Social Networks, Extended Families, and Consumption Smoothing: Field Evidence from South Africa

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Abstract

This paper analyses the joint determination of social network membership and employment status in stochastic environments, using data from a new survey undertaken in KwaZulu Natal province as well as ethnographic evidence. The results show strong links between membership of social networks and employment. In particular, being a member of a ROSCA or community-based burial society smooths positive as well as negative shocks both intertemporally as well as across individual members. The results also show that having access to a stable income source such as a social pension enhances the employment probabilities of individuals who reside in households recently sujected to health shocks. Where access to such non-stochastic income is rare, membership of ROSCAs and community based burial societies is common.

Keywords: social networks, consumption smoothing, public transfers, informal insurance.

JEL codes: D1, H55, I138, O17

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1 Introduction

Among poor South Africans, the existence of multi-faceted support networks, whether in the form of kinship ties through extended families, neighbourhood groups of various types, or friendship circles such as the numerous women's groups prevalent in rural communities, can often mean the difference between survival and destitution. This study examines the livelihoods of people living in environments frequently plagued by shocks, and the complex networks they share with others, particularly extended family members and other individuals in the community with whom they regularly interact in various schemes to share risk and good fortune. The paper addresses the question of one's employment status is affected by membership of social networks, particularly groups commonly referred to as rotating savings and credit associations (ROSCAs).

The approach relies on both econometric analysis and ethnography. The core of the paper relies on new data collected through survey and ethnographic work conducted primarily in areas of KwaZulu Natal province previously demarcated as "homelands". The results show a strong link between network membership and employment. Being a member of a network helps mediate shocks (depressing the effects of positive and negative income shocks). Moreover, the results suggest that having access to an income source that is invariant to shocks reduces one's membership probability. Finally, the evidence suggests that membership is determined not only by the availability of income sources that are invariant to shocks, but also by the types of risk individuals bear, particularly the risks posed by health shocks, and by the interaction of these risks with the availability of income sources that are non-stochastic.

The paper is organised as follows: in section 2, I outline the theoretical framework of the paper. Section 3 provides background details of the fieldwork. This is the followed by an ethnographic account of network membership and employment in section 4. I then turn to the econometric model in section 5, beginning with the simplifying assumption that network membership is exogenously given. This assumption is then relaxed in section 6, since membership is typically the product of a non-random process of selection. The impact of membership is then obtained indirectly by showing the differential impact of shocks (both negative and positive) for members and non-members. This is then followed by a discussion of the main results and finally, concluding comments are offered in section 7.

2 Theoretical Framework

Although the study of informal networks[1] has only gained momentum in the last decade[2], their existence has long been recognised in the broader development literature.[3] A common theme throughout this literature is the role of credit constraints, with individuals forming ROSCAs where formal channels of credit and insurance are

[1]The term "network" has been used recently to refer to search behaviour in South African labour markets, in the sense that friends and family of those searching for employment make up the network through which information about employment is passively acquired. I use the term to refer to a collection of individuals that pool resources and information in various ways on a regular basis. These networks include small ROSCAs, informal burial societies, and food-sharing groups. They are usually community specific, but are sometimes kin-based.

[2]See for example Banerjee, Besley, and Guinnane (1994); Besley *et al* (1993); and Guyer and Belinga (1995); Van den Brink and Chavas (1997). See also Dercon and Krishnan (2000); Handa and Kirton (1999); Gugerty (1999)).

[3]See for example the pioneering work by Geertz(1962) and Ardener(1964).

thin. ROSCAs in particular are seen as a solution to the exclusion of the poor from formal credit markets, since networks of this nature benefit from mutual monitoring and limits the informational asymmetries that usually characterise formal credit and insurance markets, thus mitigating moral hazard problems. Other studies show that saving for the purchase of costly durable goods are common motivations for why people join these networks.[4] Both of these themes – credit constraints and savings for the purchase of a costly durable good – are supported by the fact that ROSCAs are prevalent mostly in poor communities. ROSCAs obviously facilitate the smoothing of consumption inter-temporally where members can acquire loans or where allocation rules depend in part on need. But can ROSCAs be viewed as a mechanism for consumption smoothing across space? Given that membership of ROSCAs tends to be clustered around very localised groups (communities, extended families, womens groups etc.), any income shocks experienced by a member are likely to covary with income shocks experienced by other members of the same ROSCA. For this reason, a ROSCA is not usually thought of as an effective mechanism for cross-sectional risk pooling. However, if risk-averse individuals are liquidity constrained and if the money contributed every month has alternative uses which are more risky but more profitable, individuals might view joining a ROSCA as an *ex-ante* consumption smoothing device that is less risky. The cost of such a strategy however, is that the overall returns are lower. In this respect, joining a ROSCA instead of investing the money in some other activity that is more risky (for example, using the money to start a business or searching more actively for off-farm wage employment) is much like opting to remain a sharecropper as opposed to becoming an owner-cultivator. To make the framework more explicit, consider the following simple extension of the standard inter-temporal model of consumption where in the absence of complete community level risk-pooling, households use credit and savings. Individuals live T periods, discount future consumption at a constant rate, and have utility functions of the form:

$$U_t = E_t \sum_{T-t}^{T} \beta^{T-t} u(c_T) \tag{1}$$

where $u(\cdot)$ is twice continuously differentiable with $u' > 0$, $u'' < 0$, and marginal utility tending to infinity when consumption tends to zero. Let A_t and y_t be the individual's asset stock and realised income at the start of period t. The proposition we wish to establish is that when individuals do not have access to full community-level insurance against shocks, and when credit markets are imperfect so that some individuals face a liquidity constraint, risk-averse individuals will tend to join ROSCAs *ex-ante* in order to smooth consumption. To coxtextualise this idea, assume now that borrowing is not possible, but saving is so that $A_t + y_t - c_t \geq 0$. To fix ideas, note that if individuals could borrow, there would not be any need to join a ROSCA (if part of the reason they join is to smooth shocks) since they could simply borrow when a shock is experienced.

Now suppose that individuals face a portfolio choice between two activities: engage in some activity which has a high potential payoff, like starting a business, or contribute

[4]The standard argument is that poor individuals who are otherwise unable to afford the purchase of some durable good, can achieve such a goal much sooner by joining a ROSCA. Besley, Coate, and Loury (1993) for example, address the apparent anomaly that membership is sustained in spite of the fact that being in such a group is not sub-game perfect Nash for at least the last player in the rotation. See Calomiris and Rajaram (1998), Handa and Kirton (1999), and Gugerty (1999), for other accounts of the so-called "costly durable good" hypothesis.

this money to a ROSCA which is less risky in the sense that the payout does not depend on the state of nature, but the activity itself is less profitable than the alternative. Let period t income be determined by a random shock, ϵ which is independently and identically distributed over all individuals living in a community, and the previous period portfolio choice, x_{t-1}. Thus, $y_t = y(x_{t-1}, \epsilon_t)$. A further refinement on the structure of the problem is such that the effect of portfolio choice on income realisation depends on the state of nature, such that: $\frac{\partial y_t}{\partial x_{t-1}} > 0$ if $\epsilon_t > 0$ and $\frac{\partial y_t}{\partial x_{t-1}} < 0$ if $\epsilon_t < 0$. The individual's period t value function is then given by:

$$V_t(A_t + y_t) = \max(u(c_t) + \beta E_t V_{t+1}((1 + r_t)(A_t + y_t - c_t) + y(x_t, \epsilon_{t+1})) + \lambda_t(A_t + y_t - c_t)) \quad (2)$$

Proposition 1 *Risk-averse individuals will choose to form ROSCAs when credit markets are incomplete and when realised income depends on idiosyncratic shocks.*

Appendix A.1 contains the proof of the proposition.

3 Fieldwork and Data

3.1 Background on Sample Algorithm

A strong association between network membership and ROSCAs was recently documented by Cichello *et al* (2002) and Keswell (2000). Keswell (2000) for example shows that network membership is significantly and positively related to unemployment transition: unemployed individuals in one period who were also members of a ROSCA have a positive and significant probability of transiting into employment of some kind in the subsequent period. More precisely, the coefficient on "ROSCA membership", in a standard probit model predicting the probability of making a transition from unemployment into employment, was found to be large in magnitude, positive in sign, and highly significant. Likewise, Cichello *et al* (2002) showed a strong positive association between ROSCA membership and employment persistence (see foonote 21 for more on this). However, because the existing data conveyed little information about the functioning of ROSCAs, not much could be said about the channels of influence of this effect. To investigate this link further, new fieldwork (both quantitative and ethnographic) was conducted on a sub-sample of households in the KIDS dataset.[5]

Since we were primarily interested in the effect of membership on employment, it made sense to stratify the sample frame on the basis of employment status. At the same time, since we were interested in looking at longer term employment dynamics as well, the final sample frame for this study was comprised of individuals who were unemployed in 1993, but who were observed as either unemployed or employed in 1998. As indicated in table 1, which shows a transition matrix of employment status for blacks (excluding coloureds) in the KIDS data, there were 699 such individuals.

[5]The *KwaZulu Income Dynamics Study* (KIDS) records comprise a panel data set covering approximately 1000 households located in KwaZulu Natal province. The first round of data was collected as part of the World Bank living standards measurement survey in 1993 (just months before South Africas first democratic election). In 1998, a team of researchers primarily interested in poverty dynamics and social capital revisited a subset of these households located KwaZulu Natal province. For more on KIDS, see Carter and May (2001); Maluccio, Haddad, and May (2000); and Maluccio, Haddad and Thomas (1999). The study by Keswell (2000) and Cichello (2002) also made use of this data.

This was the starting point of the sampling algorithm for the present study. Appendix A.2 provides the exact algorithm used in the derivation of the target sample, but essentially the logic was to ensure sufficient variation in employment status.

The final target sample comprised 677 individuals observed in 1998 as residents of 358 households which were spread across 45 separate magisterial districts in Kwazulu Natal province. Of these, 278 households (about 78% of the target sample) were successfully tracked and interviewed.[6] Accounting for attrition through death or relocation, we have a sample of 1148 individuals for whom valid information on employment status was obtained. Removing clusters with very low tracking rates[7] and accounting for missing data among some explanatory variables, the final sample (including data on new household members and new labour market entrants) for which we have reliable data on employment status in 2002 comprises 928 individuals.

At the 95% level of confidence, the final household level sample of 278 households represents a stratified random sample of the KIDS households tracked in 1998. Moreover the final sample of 928 individuals represents a valid random sample of those observed as either employed or unemployed in 1998.[8] Thus the sample of households and individuals for which information is available for 2002, can be thought of as a valid sample (on the stratified characteristics) of the KIDS households and individuals.[9]

3.2 Data Description

Table 3 reports summary statistics for this sample of individuals, stratified by network membership, defined as whether one belongs to a ROSCA or some variant thereof such as a community-based burial society. Typically, they way these social networks operate is that members of a community decide to contribute money to a pot, which is then allocated to one of the members, either randomly, or in some predetermined fashion. In South Africa, social networks bearing this type of structure are sometimes referred to as a *stokvel*, though other indigenous names are also common depending on location and context.

