Remittances as Insurance for Household and Community Shocks in an Agricultural Economy: The Case of Rural Malawi

Working Title: “Remittances as Insurance for Shocks”

Simon Davies
Department of Economics and International Development
University of Bath
Bath
BA2 7AY
United Kingdom

Email: sd245@bath.ac.uk
Tel: + 44 (0) 7734 265 789

Abstract

This paper analyses the extent to which remittances insure households against idiosyncratic shocks such as sickness and community shocks such as drought. We extend the analysis of previous studies to find that the geographical source of remittances matters in agricultural economies when this flow is viewed as a risk pooling mechanism. In particular, we find that remittances from outside a household's home district help to insulate a household against the effects of droughts but similar risk pooling within the local area is ineffective. Only around 10% of households received remittances from outside their home district, and these insured only food consumption. When remittances are viewed as an ex post coping strategy, there is some evidence that remittances from the local community insure household members against health shocks. In addition, we find that it matters which household member suffers from health shocks, with males tending to be better insured in male-headed households and females benefiting more in female headed households. Our results are robust to numerous model specifications including fixed effects, removing predictable shocks, and removing observations with potential simultaneity problems.

[180 words]

JEL Codes: D10; D14; O12; O17
Keywords: Remittances; Shocks; Insurance; Drought; Health; Household economics; Africa; Malawi

1 Introduction

Rural households in developing countries have to cope with regular income shocks. These shocks can be household specific or affect the entire local community. Risk pooling mechanisms such as sending remittances have developed to support households' consumption during periods of, say, drought or ill health. Recent work focuses on the extent to which household consumption is insured against health shocks (Asfaw and von Braun, 2004; Gertler and Gruber, 2002), and weather shocks (Dercon et al., 2005). Park (2006) and Harrower and Hoddinott (2005) extend the analysis to estimate the extent to which shocks are insured through risk sharing networks.

This paper draws on existing theoretical models to combine these two approaches. In addition, we introduce two novelties: firstly we recognize that the geographical source of remittances is a key issue when analyzing risk sharing in agricultural economies. We show that remittances from local areas are used to insure consumption against health shocks, but that remittances from outside the home district are required to insure against weather shocks. Secondly, we show that the impact of health shocks depends greatly on which household member suffered from the shock revealing details of intra-household behavior.

The importance of insuring exogenous shocks cannot be underestimated. Dercon et al. (2005) find that they can have a persistent negative impact on consumption levels. Furthermore, to survive these shocks households resort to a number of coping strategies, several of which ensure that households and communities remain in a poverty trap. For example, selling productive assets (Fafchamps et al., 1998) reduces future agricultural output. Dercon (1996) *in* Dercon et al. (2005) find that in Tanzania, the crop portfolio of the richest groups of smallholders yields 25% more per adult per unit of land than the poorest group, but output is riskier.

Insurance through remittances and their geographical sources are essential considerations in agricultural economies in which households suffer from both idiosyncratic and covariant (community) shocks which are largely determined by local weather conditions[1]. Remittances from the home village or district can act as effective insurance for household shocks, but tend to be unsuitable for shocks such as floods or droughts which affect the entire community. Instead remittances from other districts, urban areas and abroad are required. However, due to problems of information asymmetry and moral hazard, local remittances might be more suitable in the insurance of health shocks than those received from more distant areas. Local communities are more likely to be able to verify the health status of a local individual (Posner, 1980) and better able to quickly offer cash support.

Several authors have looked at the importance of geography when considering insurance in developing countries. For example, Paulson (2000) notes the importance of the spatial dimension of risk in agricultural economies and finds that remitters are less likely to move from other Thai regions to Bangkok the more its rainfall (in Thailand economic growth is strongly correlated with the previous year's rainfall) covaries with that of their home province.

Rosenzweig and Stark (1989) find that households in rural India may attempt to diversify risk spatially by sending their daughters to marry into villages where weather patterns are as uncorrelated as possible with their home village, given the constraint of travel expenses. By contrast, Fafchamps and Gubert (2007) find that households in the rural Philippines prefer to form insurance links with households within the same village due to the costs of maintaining links over large geographical distances.

Our panel data set follows 700 rural Malawian households over four survey rounds between 2000 and 2002 allowing us to test the impact of shocks and income changes on household consumption. The data contain information on the geographical source of remittance permitting tests to assess whether remittances from different sources help to smooth consumption following shocks.

---

[1] Agriculture contributes 35% to GDP and earns 90% of export earnings in Malawi (Simler, 1997). Smallholder farmers are the "breadbasket" of the economy. 84% of agricultural production comes from around 2 million smallholder households cultivating one hectare of land or less (Conroy et al., 2006: p.24; Mkandawire, 1999: p.44). The economy is largely rural and agricultural with around 85% of the population living in rural areas and agriculture occupying nearly 90% of the workforce and contributing around 35% of GDP (World Bank Development Indicators, 2006).

