	186.1380	88.0062	2.12	0.034	**	
Has finished technical school or college	86.4258	181.1930	0.48	0.633		
Thatched roof	-88.6717	247.8010	-0.36	0.720		
Brick house	187.5950	106.4500	1.76	0.078	*	
Respondent owns the family farm	26.7010	88.9079	0.30	0.764		
Respondent's spouse owns the family farm	35.5594	110.4950	0.32	0.748		
Area of cultivated land in acres	-8.2684	35.6807	-0.23	0.817		
log(Area of cultivated land)	44.2410	87.2737	0.51	0.612		
Proportion of cultivated land under tea	423.7400	226.7830	1.87	0.062	*	
Proportion of cultivated land under coffee	201.4190	244.4790	0.82	0.410		
Raises cattle	8.9481	120.9740	0.07	0.941		
Raises sheep or goats	-84.1847	84.6678	-0.99	0.320		
Raises poultry	-131.6360	182.7900	-0.72	0.471		
Household labor days per month	2.7782	1.5017	1.85	0.064	*	
Household receives remittances	-33.6047	76.3423	-0.44	0.660		
Number of ROSCA memberships	-3.4111	36.1560	-0.09	0.925		
Savings account in bank	-30.7443	124.4410	-0.25	0.805		
Credit constrained, formal	52.3754	75.8018	0.69	0.490		
Credit constrained, informal	-201.1420	238.6680	-0.84	0.399		
Member of local savings institution	-36.7083	116.7310	-0.31	0.753		
Not recovered from earlier shock	47.1247	83.8692	0.56	0.574		
Not helped with recent shock	143.1240	101.1000	1.42	0.157		
Seriously ill household member recently	-50.6148	114.1390	-0.44	0.657		
School teacher	6.5711	141.0470	0.05	0.963		
Priest, missionary or preacher	-210.0270	267.1310	-0.79	0.432		
Extension officer or vet, etc.	-818.6350	230.8600	-3.55	0.000	***	
Civil servant or military officer	135.0710	128.8940	1.05	0.295		
Petty trader, shopkeeper or business owner	10.9422	101.4960	0.11	0.914		
Village chief or elder	-161.1630	324.8970	-0.50	0.620		
Politician or spokesperson	-315.6230	589.9510	-0.53	0.593		
Distance in km	-0.0496	0.1714	-0.29	0.772		
log(Distance in km)	39.9223	17.1440	2.33	0.020	**	
Family member	230.5950	71.3818	3.23	0.001	***	
Same sex	6.8601	70.4484	0.10	0.922		
Multiplex relationship	537.6630	82.0025	6.56	0.000	***	
	Sigma(1)	1364.8900	45.1835	30.21	0.000	***
	Sigma(2)	769.1350	10.7911	71.27	0.000	***
	RHO(1,2)	0.5420	0.0357	15.19	0.000	***