The differences in means on some variables is striking. First, there appears to be a substantial and statistically significant difference in average age between members and non-members, with members on average being 20 years older than non-members.

Members tend to be women, confirming patterns reported in ethnographic accounts of ROSCAs and informal burial societies in other parts of Sub-Saharan Africa. For

[6] From the remaining 80, 15 households refused to participate, 25 had moved to another area, and 21 households were not known to residents of the area. A further 19 households could also not be tracked. However, these were cases where all households in the relevant cluster could not be found. Investigations revealed these households had never been interviewed in one or more of the previous waves. The relevant areas are Ezakheni B (cluster 206 near Ladysmith), Edendale (cluster 243 near Pietermaritzburg) and Ndwedwe (cluster 213). Table 2 gives the precise tracking report.

[7] Clusters 194 and 199 were dropped from the sample as these were clusters where only a single household was successfully tracked and interviewed

[8] A simple power calculation reveals that with a 5% sampling error, and a population size of 1000 (at the household level), a valid sample of size 278 is needed. Likewise, at the individual level, for a population of 750, with a 50-50 split on sample characteristics (employed vs. unemployed) and a sampling error of 5%, a sample of 254 would suffice.

[9] Of course, this does not mean the sample necessarily generalises to the rest of the province. This is only true to the extent that the KIDS households themselves are representative of Black households in KwaZulu Natal and given the rapid changes in living arrangements and migration patterns observed over the last decade, caution should prevail in generalising the results of this study to the whole province.

example, see Anderson and Baland's (2002) work in Kibera, an urban slum near Nairobi, Kenya, as well as the collection of essays in Ardener and Burman (1995), and in particular, the contribution by Burman and Lembete (1995) on ROSCAs in urban townships near Cape Town and Johannesburg.

There also appear to be significant differences in eduction with members on average acquiring three years less education than non-members. Just over 12% of respondents were pensioners and about the same number were network members. About 60% of the sample respondents reported that they were engaged in some type of employment activity, broadly defined to include subsistence activities and casual employment.

As will be made clear below, an important dimension of assessing the evidence that ROSCAs function as inefficient *ex ante* consumption smoothing mechanisms is the availability of income sources that are exogenously given (i.e., income sources that do not co-vary with shocks to the environment; a factor which is of paramount importance when subsistence farming is involved). In the data, access to such an income source can be proxied by access to pension eligible elderly in the household. The variables "Mother Alive" and "Father Alive" refer to whether such pension-eligible persons living in the households are the parents of the sample individuals[10] Roughly 31% of the respondents reported a pension eligible father to be alive and living in the same household. A substantially larger fraction of individuals (58%) reported the same of their mothers.

Strikingly, when this figure is stratified by membership, we notice a substantial difference. A substantially larger fraction of individuals who are not members of a network are observed as living with a pension eligible mother (63%) compared to the comparatively smaller fraction of network members (20%). By contrast the difference between members and non-members is substantially smaller when one looks at those who reside with pension eligible fathers. Since previous work (notably that of Esther Duflo (2000), as well as Marriane Bertrand and colleagues (2003)) has shown that individuals benefit more from living with pension-eligible mothers than they do from pension eligible fathers, this noticeable difference is consistent with the argument that risk-averse individuals who reside with pension eligible mothers are less likely to join ROSCAs since they already have access to an income stream that is invariant to stochastic influences, namely the social pension received monthly by the mother. However these raw differences between members and non-members cannot distinguish whether they are driven by age effects or differences due to access to pensions. Of course the two effects are related: the older one gets, the less one can rely on pension eligible parents for support, and the degree of reliance might be further conditioned on the types of shocks one expects to mitigate through pensions or networks. The econometric work presented later will isolate each of these effects.

4 Ethnographic Evidence

Though network theory has been applied to the analysis of labour markets (Montgomery, 1991), attention is usually limited to explanations of job search within the confines of well-defined wage employment in labour markets unlike those typically en-

[10] Notice that this is a strong assumption. It is possible that individuals might have access to pension income from elderly individuals in the household who are not their parents and indeed, they might have claims on the resources of elderly not living in the household. Arguably however, parents are more likely (than others) to share resources with their children, so this possibility can be safely ignored.

countered in poor countries. As table 3 indicates, the overwhelming majority of households in the sample are drawn from areas of the province that were part of the so-called "homelands". These areas are outside of the major urban and peri-urban industrial centres, and are therefore outside of the reach of primary labour markets. Despite the lack of primary labour market opportunities in these areas, owing to industrial decentralisation policies undertaken during the decade 1982-1992, the socio-economic environments in some areas in the sample under consideration are quite unlike most other parts of the homeland territories.[11] This fact limits the causal inference that can be made from any large-n study, since if labour market conditions are spatially varied, then the extent and nature of consumption smoothing across space might also vary. This necessitates a firsthand account of these localised networks and the particular contexts in which they emerge.

Nested within the larger statistical analysis therefore, is an ethnographic study of four communities drawn from the larger dataset generated in the initial phase of the fieldwork described above.[12] During this phase of fieldwork, households in four of the 47 communities (clusters) were re-visited one month after the quantitative survey had been completed. The goal was to conduct further interviews with individuals who had reported that they belonged to a network in order to better understand the survey data and thereby shed light on the likely causal mechanisms that might be in operation. A total of 86 interviews were conducted with key respondents who were members of stokvels or burial societies. The interviews each lasted approximately two hours, and included questions about the structure and workings of the group, and the benefits associated with membership, as well as a general discussion about the community.

The four communities chosen were Osizweni, an urban "township" outside Newcastle in the far north-west region of the province; Gugwini, a peri-urban community near the town of Mzinyathi (very close to Durban); Ezinyathini, a rural community outside Eshowe (about 100 kilometres north of Durban); and Mfongosi, a deep rural village in the magisterial district of Nkandla (roughly in the central part of the province just across the Tugela river). These communities were selected both because preliminary analysis of the quantitative data indicated a significant number of social network memberships in these areas, and because they allowed a similar degree of variation in terms of remoteness, population density, and access to primary labour markets, as proxied by closeness to industrial zones. In the cases studied, two communities–Osizweni and Gugwini–were situated close to industrial zones created during the mid 1980s industrial decentralisation programme, whereas the other two communities reflected the general pattern typified by most areas located in the former KwaZulu homeland, i.e., largely

[11] The favorable incentives (such as tax breaks etc.) made available through the regional industrial development programme (RIDP) and other Apartheid era industrial decentralization initiatives, combined with the rising power of labour unions in the major city centres which began to realise significant benefits for workers, saw the relocation of vast numbers of (mainly labour intensive) manufacturing firms to more remote locations of the former homelands areas in the province. As a consequence of this policy, certain homeland areas in which the survey work was conducted (either in or on the periphery of the manufacturing zones created by firms that relocated) are somewhat different to the majority of other homeland areas of the province where no such changes took place. For example, a major difference is that in areas where firms relocated, wage-employment is more widely available compared to other homeland areas, but at a third of the price in the major cities – Durban, Pinetown and Richards Bay for example – for exactly the same skill category of jobs in sectors with identical capital intensity (Burns, 1998).

[12] For more on the advantages of this type of fieldwork design see Lieberman (2002) and Udry (2002).

remote and extremely thin labour market opportunities (primary or otherwise).[13]

While these four communities differed in the extent of their remoteness from neighbouring towns, none of the areas had tarred roads, making access difficult. Local unemployment rates in these communities were also extremely high. Informal observation suggested there was virtually no form of wage labour except in Gugwini. The few with wage employment tended to be migrant workers engaged in casual as opposed to full-time employment. As already noted, reliance on subsistence agriculture and state grants was pervasive, and poverty levels were severe.[14]

The qualitative interviews also confirmed the severe impact and frequency of negative shocks to these communities as revealed in the quantitative analysis (see Table 3), but understated the frequency and impact of positive shocks. This difference can be explained by the fact that in the intervening period between the survey and the qualitative study, the province suffered extensive flooding, and all four communities revisited had been affected. The recent flooding, in particular, had had a devastating impact in Ezinyathi. This only served to worsen the impact of other recent shocks (particularly crop fires) that had recently plagued this area. Thus, the incidence of reported negative shocks during the qualitative interviews dominated conversations, with very few individuals reporting positive shocks. Moreover, most individuals reported that their households had suffered multiple correlated negative shocks during the preceding four years, with the most common negative shocks being the death of a household member, serious injury, chronic illness, job loss, crop failure, and the destruction of property owing to fire, flooding and the like.

Given the extent of poverty across these communities, the lack of sustained employment, and their vulnerability to shocks with negative consequences for income-generation, one's ability to smooth consumption becomes especially salient. Two broad categories of social networks were targeted in the follow-up qualitative round of fieldwork: *stokvels* and informal "burial societies".[15] In the case of burial societies, individual members make monthly contributions, in return for which they receive assistance in covering funeral costs in the event of the death of a household member. Assistance generally took the form of a cash payout as well as the provision of equip-

[13] Mfongosi and neighbouring Dlolwana are both in the Nkandla municipality, an area that has been closely studied over the last two decades. In a series of studies, based on a panel sample of 70 households spanning over a decade, Elisabeth Ardington documented the evolving livelihoods of individuals residing in this deep rural area. A key finding, also borne out by this study, is the massive reliance on state pensions, remittances, and subsistence agriculture and the virtual absence, of local wage-labour opportunities (Ardington, 1988). More recently, large-scale retrenchments have also lead to a decrease in the amount of remittance income flowing into the area, and an even greater reliance on social pensions (Ardington and Lund, 1996).

[14] Given time and financial constraints, no attempt was made to compile comprehensive household income and expenditure data, thus rendering impossible the calculation of quantitative poverty profiles. However, informal observations of the living conditions of most respondents suggested that the vast majority of households did not earn nearly enough to be living above even the least generous of poverty lines (such as the World Bank dollar per day line). As an illustration, a retired security guard living in Mfongosi was considered to be affluent, simply because he could afford pots and plates. This same individual had a plot of land lying fallow, because he could not afford the cost (about 500 Rand) of erecting a fence to keep wild animals out of the plot, which would enable him to farm vegetables.

[15] Both rounds of fieldwork had identified five types of social networks associated with savings and insurance including formal life insurance and state-aided burial societies. Both of these forms of insurance are however excluded from the analysis since they tend to be large and anonymous, and thus do not meet any recognisable definition of a small-scale social network.

ment, utensils, and other items used for the funeral, such as tents, cups, plates and candles . Belonging to a burial society was seen as superior to more formal types of insurance because they were cheaper, and offered more flexibility. For example, in some cases, if an individual was unable to meet her monthly contribution owing to an income shock, she was not forced to forfeit her accumulated contributions (as would have been the case with a formal insurance plan). Moreover, since informal burial societies typically do not require medical exams, many individuals that would otherwise be excluded (either because they could not afford the high premiums associated with high risk life insurance, or because pre-existing medical conditions rendered them ineligible) are able to acquire some type of death benefit informally. Note however that this is a case involving the smoothing of consumption inter-temporally as well as across space (through the additional services that the members of the burial society offer one another when the funeral takes place).