This paper draws on two strands of theoretical literature on insurance in developing countries. The first, discussed in Section 2.1, views remittances as an ex post coping strategy, that is, a strategy used following a shock. Section 2.2 reviews the models and literature on shocks and the moderating impact of remittances from the perspective of consumption smoothing models. Rather than smoothing consumption over time however, as in the permanent income hypothesis, these theoretical models postulate a cross-sectional equivalent in which households smooth consumption amongst themselves following shocks. The data and descriptive statistics are presented in section 3 and empirical results are discussed in sections 4 (ex-post coping mechanism) and 5 (remittances as consumption insurance). Section 6 extends the analysis to focus on health shocks and the importance of which household member suffers from the shock. Section 7 concludes by drawing out important policy implications with particular relevance for recent moves to implement social security programs in a number of sub-Saharan African countries.

2 Modeling insurance

2.1 Remittances as an ex post coping strategy

Studies analyzing coping strategies used following shocks tend to focus on estimating which of a variety of potential strategies households choose to use. Harrower and Hoddinott (2005) model remittances as an ex post coping strategy following a shock using a panel probit model to estimate the probability of receiving remittances. They find that asset poor households receive gifts in kind following livestock loss. Migration is used as a coping strategy for all wealth groups in the case of crop loss or livestock loss.

Fafchamps and Lund (2002) take a similar perspective, but model the value of remittances received and the value of loans taken following shocks, rather than the likelihood of a household engaging in these strategies. These authors find that both remittance receipts and borrowing increase following shocks, and households whose social networks face negative shocks see gift and loan income decrease. When shocks are instrumented, network shocks impact negatively on borrowing, but do not affect gifts. The authors suggest that this is because many gifts are ritual in nature (e.g. funerals) causing the gifts to be made to meet social obligation even in the face of network shocks. Focusing on specific shocks, households having to meet funeral expenses increase their borrowing and see an increase in remittance income. Unemployment is insured through borrowing.

Using Seemingly Unrelated Regression (SUR), Park (2006) estimates the value of net transfers received; sale of assets; loans; and number of household members working (as a proxy for increased labor market participation). He finds that net remittance income increases when the household head has a child that lives outside of the village of origin, but decreases if children live within the village. Remittances increase as household economic status (as measured by education, age and sex of household head) declines, and decrease following economic hardship. The author suggests that this is indicative of the fact that most shocks are covariant in nature. Households which are isolated from other households tend to sell livestock during following shocks, whilst other households do not. Park (2006) treats all shocks equally using one “hardship dummy” meaning it is not possible to discern the effects of different types of shock.

2.2 Consumption smoothing models and empirical evidence

This constitutes the second main branch of the theoretical and empirical models used to understand the impact of shocks in developing countries, and the extent to which they are insured. Under the perfect risk sharing hypothesis idiosyncratic shocks should not impact on the growth in consumption once aggregate shocks are taken into account. Cochrane (1991) proposes a simple test for complete consumption insurance.

$$\Delta \ln c_{t,v}^{h} = \alpha + \beta S_{t,v}^{h} + \varepsilon_{t,v}^{h} \qquad (1)$$

where the left hand side variable is household h in village v’s non-durable consumption growth, and S represents idiosyncratic shocks. Under perfect consumption insurance, $\beta=0$, that is, idiosyncratic shocks have no impact on change in consumption. This specification however, needs to be augmented to control for community shocks. Thus, either community shocks can be entered directly (e.g. Gertler and Gruber, 2002) or community and time interactions can be used to control for unobserved aggregate shocks (Skoufias and Quisumbing, 2003; Harrower and Hoddinott, 2005). Some authors (e.g. Mace, 1991; Townsend, 1994; Asfaw and von

Braun, 2004) use change in average community income in place of the unobserved community shocks. Household characteristics, X are also included as control variables (Harrower and Hoddinott, 2005; Dercon et al., 2005; Skoufias and Quisumbing, 2003).

$$\Delta \ln c_{t,v}^{h} = \alpha + \beta S_{t,v}^{h} + \delta S_{t,v} + \varphi X^{h} + \varepsilon_{t,v}^{h} \quad \textbf{(2)}$$

Since shocks are assumed to effect the growth rate of consumption through their impact on income, numerous authors (e.g. Harrower and Hoddinott, 2005) estimate regressions using household income, rather than shocks and round and regional dummies. So,

$$\Delta \ln c_{t,v}^{h} = \alpha + \beta \Delta (\ln y_{t,v}^{h}) + \sum_{t,v} \delta_{t,v} (D_{t,v}) + \varphi X + \varepsilon_{t,v}^{h} \quad \textbf{(3)}$$

where D are round and region dummies. Dercon and Krishnan (2000) perform regressions similar to (3) to find that both idiosyncratic shocks and the covariant village rainfall index impact on consumption with the coefficient on village rainfall being significantly more important than those for idiosyncratic shocks.