References

- Alderman, H., P.-A. Chiappori, L. Haddad, J. Hoddinott, and R. Kanbur, 1995. "Unitary Versus Collective Models of the Household: Is It Time to Shift the Burden of Proof?" *The World Bank Research Observer*. Vol. 10, no. 1: pp. 1-19.
- Aleem, I., 1993. "Imperfect Information, Screening, and the Costs of Informal Lending: A Study of a Rural Credit Market in Pakistan". J. E. Stiglitz (ed.): *The Economics of Rural Organization: Theory, Practice, and Policy*. New York, NY, Oxford University Press, pp. 131-153.
- Anderson, S., and J.-M. Baland, 2002. "The Economics of ROSCAs and Intrahousehold Resource Allocation." *The Quarterly Journal of Economics*. Vol. 117, no. 3: pp. 063-995.
- Coate, S., and M. Ravallion, 1993. "Reciprocity without Commitment: Characterization and Performance of Informal Insurance Arrangements." *Journal of Development Economics*. Vol. 40, no. 1: pp. 1-24.
- Coleman, J. S., 1988. "Social Capital in the Creation of Human Capital." *American Sociological Review*. Vol. 94 (Supplement): pp. S95-S120.
- Cragg, J. G., 1971. "Some Statistical Models for Limited Dependent Variables with Application to the Demand for Durable Goods." *Econometrica*. Vol. 39, no. 5: pp. 829-844.
- De Weerd, J., 2002. *Risk-Sharing and Endogenous Network Formation*. Discussion Paper. Helsinki, Finland, UNU/WIDER. June, 2002. 19 pp.
- van den Brink, R., and J.-P. Chavas, 1991. *The Microeconomics of an Indigenous African Institution: The Rotating Savings and Credit Association*. Ithaca, Cornell Food and Nutrition Policy Program. November 1991. 33 pp.
- Duflo, E., and C. Udry, 2004. *Intrahousehold Resource Allocation in Cote d'Ivoire: Social Norms, Separate Accounts and Consumption Choices*. NBER Working Papers. National Bureau of Economic Research, Inc. 42 pp.
- Goldstein, M., 2000. "Chop Time, No Friends: Intrahousehold and Individual Insurance Mechanisms in Southern Ghana". 59 pp. Unpublished manuscript.
- Greene, W. H., 2000. *Econometric Analysis*. 4th ed. Upper Saddle River, NJ, Prentice Hall.
- Handa, S., 1994. "Gender, Headship and Intrahousehold Resource Allocation." *World Development*. Vol. 22, no. 10: pp. 1535-1547.
- Heckman, J. J., 1979. "Sample Selection Bias as a Specification Error." *Econometrica*. Vol. 47, no. 1: pp. 153-162.
- Kherallah, M., C. Delgado, E. Gabre-Madhin, N. Minot, and M. Johnson, 2000. "The Road Half Traveled: Agricultural Market Reform in Sub-Saharan Africa." Food Policy Report. International Food Policy Research Institute. Washington, DC, October 2000.
- Lee, B.-J., 1992. "A nested Tobit analysis for a sequentially nested regression model." *Economics Letters*. Vol. 38: pp. 269-273.
- Lee, L.-f., 1994. "Semiparametric two-stage estimation of sample selection models subject to Tobit-type selection rules." *Journal of Econometrics*. Vol. 61, no. 1994: pp. 305-344.
- Lin, T.-F., and P. Schmidt, 1984. "A Test of the Tobit Specification Against an Alternative Suggested by Cragg." *Review of Economics and Statistics*. Vol. 66, no. 1984: pp. 174-177.

- McDonald, J. F., and R. A. Moffitt, 1980. "The Uses of Tobit Analysis." *Review of Economics and Statistics*. Vol. 62, no. 2: pp. 318-321.
- Melenberg, B., and A. van Soest, 1996. "Parametric and Semi-Parametric Modelling of Vacation Expenditures." *Journal of Applied Econometrics*. Vol. 11, no. 1: pp. 59-76.
- Morduch, J., 2000. "The Microfinance Schism." *World Development*. Vol. 28, no. 4: pp. 617-629.
- Osterloh, S. M., 2004. "Microfinance in Adverse Environments: The Case of KDA in Kenya." MSc Thesis. Cornell University, Department of Applied Economics and Management, Ithaca, NY.
- Pagan, A., and F. Vella, 1989. "Diagnostic Tests for Models Based on Individual Data: A Survey." *Journal of Applied Econometrics*. Vol. 4, no. Supplement: Special Issue on Topics in Applied Econometrics: pp. S29-S59.
- Platteau, J.-P., 1995. "A Framework for the Analysis of Evolving Patron-Client Ties in Agrarian Economies." *World Development*. Vol. 23, no. 5: pp. 767-786.
- Udry, C., 1994. "Risk and Insurance in a Rural Credit Market: An Empirical Investigation in Northern Nigeria." *Review of Economic Studies*. Vol. 61, no. 3: pp. 495-526.