Stokvels are of two types. First there are "money stokvels" which tend to operate in the usual rotational fashion that typically characterises a ROSCA. Mutual monitoring and discipline associated with saving as a group was viewed as an important aspect of these organizations, with most members saying they found it difficult to save very much on their own.

The second type of ROSCAs observed are "food stokvels". These types of networks were fairly common across the communities, representing more than half the total number of memberships reported. They tended to be very localised, and almost universally did not operate through any of the standard mechanisms identified in the literature such as random allocation or bidding mechanisms (see Besley, Coate and Loury (1993) for example). Rather, a group of individuals make regular monthly contributions which are deposited into a bank account held under the name of a single member of the group who would usually be conferred the title of "treasurer". This person would typically travel to the nearest town on a given day (usually the day on which pensions are disbursed as most members' key income sources appeared to be the receipt of a social pension, either directly, or indirectly, through a claim on the income of a family member with access to a state pension) and deposit the money in the bank account, sometimes accompanied by one other individual. Every detail of the costs involved would be taken into account, including the subsidisation of transport costs of the individual making the trip (which in at least one area visited meant sacrificing a full day). Then, at certain appointed times during the year, the money would be withdrawn from the account, and used to purchase food items in bulk at substantially lower prices. The food would then be distributed equally amongst group members. Typically, these are annual events, mostly just before the commencement of year-end festivities. Most respondents typically reported that they received enough food from this once-off purchase to carry them through the first four to five months of the year.

Most of the groups interviewed (during both the survey and ethnographic components of the study) typically met once a month in a group member's home. Usually, each organisation fulfilled a single purpose, although in a few cases, organizations acted as both money stokvels and burial societies. For example, in some stokvels, members would contribute a small additional amount in the event that one of their members experienced a death in their household. This amount would be used to help cover catering and other costs associated with the funeral. Moreover, money stokvels also sometimes gave out loans (at substantially higher interest rates to non-members) in addition to their usual function.

The overwhelming majority of members were women over the age of 50, many of whom had no formal education (confirming the quantitative results reported in

table 3). Certainly, none had progressed further than completing junior high school and most of those who had some formal education, had five years or less. Typically, individuals belonged to one organization, but in about a third of the cases, individuals reported two memberships. The male partners or spouses of network members were generally not themselves members of the organization, and though male partners were usually aware of the membership, this information was kept secret in about a quarter of cases. This relatively low frequency of memberships that are kept secret from male partners suggests that intra-household conflict over resources, as argued by Anderson and Baland (2002), at best, plays a minor role in accounting for why the individuals in this study form networks of this nature.[16]

As noted above, local unemployment rates in all four communities were very high. In the absence of regular employment activities, many of these women were self-employed in subsistence agriculture – a significant number in s0-called "community gardens". Some engaged in the small-scale production of crafts and indigenous artefacts using locally available resources such as straw, wood and grass. Others relied heavily on a combination of state grants (most notably state pensions, disability grants and child grants) and subsistence agricultural production.

Yet, within this context of meagre (and often uncertain) incomes, network members were required to make regular monthly contributions to their chosen organization.[17] The timing of monthly payments is almost universally designed to coincide with the receipt of state grant income and the receipt of remittances or other income transfers. Contributions by members varied somewhat, but the vast majority were between 100-150 rands per month, where in most cases, such contributions are made on an equal basis.

To maintain membership in an organization, members had to make regular contributions. Default by members of money stokvels would result in the member's accumulated earnings being returned to them and their membership suspended. However, in cases of default by members of food stokvels, it was acceptable for a member who could not make their payment to find a "substitute" for a few months i.e., they would be allowed to find another individual who would take their place in the organization and continue to make payments, until such time as the member was able to resume making their own contributions.[18] Again, note that this mechanism of dealing with default effectively allows members to insure other members. These observations about how these social networks function suggest several important lessons of relevence to the theoretical framework postulated earlier.

First, the mechanism of countering default suggests that while there is no doubt that covariate shocks play an important role in these communities (as evidenced by the widespread flooding that seemed to have affected almost every person interviewed), the type of within-group insurance observed (in the food ROSCAs and community based burial societies in particular) suggests that the sharing of risk might be an important motivation. However, this kind of within-group insurance can only be sustained where *idiosyncratic shocks* are significant. The ethnographic evidence suggested that many

[16] However it could be the case that conflict over household resources is not easily observed, in which case simply asking if the husband knows about one's membership would not reveal anything about whether one's membership is part of a strategy in a more complex intra-household bargaining game.

[17] In a few cases, individuals made weekly contributions, but this was the exception rather than the rule.

[18] The details of splitting the annual payment at a later date would be left to the two individuals to resolve.

positive shocks (such as a sudden increase in received remittance income) reported by individuals were idiosyncratic. Moreover, as will be discussed below, some types of negative shocks, injury and chronic illness in particular, tended to be household specific.

Secondly, for within-group insurance to be sustained, it has to be the case that the risk of default by the members be minimised. One way in which this could be achieved is by admitting only those individuals that have been appropriately vetted by the group. If this is true, then these types of social networks cannot be expected to achieve a Pareto efficient allocation of risk in the standard sense described in the literature (Platteau, 1991; Fafchamps, 1992; and Townsend, 1994). Stated differently, the communities within which these social networks are embedded would not operate as Arrow-Debrue economies, if membership is selective. Every indication from the ethnographic evidence suggests that this is true. Individuals are required to be appropriately vetted before being allowed to join, otherwise there is little guarantee that group norms and sanctions will serve as a significant deterrent to members inclined to default.

In summary then, the ethnography of ROSCAs and community based burial societies presented above provides some basis for proposition 1. Indeed, the evidence suggests that where idiosyncratic shocks are significant, risk-averse individuals that cannot use formal credit channels to smooth consumption will tend to engage in *ex ante* methods of smoothing consumption that are Pareto inefficient. Moreover, the descriptive account of the quantitative data seems consistent with the prediction (see proposition 1) that, if individuals do not face binding liquidity constraints or they have an income source that is invariant to shocks, then forming networks like food ROSCAs becomes less urgent.[19] Recall that a significantly larger fraction of non-networked individuals reported a pension eligible mother alive and to be living in the same household as them.

Given these features of the networks under consideration and the implied reciprocity surrounding membership, one would expect the gains arising from positive shocks to be (at least) partially shared by network members, thus lowering the expected positive effect such shocks are likely to have on outcomes. Likewise, the (negative) effects of negative shocks would also be attenuated, since membership evidently allows one to pool risk not only inter-temporally, but also cross sectionally. I now turn to an econometric investigation of these factors.

5 Empirical Estimates

5.1 Baseline Specification

The basic empirical question I seek to study is the effect of network membership on employment status. The model I begin with is broadly similar to those proposed in the discrete choice literature (see for example Brock and Durlauf, 2001). Thus,

[19] Of course membership also confers non-pecuniary benefits to individuals. For example, many women reported that they enjoyed meeting with others members of the social network, and being part of a group activity. Group members also tended to lend one another possessions and more than a quarter of those interviewed reported that they helped one another in a livelihood generating setting such as planting, irrigation, and harvesting. Group members also appeared to provide assistance to each other with childcare activities and some stated that group members often provided emotional and financial support to one another in times of distress.

the influence of network membership on employment, conditioned on other individual characteristics, can be represented by the following reduced form probability model:

$$p(y_i \mid x_i, z_i) = x_i^{'}\beta + \gamma z_i + u_i \tag{3}$$

where x_i is a vector of individual specific characteristics, and z_i is a binary variable indicating whether or not the individual belongs to a network. This model represents the baseline case considered, the results of which are reported in tables 4 and 5.

Since the data allows one to control for certain observable household shocks, I augment the vector x with binary variables indicating the recent occurrence of household specific shocks.[20] In what follows, the vector of variables describing each shock is first aggregated into two groups: those households that experienced one or more negative shocks and those households that experienced one or more positive shocks. Because of the high frequency of reported negative shocks, further insight can be derived by disaggregating this variable into the most common types of shocks reported, namely death, chronic illness, and the destruction of property through crop fires, flooding, and the like. These disaggregated results are presented in columns three and four of tables 4-5.

5.2 The Effect of Network Membership on Employment

The estimated marginal effects reported in table 5 shows that network membership has a large and significant positive impact on employment probabilities. Being a member of a network is found to confer a 13% advantage on one's probability of having a job, compared to individuals who are not members. This membership effect has been found in other previous work, using the second wave of the KIDS data. As noted earlier, Keswell (2000) showed this effect to be a robust finding even when the outcomes are not binary, but include other labour market states such as "self-employed" and "inactive". Likewise, Cichello, Fields and Leibbrandt (2002) using the same data set, but quite different samples and controls, find a very large significant positive effect of membership on employment persistence.[21]

5.2.1 Controlling for Access to Pensions and Shocks

In South Africa, extended families often play a crucial role when employment opportunities are scarce, through the now well documented efficacy of the social pension system (Case and Deaton, 1998). Moreover, as Elisabeth Ardington long ago noted, the reach of social pensions extends far beyond the obvious beneficiaries, and formed

[20] The recall period for both positive and negative events is since the last survey conducted in 1998. Because respondents were unlikely to remember the precise timing of events, field-assistants were trained to ask the questions relating to shocks in relation to some other occurrence, the timing of which can be more easily identified. For example, if a household reported that they had a crop failure "a few years ago", they were asked whether it happened before or after the birth of a young child in the household, or before or after the death of a senior household member.

[21] This is entirely consistent with my other findings, not reported here, that membership of financial networks lowers the probability of exit from employment significantly. In a multinomial logit framework with 4 mutually exclusive outcomes – namely "employed", "unemployed", "out of the labour force" and "self-employed", Keswell (2000) showed a large negative effect of network membership on the probability of transitioning out of employment and into unemployment.

an integral part of rural life even before the racial equalisation of benefits (Ardington, 1988). More recently however, Duflo (2000) found a positive association between the nutrition of granddaughters and pension receipt by grandmothers. In a similar vein, the work of Bertrand *et al* (2003) suggests possible labour supply effects when intergenerational claims on the resources of elderly living in the same household are strong. Their main result is that pension receipt is associated with substantial and statistically significant negative employment and labour supply responses: living in a three-generation household where pension eligible individuals are present is associated with an employment elasticity of -0.55 and the effects are larger for individuals living with pension eligible females, than for those living with pension eligible males. If the negative employment elasticity is truly on the order of 0.55, and if mothers are more likely to share resources with others in the household than fathers are, as their results seem to imply, then one would expect "mother alive" to be negatively related to employment, whereas the opposite would be expected for "father alive". This is precisely what the results show. Controlling for whether an individual belongs to a household that experienced a negative or positive income shock in the recent past, column 2 of table 5 shows that individuals living with their mothers who are pension eligible have a 6% lower probability of being employed than individuals who do not. By contrast, living with a pension eligible father does not appear to have a discernable effect on one's employment probability. However, one might expect these effects to be different for those households that experienced shocks than for those that did not. Given the substantial variation of reported negative shocks, it is instructive to ask how the experience of a shock might condition these effects.