Barrera and Pérez-Calle (2005) analyze consumption smoothing in Columbia and Nicaragua and note that a "particular group of observations [may have] a different consumption smoothing parameter than the general one", given by β. They therefore allow the slope and intercept of this parameter to vary for different categories of households. This may, for example, be relevant for rural/urban difference or, in our case, for households which receive remittances, and those which do not. Barrera and Pérez-Calle (2005) include interaction terms as shown in (4), and this could also be tested by splitting the sample. Barrera and Pérez-Calle (2005) also estimate a version of (4) in which they replace change in income with shock variables. We augment this to include interaction variables between both household and community shocks, and remittances.

$$\Delta \ln c_{t,v}^{h} = \alpha + \beta S_{t,v}^{h} + I_1[\alpha^{I_2} + \beta^{I_2}(S_{t,v}^{h})] + \delta S_{t,v} + I_2[\alpha^{I_2} + \delta^{I_2} S_{t,v}] + \varphi X + \varepsilon_{t,v}^{h} \quad \textbf{(4)}$$

where I_1 represents interaction terms for household shocks, $S^h_{v,t}$, and I_2 interactions for community shocks, $S_{v,t}$.

Studies estimating different versions of the basic hypothesis that shocks impact on consumption but can be insured have generated a wide range of results with some authors able to reject the full insurance hypothesis and others not. In general, results indicate that food consumption is more likely to be insured than other consumption, but this result varies depending upon the country studied. Health shocks are potentially devastating for a household but their largely idiosyncratic nature makes them a good candidate for insurance. Weather shocks are undoubtedly covariant in nature, and therefore difficult to insure within the context of small communities. These two contrasting shocks are therefore especially interesting to examine and findings from key studies are presented in Table 1.

[Table 1 about here]

3 Data and descriptive statistics

This study uses the Malawian Complimentary Panel Survey (CPS) undertaken by the Center for Social Research (CSR) in Malawi with technical assistance from the International Food Policy Research Institute (IFPRI) between January 2000 and July 2002. Four rounds of interviews were conducted yielding an unbalanced panel of 2550 households. We focus on the 2355 rural households since urban households are likely to have access to different, additional means of income smoothing. Banking services are prevalent in urban areas, and employers often provide basic credit and saving services for their employees.

Households reported the geographical sources of their remittance income over the month previous to the survey. Over a third of rural households reported receiving remittances, with more cases of remittances coming from local areas (village and home district) than distant places (other districts, urban areas and abroad).

[Table 2 about here]

Households also reported recent shocks. In particular, they reported whether a household member had recently suffered from a health shock and which member. In cases in which a member had left the household since the previous round, they reported the reason for their absence allowing us to construct a dummy variable indicating whether or not a household had suffered from a recent death. Drought and Flood indicator variables were constructed using reports from Famine Early Warning System Network reports from Malawi, and equal to 1 if a household lives in an area which suffered from a flood or drought since the previous round, and 0 otherwise. Table 3 shows that around 3% of households reported suffering from a death; nearly 2% suffered from drought, and around 6.5% from flooding. Over half of all households suffered from a health shock.

[Table 3 about here]

Table 4 reports simple correlations between shocks and remittances received from local areas, and more distant areas in both value and indicative terms. Idiosyncratic shocks are associated with increased likelihood of receiving local remittances and increased value of local remittances, and are significant for value of remittances. Covariant shocks and receipt of local remittances are negatively associated and are significant in three out of four cases. These relationships are unsurprising. Local remittances are likely to increase following idiosyncratic shocks if there is some degree of insurance or altruism in remittance giving. That remittance decrease from local areas following covariant, community shocks such as flooding and droughts is, likewise, to be expected. Most local households would have been affected, and givers would therefore find it more difficult to give remittances.

Where significant, covariant shocks are positively associated with remittances from outside the home district, whilst there are conflicting signs and no significant correlations between idiosyncratic shocks and remittances received from distant places. Neither of these results should be surprising. Covariant shocks such as flooding and droughts are difficult to insure close to home, but remittances from unaffected areas can help to ease the impact of these shocks. Theoretically, one might anticipate that remittances from far away can ease the impact of idiosyncratic shocks as well as those from closer to home, with distant relatives as well as neighbors assisting households which suffer from these shocks. However, as noted by Posner (1980), it is reasonable to assume that, at least in the case of health shocks, the problem of information asymmetry is reduced closer to home. This would encourage local insurance of such shocks. Secondly, where a shock requires immediate expenditure such as medical expenditure or on funerals, local insurance is preferable in economies with little formal financial infrastructure, and where travel is difficult[2].