5.2.2 The Effect of Pension Access Conditioned on Shocks

Column 3 of table 5 introduces interaction terms between "mother alive", "father alive", and specific types of negative shocks that respondents reported as having occurred in the recent past.

The results reveal several interesting patterns. Living with a mother who is pension eligible clearly has a negative effect (-0.124) on employment probabilities. However, the partial effect of "mother alive" appears to be strongly conditioned by the occurrence of chronic illness in the household. The evidence shows that the effect of this conditioning is strong enough to produce a sign change on the partial effect of "mother alive". More precisely, if one lives with a pension eligible mother, and if someone in the household was chronically ill in the recent past, the partial effect of "mother alive" is estimated to be 0.031 (i.e., -0.124 + 0.155). There are two plausible, but competing interpretations of this effect, summarised in the following conjectures:

Conjecture 1 *Since shocks are observed at the household level, the recent occurrence of chronic illness in the household is correlated with the loss of the pension, i.e., the pension eligible mother gets sick, loses the pension, and this shows up as a positive effect on the employment probability of young individuals in the household.*

Conjecture 2 *Having access to a pension reduces the costs associated with gaining employment.*

For conjecture 1 to be true, it has to be the case that illness is a binding constraint on pension receipt. There is some evidence to suggest that this is not the case. During the ethnographic component of this study, conversations often centred on the role of

social pensions. It emerged from many of the interviews that local pension disbursements often deviate from required practice. In areas where take-up was not complete, individuals make a living out of offering to help the elderly to obtain the pensions. This would suggest that in practice, the collection of pensions could be undertaken through proxy. That local authorities deviate from required practice is, of course, not surprising. Indeed, Bertrand *et al* (2003) were able to exploit deviations in the age eligibility criteria in their work (also see Case and Deaton (1998) for more on this). Moreover, table 3 shows that virtually none of the households in the sample experienced the loss of a pension or grant in the four years prior to the survey date.

In contrast, the evidence is highly consistent with conjecture 2. If an employed member of the household loses his or her job as a consequence of chronic illness, one might expect this to reflect as an increase in the employment probability of some other individual in the household of working age, if there are no constraints to entering the labour market. Moreover, if individuals choose more leisure over labour as a consequence of having access to the pension, one would expect the response to be smaller (or zero) for individuals living in households where there is some other source of income, assuming that unemployed individuals residing in the two types of households are not different in their observable characteristics. Yet this is precisely the opposite of what the results show (table 7). When individuals do not reside in pension eligible households, the shock has no effect on employment probabilities, whereas the estimated marginal effect of the recent occurrence of chronic illness in the household is very large (0.155) and statistically significant for individuals who do reside with pension eligible mothers. One likely interpretation of this effect is that having access to a pension income reduces the costs of job search.

5.3 The Effect of Access to Pensions on Membership

Negative shocks (as proxied by chronic illness, death, and property loss) are strong predictors of membership. In particular, individuals living in households in which someone was recently chronically ill have about a 4.5% larger probability of being members than individuals not living in such households. Similarly, individuals exposed to shocks that lead to the destruction of household property are about 16% more likely to be members than individuals not subject to such shocks. The theoretical model predicts that individuals who are likely to have access to sources of income that are invariant to shocks (i.e., social pensions) are also less likely to belong to these networks. The results reported in column three of table 5 seem consistent with this prediction. Note the negative and significant effect on "Mother Alive", as compared to the positive effect of "Father Alive". Given this result, if individuals become members in part to pool risk, one should also expect to see the following:

Conjecture 3 *Individuals subject to negative shocks, but who have access to social pensions (as proxied by "mother alive") should have lower probabilities of membership than individuals without access to social pensions.*

Taking the partial derivative of membership probability with respect to each of the negative shocks included in the regression (rows 2 and 3 of table 7) shows that those who experienced negative shocks, but who have access to pensions (i.e., the partial effect of each shock is the coefficient on the relevant shock term plus the coefficient on its interaction with "mother alive") are less likely to be members, than those who experience these same shocks, but have no access to social pensions.

Finally, since the predictions of the theory rest heavily on the existence of access to non-stochastic income transfers where an individual's ability to smooth consumption is bound by a liquidity constraint, one would expect that when an individual reaches the age-eligibility threshold (60 for women and 65 for men), living with a pension eligible mother should not have a negative effect on one's probability of membership because:

Conjecture 4 *Reaching the eligible pension age most likely corresponds to exiting the labour force, so that pension incomes become the sole source of income of these individuals. Thus, there is a greater need to protect access to the pension. One way to accomplish this is to become a member yourself.*

The evidence is consistent with this conjecture. Specifically, individuals above the age of 60 have a positive probability of being a member, even if they live with a pension eligible mother (row 4 of table 7). Moreover, table 5 shows that being a pensioner is a strong predictor of membership.

To summarise thus far, estimating equation 3 and extensions thereof suggests that networks, shocks, and access to an unearned income source that is invariant to shocks (i.e., a non-stochastic income transfer), all have direct or indirect effects on individual employment probabilities. Moreover, the evidence shows that for households where pension eligible mothers are not present, ROSCAs and community-based burial societies appear to substitute for extended families as a form of pooling risk. Finally, this interaction between membership of ROSCAs and access to non-stochastic transfers appears to vary over the life-cycle of an individual in a fairly predictable manner.

In the next section, we investigate the differences between ROSCAs and extended families in their ability to smooth the effects of shocks across individuals, controlling for covariance in unobserved differences between members and non-members.

6 Endogenous Network Formation

While it is reasonable to assume that some group memberships are exogenously determined (membership of a particular ethnic group, for example) the same cannot be said of other groups such as the neighbourhood to which one belongs, sports clubs, various social groups, or indeed ROSCAs or burial societies. In the context being considered here, it is entirely plausible that network membership is at least partly determined by the individual attributes and household characteristics contained in the vector of variables given by x. Indeed, recall that factors such as age, gender, and access to a state pension as proxied by "mother alive" and "father alive" are strongly correlated with network membership as suggested by the ethnographic evidence. The descriptive evidence in table 3 strongly suppor ts these findings. Moreover, since membership could be correlated with omitted variables, it could also be correlated with the error term, leading to a classic endogeneity problem. These two factors – simultaneity and non-zero covariance between the membership variable and the error term – adds substantial complexity to the problem of trying to identify average treatment effects, given that it is often not possible to find valid exclusion restrictions that allow the network effects to be uniquely identified from other correlated factors (see for example Manski, 1993; Blume and Durlauf, 2001; and Durlauf, 2003). The next sub-section outlines the empirical strategy used to address this concern.

6.1 Empirical Strategy

Given the data structure we are dealing with, we require an estimation framework that will account both for the possible endogeneity of network membership, as well as covariation among the unobservables predicting membership and employment. This necessitates a framework that allows the joint determination of employment and membership. A useful candidate is a correlated disturbance model, as developed by Maddala (1983):

$$\begin{aligned} p(y_i \mid x_i) &= x_i^{'}\beta + u_i \\ p(z_i \mid x_i^c) &= x_i^{c'}\beta^c + e_i \\ \rho &= \text{cov}(u_i, e_i) \\ E(u|x_i, x_i^c) &= E(e|x_i, x_i^c) = 0 \\ Var(u|x_i, x_i^c) &= Var(e|x_i, x_i^c) = 1 \\ Cov(u, e|x_i, x_i^c) &= \rho \end{aligned} \tag{4}$$

This data structure, is similar to Zellner's SUR model, with the key difference that both endogenous variables are binary. Imposing the restriction that $\rho = 0$, reduces this model to the standard single equation framework. However, these estimates will be inconsistent if the implied restriction of $\rho = 0$ turns out not to be supported by the data. Formally, the Wald test statistic of $(\rho/se(\rho))^2$ (which is χ^2 distributed) can be used to test $H_0 : \rho = 0$ against the alternative $H_1 : \rho \neq 0$. Given the data, it can be shown that $\chi^2_{calc} = (0.34/0.099)^2 = 11.79$, which implies rejection of the null hypothesis at the 5% level for the given restriction. The test, it would appear, strongly confirms the presence of an endogeneity problem suggesting the joint model given by equation 4 to be the more appropriate model.

The joint density of the errors (without individual subscripts which are dropped to reduce notational clutter) and joint probabilities of employment and network membership can be represented as

$$\phi(u, e, \rho) = \frac{1}{2\pi\sigma_u\sigma_e\sqrt{(1-\rho^2)}} \exp\left(-\frac{1}{2}\frac{(u^2 + e^2 - 2\rho ue)}{1-\rho^2}\right) \tag{5}$$

$$P(y = 1, z = 1) = \int_{-\infty}^{u}\int_{-\infty}^{e} \phi(x\hat{\beta}, x^c\hat{\beta}^c, \hat{\rho})dude \tag{6}$$

$$= \Phi_{yz}(x\hat{\beta}, x^c\hat{\beta}^c, \hat{\rho}) \tag{7}$$

Given the implied exclusion restriction, the parameters of the above system can be identified (see also Maddala (1983) and Wilde (2000) for more on identification). Depending on the problem to be analysed, three other joint probabilities can be estimated; namely:

$$\begin{aligned} P(y = 1, z = 0) &= \int_{-\infty}^{u} \phi(x\hat{\beta})du - \int_{-\infty}^{u}\int_{-\infty}^{e} \phi(x\hat{\beta}, x^c\hat{\beta}^c, \hat{\rho})dude \\ &= \Phi(x\hat{\beta}) - \Phi_{yz}(x\hat{\beta}, x^c\hat{\beta}^c, \hat{\rho}) \end{aligned} \tag{8}$$

$$\begin{aligned} P(y = 0, z = 1) &= \int_{-\infty}^{e} \phi(x^c\hat{\beta}^c)de - \int_{-\infty}^{u}\int_{-\infty}^{e} \phi(x\hat{\beta}, x^c\hat{\beta}^c, \hat{\rho})dude \\ &= \Phi(x^c\hat{\beta}^c) - \Phi_{yz}(x\hat{\beta}, x^c\hat{\beta}^c, \hat{\rho}) \end{aligned} \tag{9}$$

$$
\begin{aligned}
P(y=0,z=0) &= 1-\int_{-\infty}^{u}\phi(x\hat{\beta})du\int_{-\infty}^{e}\phi(x^{c}\hat{\beta}^{c})de \\
&- \int_{-\infty}^{u}\int_{-\infty}^{e}\phi(x\hat{\beta},x^{c}\hat{\beta}^{c},\hat{\rho})dude \qquad (10)\\
&= 1-\Phi(x\hat{\beta})\Phi(x^{c}\hat{\beta}^{c})-\Phi_{yz}(x\hat{\beta},x^{c}\hat{\beta}^{c},\hat{\rho})
\end{aligned}
$$