[Table 4 about here]

4 Estimation of remittances as ex-post coping strategy

This section follows from the discussion in section 2.1 and views remittances as a coping mechanism used by households following a shock. The perspective is therefore similar in nature to that of Harrower and Hoddinott (2005), Fafchamps and Lund (2002) and Park (2006). We estimate the impact of shocks on the likelihood of receiving remittances using a pooled probit model. Our analysis differs in one key respect from previous authors; we consider separately the likelihood of receiving remittances from local areas (defined as the home village and district) and from more distant areas (outside the home district). We focus on four shocks faced by households: death of household members, health shocks, floods and droughts. Floods and droughts capture the covariant, district level shocks. Larger scale shocks as well as regional preference and cultural differences are captured by three regional dummies representing the north, center and south of this small country. The main cultural, tribal and religious differences are captured by these dummies, as are the main economic differences including price differentials which tend to vary at this level and industrial make-up (Conroy et al., 2006). Round dummies are also included to capture national shocks and seasonal differences. The results are presented in Table 5 and offer considerable support for the hypothesis that when remittances are considered as a form of insurance, geographic sources matters.

[Table 5 about here]

Households which have suffered from recent sickness are more likely to receive remittances than other households. Our models indicate that having suffered from a health shock increases the probit of receiving remittances by around 0.180.

[2] This might be expected to change, as it is becoming increasingly easy to transfer funds using mobile phone credit, even in rural areas.

Regressions in which remittances from local and distant areas are pooled indicate that no other analyzed shocks impact on the probability of receiving remittances. However, splitting remittances by source is revealing. Suffering from bereavement does not appear to change the probability of receiving remittances in any of our models. This might be for two reasons: firstly, all deaths are pooled. It is likely that some deaths impose additional burden on a household, attracting altruistic or insurance payments in the form of gifts and remittances. Other deaths may actually relieve pressure on household finances. These two effects may be cancelling each other out. Secondly, gifts following bereavement may involve contributing to funeral costs and are not received by households.

Weather shocks are especially interesting. All estimations show negative and significant impacts of floods and droughts on receiving local remittances. This result is not surprising given that most households in the local area would also have suffered from these shocks. However, all model specifications show that the probability of receiving remittances from outside a household's home district increases following droughts. Suffering from a drought increases the probability of receiving remittances from outside the home district whilst the same shock reduces the probit of receiving local remittances.

These results help to confirm the central hypothesis of this work: that geographic source is an important consideration when remittances are viewed as a form of insurance. Covariant or community shocks require risk pooling with individuals living further away from home where weather patterns are uncorrelated with those of the home district. Idiosyncratic shocks such as sickness can be insured either close to home or further away.

A number of interesting results can be obtained from the control variables. Households with female heads are more likely to receive distant remittances. Due to the nature of the survey, a household would have been registered with a de facto female head if the husband worked away from home and sent back remittances. It is notable that the female head dummy is insignificant across all models with respect to receiving local remittances. Age has a positive effect on receiving both local and distant remittances. (A square was included but was consistently insignificant so was dropped from this analysis in the interests of parsimony.) This could reflect a use of children as “pension providers” for their parents. Households whose heads were born abroad are less likely to receive remittances. This might seem counter-intuitive at first glance, but it could be that those who move abroad tend to cut ties with their families in their home countries but do not have significant family or social networks inside their adopted country to compensate.

5 Remittances as consumption insurance

5.1 Estimation method and econometric issues

This section views remittances as consumption insurance and estimations are based on the models outlined in 2.2 and the empirical insights described in section 3. We include interaction variables as shown in (4) to assess the moderating impact of remittances following shocks. Separate regressions are also estimated for remittance receiving and other households.

We follow the majority of authors in analyzing food and non-food consumption (excluding durables) separately. We enter Asset Indexes for livestock and other assets separately due to the importance previous authors have attached to livestock in smoothing consumption (Fafchamps et al., 1998). We test for the impact of shocks directly, rather than through income. This allows us to avoid attenuation bias whereby measurement error in income leads to downward biasing of coefficients (Deaton, 1997, 3rd ed.: pp.99-100) and to directly assess the impact of different shocks. As is standard, we use per capita consumption for each household as the dependent variable.

Several important econometric issues need to be addressed within the context of analysis of the impact of shocks on consumption, with a large proportion of these especially relevant for health shocks. These problems and solutions or robustness tests undertaken are described in Table 6.

[Table 6 about here]

5.2 Econometric results

Table 7 reports results based on (2) and (4). All estimates report standard errors robust to heteroskedasticity (White, 1980) and clustering (Deaton, 1997, 3rd ed.: pp.74-78) and use initial household characteristics to eliminate potential endogeneity. Column 1 presents a simple estimate of (2) and can be viewed as the base regression. This estimate suggests that drought has a strong negative impact on consumption growth. Droughts are covariant in nature and are therefore difficult to insure. The coefficient on health shocks is positive and significant. This is counter-intuitive at first glance, however this result is not entirely illogical. Irac and Minoiu (2007) note that a positive and significant coefficient on a shock variable might be the result of over-insurance, or of preference change. Column 1 does not test for the source of insurance and it is possible that health shocks are met with increased health and food consumption, and this increase may be financed (insured) through lower savings or remittances.

Death and floods do not significantly impact on consumption growth. This can be interpreted as evidence that although these shocks impact on income, they are adequately insured and do not therefore impact on consumption. Other explanations are possible in our case however. Death may not have any impact *on average* because our variable is unable to distinguish between the death of different members, some of whom may increase burden on a household whilst living (e.g. the very old), and others whose death increases the burden (prime age working adults). The nature of our flood variable makes it difficult to capture differences between household at the centre of the shock whose crops have been entirely destroyed, and those who live around the periphery. This latter group may actually benefit from the increased rainfall thanks to better quality land, or living on the edge of the area affected.

[Table 7 about here]

A number of other interesting results can also be seen in column 1. The log of initial income is negative and significant throughout Table 7. This can be interpreted in the same way as initial income in macroeconomic growth models. The higher starting income is, the lower is consumption growth – there is thus some evidence of a closing gap between lower and upper income groups. The low r2 values are disappointing but are around the average values found by other authors.

We next investigate the hypothesis that remittances act as insurance for shocks. The remaining regressions in Table 7 estimate (4) interacting shock variables with dummies indicating receipt of remittances from local areas (RemLocal) and from outside the home district (RemDistant). The results strongly support the findings in the previous section in which remittances are viewed as an ex-post coping strategy. That is, for those who receive them, distant remittances can help to insure covariant shocks. Droughts have a strong negative impact on consumption growth, however households that receive distant remittances appear to be fully insured. We cannot rule out the possibility that the coefficient on Drought and the interaction term Drought*RemDistant sum to zero in columns 2 and 3 (with p-values of 0.8894 and 0.8652 respectively). These results are confirmed by estimating the model separately for households that do and do not receive remittances from local and distant areas. Droughts have a strongly negative and significant impact on consumption growth for households that do not receive remittances from outside of their home district whilst this variable is insignificant for households which do.

As in regression (1), health shocks increase consumption growth, but, somewhat surprisingly, local remittances appear to actually act to *reduce* this consumption growth. In light of this surprising outcome and the econometric problems associated with this shock, this result needs further investigation and it is to this that we now turn. The impact of the predictability of health shocks is investigated, followed by the hypothesis that increased health and food consumption are responsible for the unexpected results associated with health shocks.

5.3 Predictability of health shocks

We turn now to one of the econometric issues discussed above; that of the predictability of health shocks. In order to verify our results we follow the methodology of De Weerdt and Dercon (2006) who test the robustness of their initial results by excluding all households for which health shocks were predicted correctly by an initial probit regression. We then re-estimate our original basic regressions excluding all correctly predicted health shocks from our sample. Although this may result in some selection bias, the aim here is to test whether this group of households which are able to correctly predict health shocks are driving the results. Such an analysis necessarily excludes the influence of these households. For brevity, only key coefficients are reported from the probit and pooled OLS results in Table 8. These results are highly supportive of the argument that the predictable nature of health shocks does not alter the key conclusions of the basic regressions. That is, drought has a large negative impact on consumption growth, or, put another way, that it is a largely uninsured shock, whilst having a sick member increases consumption growth. Interestingly, the coefficient on flood shocks remains positive and is now (marginally) significant. This is likely to reflect characteristics of the households that remain in the regression. In particular, this group may own land in areas that is likely to be less affected by flood damage, but in a better position to benefit from increased rainfall. We do not know why this might be the case. Given the similarity of these results to our initial regressions, we chose to continue our analysis with our initial sample, maximizing the number of observations included.

[Table 8 about here]

It is interesting to note a number of the (unreported) results from the probit models predicting health shocks. Floods have a positive impact on the likelihood of a household suffering from a health shock, whilst droughts have a negative impact. Floods bring with them a large number of insects which help to spread disease, while droughts do not offer a friendly environment for insects. It is somewhat surprising that per capita consumption level does not appear to impact on the probability of suffering from a health shock. It is likely that behavior, sanitary facilities and weather conditions are responsible for health shocks at all levels of consumption. The impact of sanitary facilities is picked up by a negative impact on probability of health shocks of non-livestock assets. Finally, household size has a positive impact on the likelihood of a member suffering a health shock. This is intuitive; more members increase the likelihood that any one of them will fall ill.

5.4 Food versus non-food consumption

Given that the predictability does not appear to have been responsible for the unexpected positive impact of health shocks on consumption growth, we now turn to the hypothesis that increased food and health consumption following a health shock are driving the positive coefficient on this variable. Separate regressions are run for food consumption, non-food consumption and non-food consumption excluding health. This makes the assumption of separable utility between food and non-food consumption. Nonetheless, other authors evidence that this is likely to be the case (Dubois and Lignon, 2005), and this risk is the price we pay for increased information. In addition, this test is of particular importance since it is possible that essential consumption such as food is more likely to be insured against shocks than non-essential consumption. Results are reported in Table 9.