Thus, the likelihood function of this model is given by:

$$
\begin{aligned}
L(\beta,\beta^{c},\rho) &= \prod_{i=1}^{n}P_{i} \\
&= \Phi_{yz}(x\hat{\beta},x^{c}\hat{\beta}^{c},\hat{\rho}) \\
&\times (\Phi(x\hat{\beta})-\Phi_{yz}(x\hat{\beta},x^{c}\hat{\beta}^{c},\hat{\rho})) \qquad (11)\\
&\times (\Phi(x^{c}\hat{\beta}^{c})-\Phi_{yz}(x\hat{\beta},x^{c}\hat{\beta}^{c},\hat{\rho})) \\
&\times (1-\Phi(x\hat{\beta})\Phi(x^{c}\hat{\beta}^{c})-\Phi_{yz}(x\hat{\beta},x^{c}\hat{\beta}^{c},\hat{\rho}))
\end{aligned}
$$

To examine whether network membership might operate, in part, through the observed individual characteristics, we first define the vector $v_i = x_i \cup x_i^c$. Now let π_1 refer to the estimated parameter vector associated with the variables only in the employment equation (with zeros in place of the parameters for variables not in the employment equation). Similarly, let π_2 refer to the parameter vector associated with v_{ij} that contains only estimates of those variables found in the membership equation (with zeros everywhere else). Then the conditional partial derivative can be derived as follows:

$$
\begin{aligned}
E\left(y_i|\, z_i=1,v_i\right) &= \Pr\left(y_i=1|\, z_i=1,v_i\right) \\
&= \frac{\Pr\left(y_i=1,z_i=1|\, v_i\right)}{\Pr\left(z_i=1|\, v_i\right)} \qquad (12)\\
E\left(y_i|\, z_i=1,v_i\right) &= \frac{\Phi_{yz}\left(v_i'\pi_1,v_i'\pi_2,\rho\right)}{\Phi\left(v_i'\pi_2\right)} \qquad (13)\\
\frac{\partial E\left(y_i|\, z_i=1,v_i\right)}{\partial v_i} &= \left(\frac{1}{\Phi\left(v_i'\pi_2\right)}\right)\left(g_1\pi_1+\left(g_2-\Phi_{yz}\frac{\phi\left(v_i'\pi_2\right)}{\Phi\left(v_i'\pi_2\right)}\right)\right) \qquad (14)
\end{aligned}
$$

where Φ_{yx} refers to the bivariate normal CDF. Note also that the g_i notation refers to the ρ normalisation of the data (see Maddala, 1983; Greene, 2003) for more details). By simply changing the conditioning to $z_i = 0$, a similar set of marginal effects can be estimated for non-members of networks. Thus equation 14 presents a useful way of asking how the set of observables jointly influence *both* employment and membership, while still exploiting the additional unobserved information influencing both outcomes, as captured by the cross-equation correlation, ρ.

6.2 Identification

Table 6 presents estimates of the conditional marginal effect (derived in equation 14) for members and non-members respectively. These estimates, which exploit the covariance among the unobserved effects in both equations, show the total effect of the observed individual and household characteristics on employment, conditioned on whether one is a member of a social network or not.

The exclusion restriction that identifies the model is whether one is a pensioner or not. By definition, this variable must be orthogonal to whether one is employed or not (as pensioners are not counted as part of the economically active sample of individuals). This is not to be confused with the indicator variable of whether one has access to a pensioner (which the variables "mother alive" and "father alive" proxy for), which, if Bertrand *et al* (2003) are correct, cannot be orthogonal to employment.

6.3 Do people join ROSCAs and informal burial societies in order to pool risk?

If stokvels and informal burial societies exist in part to pool risk across individuals, then it stands to reason that shocks should affect members and non-members differentially. More precisely, we should expect:

Conjecture 5 *Shocks should have a lower effect on the employment probability of network members than non-members because the effect of sharing risk reduces the individual private value of the windfall.*

Table 6 shows statistically significant group differences of the impact of positive shocks on individual employment probabilities.[22] For individuals living in households that had recently experienced a windfall gain, the marginal effect is smaller for members than for non-members (row 1, table 8). One's probability of finding employment is about 26% higher for non-members who had experienced a positive income shock (versus those who had not) whereas this advantage is reduced to about 11% when one is a network member. One interpretation of this finding is that since network members engage in consumption smoothing activities with others in their group, the positive effect on employment produced by the windfall (say through lowering the costs of job search) is muted when one is a network member, if members engage in mutual insurance.[23]

Likewise, we should expect network membership to have a muting effect on the consequences of negative income shocks, if these types of social networks smooth shocks over individuals. More precisely, we expect:

Conjecture 6 *Network members are more effective at smoothing negative shocks than non-members who don't have access to pension incomes.*

The evidence on this is a bit more varied. Table 6 shows that the direct effect of a recent death in the household has a much larger negative effect on the employment probabilities of individuals who are not members of social networks and also do not live in households where a pension eligible mother resides (row 2, table 8). This is consistent with conjecture 6. However, this result depends on the shock one is exposed to. As table 8 shows, the same is not true when the shock one is exposed to is the

[22] Postive shocks are not disaggregated since there is little variation in the responses to this section of the questionnaire

[23] Of course another plausible interpretation is that network members are much more risk averse than non-members and so are less likely to take risks with the windfall (perhaps because group norms discourage risk taking but foster prudence) thereby lowering their chances of gaining employment. Again note that in the context of the present study, since employment is broadly defined to include a multitude of livelihood generating activities (including starting/running a business) this explanation is entirely possible. However, there is little in the data that would allow a test of this hypothesis.

destruction of household property due to fire and the like (row 3). In this case, the negative shock appears to have a positive effect on employment probabilities, but is larger in magnitude for non-members. One possible interpretation of this finding is that this variable reflects the effects of crop fires (which had been widely reported during the ethnographic work) in the sense that the destruction of one's property through fire is likely to be correlated with the destruction of one's crops through fire which plausibly could lead to an increase in the amount of time devoted to non-agricultural labour activities. Since non-members do not have access to a ROSCA, the shock has a much more pronounced effect.

6.4 Do ROSCAs and informal burial societies substitute for extended families?

If the theoretical prediction is that individuals only ever join networks when they cannot smooth consumption through some other means (either by having access to their mother's social pension or through borrowing) then we should be able to show:

Conjecture 7 *"Mother alive" has no independent effect on the employment probabilities of members of networks, whereas we should see a negative effect on the employment probabilities of non-members.*

Both of these predictions are true, though again there appears to be some variation in the response depending on the types of shocks one was exposed to. The results show that if one is a network member, there is virtually no effect of living with a mother that is pension eligible (i.e., both the estimated marginal effect and t-ratio are of small magnitudes), whereas for non-members the effect is negative in sign and large in magnitude (row 4, table 8). Interestingly though, the evidence suggests that individuals who are members of networks *and* have access to pension incomes are better able to cope with the recent occurrence of chronic illness in their households (row 6, table 8) than their counterparts who are members without access to pension incomes (rows 5, table 8). This would seem to make sense since we know that both conjectures 2 and 5 are supported by the evidence, so a larger effect is not surprising for individuals who enjoy the benefits of both membership and access to pensions. Yet this result seems inconsistent with strict substitutability between social networks and extended families. One explanation for this apparent inconsistency is that individuals respond differently to different types of negative shocks. This is reasonable since not all risks can be coped with through having access to a pension. If chronic illness of an employed member of the household leads an unemployed member of the household to replace this person in the labour market, then even if this person faces lower costs of finding employment because they have access to a social pension, there remains the question of who will take this individual's place in the household (especially if their primary responsibility was to take care of the sick and the elderly). In such a case, it would make sense for the individual to still choose to belong to a ROSCA or a burial society, even though the theory predicts they should not, since other members of the social network could help with the burden of care-giving. This type of arrangement was ubiquitous in many of the communities visited during the ethnographic component of the study.

7 Conclusion

A rich collection of ethnographic studies on ROSCAs, exemplified by the pioneering work of Clifford Geertz (1962) and Shirley Ardener (1964), as well as other more recent contributions such as Anderson and Baland (2002), and Arderner and Burman (1995), suggests that fundamental to the function, purpose, and reach of social networks is the complementary role played by extended families. In South Africa, the growing importance of three-generation households, induced in part by the social pension, and the complex behavioural responses associated with the social pension (see Burns and Keswell (2004) for a survey) make this fact even more pertinent. These complexisties in behaviour necessitates a more complete model both of the processes by which groups are formed as well as the subsequent behaviours (or outcomes) they induce (Durlauf, 2003).

This paper represents an attempt to address this challenge. The joint determination of network membership and employment was considered, in the context of environments frequently plagued by shocks, where formal employment opportunities are scarce and risk-sharing and informal insurance networks common. The results show a strong link between network membership and employment. Being a member of social network helps to depress the effects of negative income shocks on employment probabilities, and from this perspective, serves a valuable role in poor communities with limited access to other forms of insurance against risks that threaten their livelihoods.

However, despite this positive mediating effect of network membership on employment outcomes given the occurrence of negative shocks, there is a potentially negative side to membership. Recall that the evidence suggests that positive shocks have a smaller positive effect on the employment probability of network members than non-members, because the effect of sharing risk reduces the individual private value of the windfall for network members *vis-a-vis* non-members. That network members are willing to share windfall gains with other network members is quite remarkable, and while it may partly be due to local norms of reciprocity, it clearly confirms the extent of the risk aversion on the part of network members, who are willing to trade windfall gains for insurance during bad times.

However, such behaviour is clearly inefficient. In the absence of sharing windfall gains with others, these gains could be invested in alternative, potentially more profitable activities. A central theme in this paper has been that risk-averse individuals who face liquidity constraints may view the joining of a ROSCAs as an *ex ante* means of smoothing consumption, particularly in high-risk environments. In a world of either complete community level risk-pooling or in the absence of borrowing constraits, these individuals would be fully insured, and the need for second-best mechnisms of consumption smoothing would fall away. Thus, credit market exclusion of the very poor results in two types of inefficiency. The first is that liquidity-constrained individuals who do not have access to stable income sources seek out informal insurance mechanisms even though such strategies are *ex ante* inefficient. The second source of inefficiency arises from the fact that these members then also share windfall gains which could potentially have been invested in more profitable activities outside of the network, one consequence of which is the muting of individual incentives. Indeed, the evidence presented in this paper demonstrates that individuals living in communities subject to frequent negative shocks, particularly chronic illness, are less likely to join ROSCAs (and thereby avoid the inefficiency) if they enjoy greater income security through access to the social pension of their mothers. Publicly provided social insurance would certainly serve to reduce these sources of inefficiency.

The results presented here also suggest that previously documented negative employment elasticities associated with access to pension income should be revisited, with greater attention being paid to the mediating impact of shocks on behaviour. This paper suggests that in the face of shocks, particularly chronic illness in the household, access to pension income may improve employment possibilities by lowering the cost of job search (Conjecture 2). Of course, the unemployment problem in South Africa probably has as much to do with labour demand as labour supply. So while the evidence shows that providing better insurance for the poor has positive effects for economic opportunity, this can but only be one part of the overall policy response to dealing with unemployment.