[Table 9 about here]

The impact of a health shock on food and non-food consumption remains positive and significant. It is noteworthy however that a health shock appears to impact to a greater extent on food consumption growth than on non-food. It is possible that health shocks are over-insured, especially with regards to food consumption. It could be that food consumption is over-insured but not through remittances. Further investigation would need to be carried out to understand the source of the insurance. Excluding health expenditure from non-food consumption does not alter this conclusion. Interaction variables are again consistently negative but are significant only in the case of non-food consumption. Drought has a strong negative impact on change in food consumption and unsurprisingly impacts on food consumption growth more strongly than non-food consumption.

The interaction variable between Drought and Distant Remittances is positive for food consumption, indicating that for those that receive distant remittances, food consumption is insured against this shock. Non-food consumption however, is not insured by distant remittances with this variable actually turning significantly negative.

5.5 Fixed effects

Although all regressions have controlled for household characteristics, there remains the possibility that there exists unobserved characteristics that are positively correlated with both consumption growth and reported health shocks. This is likely to be the case if self-reported health shocks are reported with error. Under the assumption that an individual's measurement error is constant over the short period of the survey, we are able control for this effect using fixed effects. We therefore verify our results using fixed effects panel models. Results are reported in Table 10. Previous results are robust to fixed effects; indeed the value of the coefficient on health shock has increased and is still highly significant. These results should be interpreted with some caution due to the lack of variability over the short time period. Nonetheless, the conclusions remain unchanged[3]. In order to understand in greater depth the impact of health shock on consumption, we need to take another approach. In particular, we attempt to understand whether it matter *who* in the household suffers from the shock.

[Table 10 about here]

5.6 Excluding the Extreme Poor

Table 11 presents results for key coefficients and excludes all households in the bottom 25% of per capita consumption which suffered from negative consumption growth. This group could be classified as the "extreme poor" and is the group for which changes in consumption level are potentially endogenous. That is, the group for which a consumption decrease might cause the health shock. In the absence of suitable instruments, we aim here to show that the key results are robust to excluding all potentially endogenous variables. The value of the coefficient on health shocks is lower than in previous estimates but remains positive and significant. We thus conclude that our results do not suffer from the problem of endogeneity.

[Table 11 about here]

6 A Focus on health shocks

6.1 Discussion and descriptive data

This section aims to "drill down" into the impact of health shocks on consumption. In particular, we aim to understand whether different members' health shocks are treated alike, and whether male and female headed households differ significantly in their behavior. We choose to focus here on health here due to the results previously obtained, and the prevalence of these shocks.

[3] Results are also robust to random effects models.

Over 50% of all households suffered from health shocks over the two weeks previous to being interviewed. Table 12 shows that adults are more likely to have been sick than children with 29% of households having had a sick adult female, and 22% a sick adult male. Ten and twelve per cent of households reported a sick girl and/or boy respectively.

[Table 12 about here]

Table 13 shows correlations between health shocks and remittance receipts from the local community and distant areas. The major and most robust conclusion is that health shocks on children are positively associated with remittances from the local community, but not from further afield. There is also some suggestion that female health shocks are positively associated with remittance receipts, especially from the local community. There are no significant correlations for adult male health shocks.

[Table 13 about here]

6.2 Empirical results

We use the same models as used in previous sections with several key changes. Firstly, our data permit us to ascertain not only whether the household as a whole suffered from a health shock, but also to decompose this into four categories: adult male, adult female, girl and boy. This allows us to assess the impact of a health shock for different household members. In addition, we decompose our sample into male and female headed households to allow for separate treatment of the responses to health shocks. Key coefficients from the initial OLS regressions reported in Table 14 and offer some interesting insight into the behavior of households when different members suffer from health shocks. Sick children and adult males impact positively on food consumption and non-food consumption. Excluding health from non-food consumption causes the coefficient on sick adult males to turn insignificant. This suggests that when children and adult males are sick, they benefit from increased food and health consumption. In addition, children benefit from increased non-food consumption apart from health. The coefficient on health shocks for adult females is negative and insignificant; adult females who suffer from health shocks do not benefit from increased consumption in any category.

[Table 14 about here]

We next ask whether this behavior is constant between male and female headed households. Results are reported in Table 15. In male headed households, children and adult males who suffer from health shocks appear to benefit from increased food and health consumption, and children benefit from increased other non-food consumption. In male headed households all coefficients on sick adult females is insignificant. Females who suffer health shocks appear not to benefit from increased consumption.

[Table 15 about here]

In female headed households however, the results are reversed. Adult females who suffer health shocks benefit from increased food consumption, but not non-food consumption, whilst there is no impact on consumption growth of health shocks amongst adult males. It could be that a male who suffers a health shock in a female headed household gains little because the whole household suffers. This is likely to be the case where an adult son is earning a wage which contributes to the family pot. Children benefit in both cases.

7 Conclusions

We have used standard models to find several new, key results. Households in agricultural economies find it difficult to insure themselves against weather shocks. Such insurance requires insurance networks with people living in regions whose weather patterns are uncorrelated with that of the household's home district. Remittances from outside one's home district can help to insulate a household suffering from a drought, however, only around 10% of household benefit from these flows.

In addition, there is some evidence that suggests that idiosyncratic shocks such as health shocks are insured close to home through remittances. Risk-sharing networks close to home reduces transaction costs and problems associated with asymmetry of information. The results show that the geographical source of remittances needs to be considered when analyzing the impact of remittances.

Health shocks were analyzed in some depth. In particular, it matters which household member suffered the health shock with males and children tending to benefit from increased consumption when they are sick, but females do not. Male and female headed households also behave differently with the opposite results being found in female households to the average.

Although over one third of household reported receiving some remittances, only around 10% reported receiving them from outside their home district (see Table 2). The real percentage potentially insured is likely to be higher, with additional households having access to “insurance remittances” but not suffering shocks requiring a “payout” during the survey period. Nonetheless the limited number of households which are able to insure themselves against covariant shocks is worrying in light of evidence showing that ability to insulate against shocks is a key component of being able to lift oneself out of poverty (e.g. Pan, 2007; Dercon et al., 2005). The results of this study emphasize the importance of external finance where shocks are covariant in nature and should therefore be seen, together with the limited number of households capable of accessing such finance, as supporting recent moves for programs aimed at insuring exogenous shocks such as floods and droughts[4]. Faced with the evidence that households are better able to insure themselves against idiosyncratic shocks than covariant ones, combined with a potential problem of moral hazard if idiosyncratic shocks were routinely insured, developing country governments and their donors should focus their limited resources on insuring households against exogenous, covariant shocks such as floods and droughts.

[4] One such programme was undertaken in Dowa, Malawi in 2006/07 following a severe drought in the region, whilst the rest of the country had an excellent harvest. Cash transfers funded by the British Department for International Development (DfID) helped to support around two thirds of residents in the region who suffered badly from the exogenous shock. See Davies and Davey (2008) for a summary of the impact of this programme.

Bibliography

Asfaw, A. and J.von Braun (2004), "Is Consumption Insured against Illness? Evidence on Vulnerability on Households to Health Shocks in Rural Ethiopia", *Economic Development and Cultural Change*, Vol.53, No.1, pp.115-129.

Barrera, F. and F.Pérez-Calle (2005), "Consumption smoothing: Empirical evidence from Colombia and Nicaragua", *Working Paper*, Fedesarrolo.

Clarke, G.R.G and S.J.Wallsten (2003), "Do Remittances Act Like Insurance? Evidence from a Natural Disaster in Jamaica", Development Research Group, World Bank, Washington, D.C.

Cochrane, J.H. (1991), "A Simple Test of Consumption Insurance", *Journal of Political Economy*, Vol.99, No.5, pp.957-976.

Conroy, A.C., M.J.Blackie, A.Whiteside, J.C.Malewezi and J.D.Sachs (2006), *Poverty, AIDS and Hunger: Breaking the Poverty Trap in Malawi*, Palgrave MacMillan: New York.

Davies, S. and J.Davey (2008), "A Regional Multiplier Approach to Estimating the Impact of Cash Transfers on the Market: The Case of Cash Transfers in Rural Malawi", *Development Policy Review*, Vol.26, No.1, pp.91-111.

Deaton, A. (1997), *The Analysis of Household Surveys: A Microeconometric Approach to Development Policy*, World Bank, Washington, D.C., Third Edition, pp.99-100.

Dercon S., J.Hoddinott and T.Woldehanna (2005), "Shocks and Consumption in 15 Ethiopian Villages, 1999-2004", *Journal of African Economies*, Vol.14, No.4, pp.559-585.

Dercon, S. and P.Krishnan (2000), "Vulnerability, Seasonality and Poverty in Ethiopia", *Journal of Development Studies*, Vol.36, No.6, pp.25-53.

Dubois, P. and E.Ligon (2005), "Incentives and Nutrition for Rotten Kids: Intrahousehold Food Allocation in the Philippines", Working Paper, Department of Agricultural and Resource Economics, University of California at Berkeley.

Fafchamps, M and S.Lund (2003), "Risk-sharing networks in rural Philippines", *Journal of Development Economics*, Vol.71, No.2, pp.261-287.

Fafchamps M., C.Udry and K.Czukas (1998), "Drought and saving in West Africa: are livestock a buffer stock?", *Journal of Development Economics*, Vol.55, No.2, pp.273-305.

Fafchamps, M. and F.Gubert (2007), "The formation of risk sharing networks", Journal of Development Economics, Vol.83, pp.326-350.

Famine Early Warning System Network, Various reports available at www.fews.net/malawi/. Accessed April 2007.

Gertler, P. and J.Gruber (2002), "Insuring Consumption against Illness", *The American Economic Review*, Vol.92, No.1, pp.51-70.