A Appendix

A.1 Proof of Proposition 1

Proposition 1 is a well known result (see for example Bardhand and Udry, 1999). The first-order condition of this problem (assuming complementary slackness between λ_t and $(A_t + y_t - c_t)$ is given by:

$$u'(c_t) = E_t\beta(1+r)V'_{t+1}((1+r_t)(A_t + y_t - c_t) + y(x_t, \epsilon_{t+1})) + \lambda_t \tag{15}$$

Using the envelope theorem, x_t will satisfy

$$E_{t-1}\frac{dV_t(\cdot)}{dx_{t-1}} = E_{t-1}u'(c_t)\frac{\partial y}{\partial x_{t-1}} = 0 \tag{16}$$

Combining equations 15 and 16, we can re-write equation 16 as

$$E_{t-1}(\beta(1+r)V'_{t+1}(\cdot))\frac{\partial y}{\partial x_{t-1}} = 0 \tag{17}$$

When credit markets are complete, portfolio choice is unconstrained as individuals can borrow in times when income realisation is low owing to negative shocks. In other words, if $\lambda_t = 0$ for all states of nature in period t, x_{t-1} is chosen so that

$$E_{t-1}V'_{t+1}(\cdot)\frac{\partial y}{\partial x_{t-1}} = 0 \tag{18}$$

However, if λ_t binds for some states of nature, then x_{t-1} is chosen so that

$$\beta(1+r)E_{t-1}V'_{t+1}(\cdot)\frac{\partial y}{\partial x_{t-1}} = -E_{t-1}\lambda_t\frac{\partial y}{\partial x_{t-1}} \tag{19}$$

This expression is clearly positive since the liquidity constraint only ever binds in periods when income is low (i.e., when negative income shocks occur) and in such periods we know that choosing more of the risky activity (for example, starting an enterprise or reducing non-agricultural wage-labour activity in favour of more intensive agricultural activity for the purposes of surplus production) leads to a reduction in realised income (i.e., $\partial y_t/\partial x_{t-1} < 0$). Therefore, the expected marginal utility of undertaking say farming or starting a business must be higher and thus the level of risk-taking must be lower, when individuals face liquidity constraints. On the other hand, when credit markets are complete, individuals will not need to join ROSCAs as an *ex ante* response to shocks as they can simply smooth consumption through borrowing. This establishes proposition 1.

A.2 Sampling Algorithm

Given that the KIDS panel was not meant to reveal anything about the racial dimensions of living standards, all Indian households were deleted from this sample which led to a target sample of 677 individuals. Clusters (or magisterial districts) known to have been fabricated by fieldworkers in the first wave of the panel (cluster numbers 217 and 218) were then deleted (see Carter *et al* (2003) for more details). Owing to the wide geographic dispersion of the areas contained in the data and the cost implications of this, all clusters with fewer than 5 households were deleted from the frame. Thus clusters 74, 76, 79, 200, 202, 208, 210, 212, 215, 219, 226, 230, 231, and 239 were not

sampled, in addition to all clusters where no individuals experienced a transition out of unemployment and into employment.

This left a total of 358 households located in 45 separate clusters spread throughout the province of KwaZulu-Natal covering 1749 individuals aged 19-64 in 2002. This target sample contained the majority of the original 677 individuals, save for those no longer in the sample owing to deletion of the clusters mentioned above. These individuals were denoted as "core" members of the target sample. Demographic details of these individuals and other spatial data such as hand-drawn maps and aerial photographs were used to locate the geographical position of the 358 households that these individuals were observed as residents of in 1998. The tracking process began by plotting the rough geographic location of each sample cluster of households. In addition to those household members denoted as core, the questionnaire also allowed for new economically active individuals joining the household to be captured. The names of those individuals identified as core persons were pre-listed on each household questionnaire. Since individuals aged 15-60 were interviewed in 1998, the target sample thus ultimately comprised the 19-64 age cohort (though allowing for new household members effectively increased the range of ages beyond the 64 year cut-off). In addition, a further 206 new household members were interviewed, increasing the potential sample to 1955. As far as was practical, individual members of each household were interviewed directly. This meant that in certain cases, more than one visit to the household was required in order to complete the interview. Individuals identified as core respondents who were no longer resident within the household had to be tracked and interviewed with a separate survey instrument. The tracking rule we applied was as follows: if the person had moved to within a five-kilometre radius of the original household, then a face-to-face interview was completed, if the individual could be located. If the individual had moved further away, they were contacted telephonically, if this was possible.

Locating many of the sample households proved challenging, given the poor quality of the available spatial data. Most maps made available were 10 or more years out of date and the quality of the aerial photographs varied greatly. In the majority of cases, households were found with the assistance of the local *Inkosi* (chief) or *Induna* (keeper of chiefs affairs).

Table 1: KIDS Employment Status Transition Matrix, 1993-1998

1993/1998	Employed	Self-Employed	Unemployed	OLF	n
Employed	672	27	160	99	958
Self-Employed	47	37	33	52	169
Unemployed	281	41	418	62	802
OLF	300	44	511	756	1611
n	1300	149	1122	969	3540

Figures represent individuals transitioning between labour market states. Row figures are for 1993 and column figures are for 1998. OLF = "Out of the Labour Force". "Unemployed" includes individuals without employment who say they have not searched for employment in the recent past.

Table 2: Fieldwork Summary

Cluster	Name	Targeted	Interviewed	Refused	Moved	Unknown	Contaminated
59	St. Wendolins	5	4	0	0	1	0
70	Lower Thukela	5	4	0	1	0	0
71	Imbali	15	10	2	2	1	0
78	Sibongile	14	12	1	1	0	0
80	Ngotshe	5	5	0	0	0	0
193	Umlazi "L"	9	8	1	0	0	0
194	Umlazi "F"	7	1	0	0	6	0
195	Hammarsdale	6	5	0	1	0	0
196	Kwa Mashu "F"	6	4	1	1	0	0
197	Kwa Mashu "C"	8	6	0	1	1	0
198	Ntuzuma "F"	10	9	1	0	0	0
199	Kwa Makhutha	7	1	0	0	6	0
201	Ximba	13	11	0	2	0	0
203	Umbumbulu	5	5	0	0	0	0
204	Mfume	5	4	0	1	0	0
205	Osizwweni	13	12	0	1	0	0
206	Ezakheni	6	0	0	0	0	6
207	Madadeni	7	7	0	0	0	0
209	Thongazi	7	6	0	1	0	0
211	S'qunga	10	10	0	0	0	0
213	Ndwedwe	5	0	0	0	0	5
214	Egugwini	8	5	1	2	0	0
216	Seaford	6	4	2	0	0	0
220	Ezinyathini	5	5	0	0	0	0
221	Dlolwana	6	4	0	2	0	0
222	Nyandu	7	7	0	0	0	0
223	Cwaka	8	8	0	0	0	0
224	Ebathenjini	8	7	0	0	1	0
225	Peacetown	7	5	0	2	0	0
227	Kwa Brush	13	10	0	2	1	0
228	Mkhindini	5	5	0	0	0	0
229	Buxedene	10	10	0	0	0	0
232	Shepstone Lake	6	5	0	1	0	0
233	Kwa Mkhize	7	7	0	0	0	0
234	Kwa Dunuse	9	8	1	0	0	0
235	Mfongosi	10	10	0	0	0	0
236	Umhambuma	7	7	0	0	0	0
237	Simdlangetsha	10	9	0	0	1	0
238	Ndaleni	11	7	4	0	0	0
240	Roodeport	14	12	0	2	0	0
241	Good Home	7	6	0	1	0	0
242	Maye	6	6	0	0	0	0
243	Edendale	8	0	0	0	0	8
244	Vulindlela	12	7	1	1	3	0
	Total	358	278	15	25	21	19
	Percent	100%	78%	4%	7%	6%	5%

Table 3: Mean Sample Characteristics

Variable	Total Sample	Non-Members	Members	n
Age	38.900 (15.4)	36.237 (13.5)	58.550 (14.3)	928
KwaZulu	0.872 (0.33)	0.872 (0.33)	0.876 (0.33)	928
Female	0.531 (0.50)	0.504 (0.50)	0.763 (0.43)	928
Education	8.719 (4.33)	9.076 (4.18)	6.159 (4.56)	928
Father Alive	0.308 (0.46)	0.333 (0.47)	0.124 (0.33)	928
Mother Alive	0.576 (0.49)	0.628 (0.48)	0.201 (0.40)	928
Negative Shock	0.523 (0.50)	0.518 (0.50)	0.557 (0.50)	928
Positive Shock	0.055 (0.23)	0.049 (0.22)	0.100 (0.30)	928
Pensioner	0.124 (0.33)	0.060 (0.24)	0.586 (0.49)	928
Network Member in 1993	0.059 (0.24)	0.034 (0.18)	0.278 (0.45)	928
Network Member in 2002	0.123 (0.33)			928
Employed	0.598 (0.49)	0.599 (0.49)	0.586 (0.49)	928
Death	0.507 (0.50)	0.339 (0.47)	0.816 (0.39)	278
Chronic Illness	0.201 (0.40)	0.122 (0.33)	0.347 (0.48)	278
Loss of Regular Job	0.158 (0.37)	0.150 (0.36)	0.174 (0.38)	278
Loss of Remmitances	0.011 (0.10)	0.006 (0.07)	0.020 (0.14)	278
Loss of Pension/Grant	0.004 (0.06)	0.000 (0.00)	0.010 (0.10)	278
Divorce	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	278
Destruction of Property	0.058 (0.23)	0.050 (0.22)	0.071 (0.26)	278
Weather/Pest related Crop Failure	0.047 (0.21)	0.011(0.11)	0.112 (0.32)	278
Loss of Livestock	0.040 (0.21)	0.022 (0.15)	0.071 (0.26)	278
Failure of Business	0.014 (0.12)	0.017 (0.13)	0.010 (0.10)	278

Standard deviations are in parentheses. There sample comprises 928 individuals and 278 households. "KwaZulu" is a location dummy, which refers to whether individuals were resident in the former homeland territories of the former Natal province. Both shock variables are binary and refer to whether an individual was a resident of a household that had experianced a negative or positive income shock since 1998, and exclude shocks that are perfect predictors of unemployment such as the loss or gain of a regular job. "Network Member" is a binary variable that indicates membership either of a *stokvel* or a "burial society". "Mother Alive" and "Father Alive" are binary variables capturing the presence of a pension-eligible parent living in the same household as the sample individuals. These variables serve as proxies for access to non-stochastic transfers, meaning that the transfer materialises whether or not a negative shock has occurred. "Employed" refers to whether an individual has access to paid employment of some type. It includes, but is not limited, to wage-employment.

Table 4: Employment, Network Membership, and Access to Non-Stochastic Transfers: Probit Index

Variable	Employment	Employment	Membership
Constant	0.990 (3.20)	0.80 (3.34)	-2.22 (5.96)
KwaZulu	-0.354 (2.65)	-0.28 (2.13)	0.13 (0.59)
Female	0.042 (0.47)	0.05 (0.59)	0.37 (2.53)
Years of Education	0.006 (0.51)	0.01 (0.86)	0.01 (0.74)
Father Alive	0.059 (0.56)	0.01 (0.11)	0.20 (1.07)
Age in years	-0.012 (2.67)		
Aged 30-39		0.02 (0.08)	0.07 (0.22)
Aged 40-49		0.11 (0.48)	0.19 (0.64)
Aged 50-59		-0.24 (1.15)	0.50 (1.84)
Aged 60 and above		-0.89 (3.83)	0.54 (1.91)
Aged 30-39 × Mother Alive		-0.16 (0.65)	0.68 (1.54)
Aged 40-49 × Mother Alive		-0.38 (1.33)	0.89 (1.84)
Aged 50-59 × Mother Alive		0.40 (1.13)	0.76 (1.44)
Aged 60 and above×Mother Alive		0.37 (0.60)	1.85 (2.54)
Mother Alive	-0.159 (1.56)	-0.33 (1.60)	-0.69 (1.77)
Negative Shock	-0.092 (1.05)		
Positive Shock	0.847 (3.82)	0.79 (3.40)	0.12 (0.42)
Father Alive × Negative Shock			
Recent death in household		-0.56 (3.78)	0.12 (0.65)
Recent chronic illness in household		0.09 (0.54)	0.39 (1.83)
Recent destruction of property		1.07 (2.33)	0.88 (2.46)
Mother Alive × Recent death		0.03 (0.17)	-0.61 (1.88)
Mother Alive × Recent chronic illness		0.43 (1.92)	-0.41 (1.09)
Mother Alive × Recent destruction of property		-0.34 (0.65)	-0.95 (1.53)
Network Member	0.298 (1.79)	0.38 (2.25)	
Pensioner			1.52 (6.42)
χ^2	36.71	103.16	209.79
R^2	0.41	0.48	
n	887	928	928

Absolute t-ratios are in parentheses. "KwaZulu" is a location dummy, which refers to whether individuals were resident in the former self-governing territories of South Africa. Both shock variables are binary and exclude shocks that are perfect predictors of employment such as a loss or a gain of a regular job. "Network Member" is a binary variable that indicates membership either of a Stokvel or informal burial society. "Mother Alive" and "Father Alive" refer to whether the individual lives in the same household as a pension eligible mother and father respectively. The R^2 is a non-linear measure of goodness of fit based on Zaviona and McElvey (1975), and is not the pseudo measure usually obtained by estimating the linear probability model. It is interpreted in the same manner as its linear counterpart. All estimates are adjusted for the effects of household-level clustering. Adjustments were also made for the choice-based nature of the sampling algorithm, but these estimates are not reported since they are both economically and statistically indistinguishable from the results reported above

Table 5: Employment, Network Membership, and Access to Non-Stochastic Transfers: Marginal Effects

Variable	Employment	Employment	Membership
KwaZulu	-0.131 (2.81)	-0.105 (2.23)	0.012 (0.64)
Female	0.016 (0.47)	0.020 (0.59)	0.036 (2.48)
Years of Education	0.002 (0.51)	0.004 (0.86)	0.001 (0.73)
Father Alive	0.023 (0.56)	0.004 (0.11)	0.021 (1.01)
Age in years	-0.005 (2.68)		
Aged 30-39		0.006 (0.08)	0.006 (0.22)
Aged 40-49		0.041 (0.49)	0.021 (0.57)
Aged 50-59		-0.095 (1.13)	0.067 (1.40)
Aged 60 and above		-0.341 (4.22)	0.076 (1.40)
Aged 30-39 × Mother Alive		-0.061 (0.64)	0.093 (1.22)
Aged 40-49 × Mother Alive		-0.150 (1.32)	0.154 (1.28)
Aged 50-59 × Mother Alive		0.141 (1.25)	0.128 (1.00)
Aged 60 and above ×Mother Alive		0.131 (0.66)	0.520 (1.85)
Mother Alive	-0.062 (1.56)	-0.124 (1.63)	-0.077 (1.64)
Negative Shock	-0.036 (1.05)		
Positive Shock	0.275 (5.13)	0.254 (4.50)	0.013 (0.38)
Father Alive × Negative Shock			
Recent death in household		-0.211 (3.87)	0.012 (0.64)
Recent chronic illness in household		0.035 (0.54)	0.045 (1.52)
Recent destruction of property		0.314 (3.70)	0.157 (1.61)
Mother Alive × Recent death		0.012 (0.17)	-0.048 (2.35)
Mother Alive × Recent chronic illness		0.155 (2.09)	-0.031 (1.42)
Mother Alive × Recent destruction of property		-0.133 (0.64)	-0.046 (3.35)
Network Member	0.111 (1.88)	0.138 (2.43)	
Pensioner			0.356 (4.10)
n	887	928	928

Absolute t-ratios are in parentheses. "KwaZulu" is a location dummy, which refers to whether individuals were resident in the former self-governing territories of South Africa. Both shock variables are binary and exclude shocks that are perfect predictors of employment such as "loss of regular job". "Network Member" is a binary variable that indicates membership either of a Stokvel or informal burial society. "Mother Alive" and "Father Alive" refer to whether the individual lives in the same household as a pension eligible mother and father respectively. The marginal effect for the education variable is computed at the mean level of schooling in the sample. All other marginal effects are obtained by subtracting (from the estimated probabilities of the events occurring) the estimated probabilities of the events not occurring.

Table 6: Employment, Disaggregated Shocks, and Access to Non-Stochastic Transfers, Conditioned on Membership (Controlling for Discontinuity in Age Eligibility)

Variable	$\frac{\partial E(y_i \mid z_i=1)}{\partial v_i}$		$\frac{\partial E(y_i \mid z_i=0)}{\partial v_i}$	
KwaZulu	-0.06	(1.47)	-0.108	(1.53)
Female	-0.01	(0.50)	0.019	(0.58)
Years of Education	0.00	(0.39)	0.004	(0.64)
Father Alive	-0.01	(0.18)	0.002	(0.04)
Aged 30-39	-0.01	(0.12)	-0.002	(0.02)
Aged 40-49	0.01	(0.12)	0.033	(0.36)
Aged 50-59	-0.10	(1.30)	-0.101	(1.05)
Aged 60 and above	-0.28	(2.67)	-0.306	(3.41)
Aged 30-39 × Mother Alive	-0.08	(0.93)	-0.073	(0.63)
Aged 40-49 × Mother Alive	-0.17	(1.36)	-0.171	(1.32)
Aged 50-59 × Mother Alive	0.04	(0.56)	0.129	(1.01)
Aged 60 and above ×Mother Alive	0.00	(0.01)	0.097	(0.48)
Mother Alive	-0.04	(0.57)	-0.121	(1.37)
Positive Shock	0.11	(2.03)	0.264	(3.19)
Recent death in household	-0.13	(2.20)	-0.215	(3.01)
Recent chronic illness in household	0.00	(0.08)	0.032	(0.34)
Recent destruction of property	0.12	(1.68)	0.321	(2.93)
Mother Alive × Recent death	0.05	(0.96)	0.018	(0.23)
Mother Alive × Recent chronic illness	0.10	(2.34)	0.161	(2.21)
Mother Alive × Recent destruction of property	-0.03	(0.18)	-0.146	(0.61)
Pensioner	-0.14	(3.41)	-0.092	(2.00)

Absolute t-ratios are in parentheses. Standard errors are corrected for within-household clustering. All other variables are binary. $\partial E(y_i|z_i = 1)/\partial v_i$ gives the partial effect of each explanatory variable on the employment probability of members, whereas $\partial E(y_i|z_i = 0)/\partial v_i$ does the same for non-members. All estimates account for the endogeneity of membership and exploits the non-zero covariance between the error structures of the employment and membership equations shown in table 4.

Table 7: Partial Derivatives of the Effects of Shocks and Age on Employment and Membership for the 19-29 Age Cohort

Tests	Partial	Mother Alive = 0	Mother Alive = 1
Conjecture 2	$\frac{\partial E(y\|x)}{\partial\, illness}$	0.000	0.155
Conjecture 3	$\frac{\partial E(z\|x^c)}{\partial\, illness}$	0.045	0.014
Conjecture 3	$\frac{\partial E(z\|x^c)}{\partial\, destruction}$	0.157	0.111
Conjecture 4	$\frac{\partial E(z\|x^c)}{\partial\, Age60}$	0.076	0.520

y refers to employment and z refers to membership. The partial effects are all significant at least at the 10% level and are based on the marginal effects presented in table 5. The estimates on which these partials are based also take account of clustering at the household level.

Table 8: Partial Derivatives of the Effects of Shocks and "Mother Alive" on Employment, conditioned on Membership for the 19-29 Age Cohort

Tests	Partial	Members	Non-Members
Conjecture 5	$\frac{\partial E(y\|x,z)}{\partial\, positive\, shock}$	0.11	0.264
Conjecture 6	$\frac{\partial E(y\|x^c,z)}{\partial\, death}$	-0.13	0.-215
Conjecture 6	$\frac{\partial E(y\|x^c,z)}{\partial\, destruction}$	0.12	0.321
Conjecture 7	$\frac{\partial E(y\|x^c,z)}{\partial\, mother\, alive}$	0.00	-0.121
Conjecture 7	$\frac{\partial E(y\|x^c,z)}{\partial\, illness}$	0.00	
Conjecture 7	$\frac{\partial E(y\|x^c,z)}{\partial\, illness\, mother\, alive}$	0.10	

y refers to employment and z refers to membership. The partial effects are all significant at least at the 10% level and are based on the marginal effects presented in table 6. All estimates account for the endogeneity of membership and exploits the non-zero covariance between the error structures of the employment and membership equations shown in table 4. The estimates also take account of clustering at the household level.

References

Anderson, S. and J.M. Baland (2002) "The Economics of ROSCAs and Intrahousehold Resource Allocation." *Quarterly Journal of Economics*, 117:2, pp.963-995.

Ardener, S. (1964) "The comparative study of rotating credit associations." *Journal of the Royal Anthropological Institute of Great Britain and Ireland*, 94:2, pp. 202-29.

Ardener, S. and S. Burman (1995) *Money Go Rounds: the importance of rotating savings and credit associations for women*, Oxford: Berg Publishers.

Ardington, E. (1988) "Nkandla Revisited: A Longitudinal Study of Strategies Adopted to Alleviate Poverty in a Rural Community." Working Paper No. 16: Rural-Urban Studies Unit, University of Natal, Durban.

Ardington, E. (1995) "Return to Nkandla: The Third Survey in a Longitudinal Study of a Rural Community in KwaZulu-Natal." Research Report No. 7: Centre for Social and Development Studies, University of Natal, Durban.

Ardington, E. and F. Lund (1994) "Pensions and Development: the social security system as a complimentary track to programmes of reconstruction and development". CSDS. Natal University.

Ardington, E. and F. Lund (1996) "Questioning Rural Livelihoods", in *Land, Labour and Livelihoods in Rural South Africa*, M. Lipton, F. Ellis, and M. Lipton eds. Durban: Indicator Press.

Banerjee, A., T. Besley, and T. Guinnane (1994) "Thy Neighbour's Keeper: The Design of a Credit Cooperative with a Theory and a Test." *Quarterly Journal of Economics*, 109:2, pp. 491-515.

Bardhan, P. ed. (1989) *The Economic Theory of Agrarian Institutions*. New York, NY: Oxford University Press.

Berry, S. (1985) *Fathers Work for their Sons: Accumulation, Mobility and Class Formation in an Extended Yoruba Community*. Berkley: University of California Press.

Bertrand, M., S. Mullainathan, and D. Miller (2003) "Public Policy and Extended Families: Evidence from Pensions in South Africa." *World Bank Research Observer*, 17:1, pp.27-50.

Besley, T. and S. Coate (1996) "Group Lending, Repayment Incentives and Social Collateral." *Journal of Development Economics*, 46, pp. 1-18.

Besley, T., S. Coate, and G. Loury (1993) "The Economics of Rotating Savings and Credit Associations." *American Economic Review*, 83:4, pp. 792-810.

Besley, T., S. Coate, and L. Loury (1994) "Rotating savings and credit associations, credit markets and efficiency." *Review of Economic Studies*, 61, pp. 701-19.

Besley, T. and A. Levenson (1996) "The role of informal finance in household capital accumulation: evidence from Taiwan." *Economic Journal*, 106, pp. 38-59.

Blume, L. and S. Durlauf (2001) "The Interactions-Based Approach to Socio-Economic Behaviour," in *Social Dynamics*. S. Durlauf and P.H. Young eds. Cambridge, MA: MIT Press.

Bouman, F. (1977) "Indigenous savings and credit societies in the third world: A message." *Savings and Development*, 1, pp. 181-218.

Brock, W. and S. Durlauf (2001) "Discrete Choice with Social Interactions." *Review of Economic Studies*, 68, pp. 235-60.

Burman, S. and N. Lembete (1995) "Building New Realities: African Women and ROSCAs in Urban South Africa", in *Money Go Rounds: the importance of rotating savings and credit associations for women*. S. Ardener and S. Burman eds. Oxford: Berg Publishers.

Burns, J. (1998) "Wage Disparities in the South African Clothing Industry." Mimeo: University of Cape Town.

Burns, J. and M. Keswell (2004) "Large Cash Transfers to the (Non) Elderly in South Africa: A Review of the Evidence", *Feminist Economics*, Forthcoming.

Callaway, B. (1987) *Muslim Hausa Woman in Nigeria: Tradition and Change*. Syracuse: Syracuse University.

Calomiris, C. and I. Rajaraman (1998) "The role of ROSCAs: lumpy durables or event insurance." *Journal of Development Economics*, 56, pp. 207-16.

Carter, M., L Haddad, J. May, and J. Maluccio (2003) "KwaZulu Natal Income Dynamics Study (KIDS) 1993-1998: Release Version 3." mimeo.

Carter, M.R. and J. May (2001) "One Kind of Freedom: Poverty Dynamics in Post Apartheid South Africa." *World Development*, 29:12 (December), pp. 1967-2148.

Case, A. and A. Deaton (1998) "Large Cash Transfers to the Elderly in South Africa." *Economic Journal*, 108:450, pp. 1330-61.

Cichello, P, Leibbrandt, M, and G. Fields (2002) "Are African Workers Getting Ahead in the New South Africa? Evidence from KwaZulu Natal, 1993-1998". Report Submitted to USAID. mimeo

Deaton, A. (1997) *The Analysis of Household Surveys: A Microeconometric Approach to development Policy*. Baltimore: John Hopkins University Press.

Dercon, S. and P. Krishnan (2000) "Vulnerability, Seasonality, and Poverty in Ethiopia." *Journal of Development Studies*, 36:6, pp. 255-53.

Dinkelman, T. and F. Pirouz (2002) "Individual, Household and Regional Determinants of Labour Force Attachment in South Africa: Evidence from the 1997 October Household Survey", *South African Journal of Economics*, 70:5, pp. 865-891.

Duflo, E. (2000) "Child Health and Household Resources in South Africa: Evidence from the Old Age Pension Program." *American Economic Review*, 90:2, pp. 393-98.

Durlauf, S.N. (2003) "Multinomial Choice with Social Interactions" in Blume, L. and S.N. Durlauf, *The Economy as an Evolving Complex System Vol. III*. Oxford: Oxford University Press.

Fafchamps, M. (1992) "Solidarity Networks in Rural Africa: Rational Peasants with a Moral Economy" *Economic Development and Cultural Change*, 40:1, pp. 147-74.

Geertz, C. (1962) "The Rotating Credit Association: a 'middle rung' in development." *Economic and Development and Cultural Change*, 10, pp. 241-63.

Glewwe, P. and G. Hall (1998) "Are Some Groups More Vulnerable to Macroeconomic Shocks than Others? Hypothesis Tests Based on Panel Data from Peru." *Journal of Development Economics*, 56, pp. 181-206.

Greene, W.H. (2003) *Econometric Analysis*. Upper Saddle River, NJ.: Prentice Hall.

Gugerty, M.K. (1999) "Preliminary Evidence on Rotating Savings and Credit Associations (roscas) in Kenya:'You can't save alone'". Harvard University. Mimeo.

Guyer, J. and S. Belinga (1995) "Wealth in People as Wealth in Knowledge: Accumulation and Composition in Equatorial Africa." *Journal of African History*, 36, pp. 91-120.

Handa, S. and C. Kirton (1999) "The economics of rotating savings and credit associations: evidence from the Jamaican 'Partner'." *Journal of Development Economics*, 60, pp. 173-94.

Izumida, Y. (1992) "The Kou in Japan: A Precursor of Modern Finance," in *Informal Finance in Low-Income Countries*. D. Adams and D. Fitchett eds. Boulder: Westview Press.

Keswell, M. (2000) "Labour Market Dynamics in South Africa: Evidence from KwaZulu Natal Province." Conference Paper Presented at the TIPS Forum 2000: Muldersdrift.

Kingdon, G. and J. Knight (1999) "Unemployment and Wages in South Africa: A Spatial Approach." Centre for the Study of African Economies, Institute of Economics and Statistics, University of Oxford: Oxford.

Kingdon, G. and J. Knight (2000) "Unemployment in South Africa: the nature of the beast.". Centre for the Study of African Economies, Economics Department, Oxford University.

Kingdon, G. and J. Knight (2001) "Why high open unemployment and small informal sector in South Africa." DPRU/FES Conference Paper: Johannesburg.

Kovsted, J. and P. Lyk-Jensen (1999) "Rotating savings and credit associations: the choice between random and bidding allocation of funds." *Journal of Development Economics*, 60, pp. 143-72.

Leibbrandt, M., H. Bhorat, and I. Woolard (2001) "Household Inequality and the Labour Market in South Africa." *Contemporary Economic Policy*, 19, No.1, pp. 73-86.

Lieberman, E.S. (2002) "Seeing Both the Forest and the Trees: Nested Analysis in Cross National Research." Paper Presented at the American Political Science Association Annual Meetings.

Lipton, M., F. Ellis, and M. Lipton (1996) *Land, Labour and Livelihoods in Rural South Africa*. Durban: Indicator Press.

Maddala, G. (1983) *Limited Dependent and Qualitative Variables in Econometrics*. New York: Cambridge University Press.

Maluccio, J. (2000) "Attrition in the KwaZulu Natal Income Dynamics Study 1993-1998.". International Food Policy Research Institute. Food Consumption and Nutrition Division: Washington DC.

Maluccio, J., L. Haddad, and D. Thomas (1999) "The Mobility of Adults in Post-Apartheid South Africa: Levels, Determinants, and Consequences", Paper Presented at the PAA Meetings, International Food Policy Institute, Mimeo.

Maluccio, J., L. Haddad, and J. May (2000) "Social Capital and Household Welfare in South Africa, 1993-98." *Journal of Development Studies*, 36, No.6, pp. 54-81.

Manski, C. (1993) "Identification of Endogenous Social Effects: the reflection problem." *Review of Economic Studies*, 60, pp. 531-42.

Manski, C. (2000) "Economic Analysis of Social Interactions." *Journal of Economic Perspectives*, 14, pp. 115-36.

May, J., M. Carter, L. Haddad, and J. Maluccio (2000) "KwaZulu-Natal Income Dynamics Study (KIDS) 1993-98: A Longitudinal Household Data Set for South African Policy Analysis." *Development Southern Africa*, 17:4, pp. 567-81.

Moffit, R. (2001) "Policy Interventions, Low-Level Equilibria and Social Interactions," in *Social Dynamics*. S. Durlauf and P.H. Young eds. Cambridge: MA: MIT Press.

Montgomery, J.D. (1991) "Social Networks and Labour-Market Outcomes: Toward an Economic Analysis." *American Economic Review*, 81:5, pp. 1408-18.

Nattrass, N. (2000) "The Debate About Unemployment in the 1990s", *Studies in Economics and Econometrics*, 24:3, pp. 129-142.

Platteau, J.P. (1991) "Traditional Systems of Social Security and Hunger Insurance: Past Achievements and Modern Challenges", in *Social Security in Developing Countries*. E. Ahmad, J.H. Drèze, P.J. Hills, and A.K. Sen, eds. Oxford: Clarendon Press.

Platteau, J-P. (1996) "Traditional Sharing Norms as an Obstacle to Economic Growth in Traditional Societies." Working Paper No. 173 - 1996/16: 1-37: CRED, University of Namur, Belgium.

Rosenzweig, M. and Wolpin. K. (1993) "Credit Market Constraints, Consumption Smoothing, and the Accumulation of Durable Production Assets in Low-income countries: Investments in Bullocks in India." *Journal of Political Economy*, 101:2, pp. 223-44.

Townsend, R. (1994) "Risk and Insurance in Village India." *Econometrica*, 62, pp. 539-92.

Udry, C. (2003) "Fieldwork, Economic Theory, and Research on Institutions in Developing Countries", *American Economic Review*, 93:2, pp. 107-111.

van Bastelaer, T. (1999) "Imperfect Information, Social Capital and the Poor's Access to Credit.". IRIS Center: Maryland.

Van den Brink, R. and J.P. Chavas (1997) "The Microeconomics of an Indigenous African Institution: The Rotating Savings and Credit Association." *Economic Development and Cultural Change*, 45, pp. 745-72.

Veall, M. and K. Zimmerman (1992) "Psuedo-R2 in the Ordinal Probit Model." *Journal of Mathematical Sociology*, 16, pp. 333-42.

Wilde, J. (2000) "Identification of Multiple Equation Probit Models with Endogenous Dummy Variables." *Economics Letters*, 69, pp. 309-12.

Wittenberg, M. (1999) "Unemployment and Search Behaviour In South Africa.". Wits University: Johannesburg.

Zaviona, R. and W. McElvey (1975) "A Statistical Model for the Analysis of Ordinal Level Dependant Variables." *Journal of Mathematical Sociology*, Summer. pp. 103-20.