Harrower, S. and J.Hoddinott (2005), "Consumption Smoothing in the Zone Lacustre, Mali", *Journal of African Economies*, Vol.14, No.4, pp.489-519.

Irac, D.M. and C.Minoiu (2007), "Risk insurance in a transition economy: Evidence from rural Romania", *Economics of Transition*, Vol.15, No.1, pp.153-173.

Mace, B.J. (1991), "Full Insurance in the Presence of Aggregate Uncertainty", *Journal of Political Economy*, Vol. 99, No.5, pp.928-956.

Pan, L. (2007), "Risk Pooling through Transfers in Rural Ethiopia", Tinbergen Institute Manuscript.

Park, C. (2006), "Risk Pooling between Households and Risk-Coping Measures in Developing Countries: Evidence from Rural Bangladesh", *Economic Development and Cultural Change*, Vol. 54, No.2, pp.423-457.

Paulson, A.L. (2000), "Insurance Motives for Migration: Evidence from Thailand", Kellogg Graduate School of Management, Northwestern University working paper.

Posner, R.A. (1980), "A Theory of Primitive Society, with Special Reference to Law", *Journal of Law and Economics*, Vol.23, No.1, pp.1-53.

Rosenzweig, M.R. and O.Stark (1989), "Consumption Smoothing, Migration, and Marriage: Evidence from Rural India", *Journal of Political Economy*, Vol.97, No.4, pp.905-926.

Simler, K.R. (1997), "The Transition to a Market-Based Agricultural Economy in Malawi: A Multi-Market Analysis", *Research Paper*, Cornell Food and Nutrition Policy Program, Cornell University.

Skoufias, E. and Quisumbing, A.R. (2003), "Consumption Insurance and Vulnerability to Poverty: A Synthesis of the Evidence from Bangladesh, Ethiopia, Mali, Mexico and Russia", Food Consumption and Nutrition Division Discussion Paper 155, Washington DC: International Food Policy Research Institute.

Stillman, S. and D.Thomas (2007), "Nutritional Status during an Economic Crisis: Evidence from Russia", Memeo Motu Economic and Public Policy Research and Duke University.

Townsend, R.M. (1994), “Risk and Insurance in Village India”, *Econometrica*, Vol.62, No.3, pp.539-591.

Townsend, R.M. (1995), “Consumption Insurance: An Evaluation of Risk-Bearing Systems in Low-Income Economies”, *Journal of Economic Perspectives*, Vol.9, No.3, pp.83-102.

De Weerdt, J. and S.Dercon (2006), “Risk-sharing networks and insurance against illness”, *Journal of Development Economics*, Vol.81, pp.337-356.

White, H. (1980), “Heteroscedasticity Consistent Covariance Matrix and a Direct Test for Heterscedasticity”, *Econometrica*, Vol.48, pp.817-838.

World Bank (2006), *World Development Indicators 2006*, CD-ROM, Washington, DC: The World Bank. Available online: http://ddp-ext.worldbank.org/ext/DDPQQ/member.do?method=getMembers&userid=1&queryId=135. [Accessed 1st June, 2007]

Tables

Table 1: Summary of Key Findings from Papers analyzing the Risk Sharing Hypothesis

Study	Key Conclusions
De Weerdt and Dercon (2006) - Tanzania	Unable to reject hypothesis that health shocks are insured. When only unexpected health shocks are included, a shock results in a 7.3% reduction in consumption
Asfaw and von Braun (2004) - Ethiopia	Household heads' health shocks impact negatively on purchased food consumption, but not on total food consumption - in-kind food gifts substitute for purchased food.
Barrera and Pérez-Calle (2005) - Colombia and Nicaragua	Health shocks have significant negative impact for Colombia. Urban households suffer more following shocks (less insured) than rural ones. Food consumption suffers less than non-food consumption.
Harrower and Hoddinott (2005) - Mali	Health shocks do not impact on change in consumption - these shocks are therefore fully insured. Loss of livestock has a negative impact. Household consumption affected by covariant shocks.
Gertler and Gruber (2002) - Indonesia	An income shock results in a consumption decrease of 0.35 units for each unit decrease in income. A decline in the health of the household head results in decreased labor market participation and therefore decreased wage income.
Irac and Minoiu (2007) - Romania	Household consumption varies with covariant shocks. Weather shocks cause households to increase non-food consumption by 55-75%, perhaps due to repairing damage (?). Poorer households' food consumption as well insured as richer households but richer households better able to increase non-food consumption following crop damage (repairing damage?).
Dercon and Krishnan (2000) - Ethiopia	Higher than average rainfall has positive impact on consumption. Crop damage has positive impact on consumption (repairing damage?).
Dercon et al. (2005) - Ethiopia	Health shocks decrease household consumption by 9% and drought causes household consumption to decrease by 19%. The impact of these shocks is persistent, having an impact on consumption level despite having occurred 2-5 years previously.
Park (2006) - Bangladesh	Food consumption risk is pooled amongst small clusters of houses and amongst relatives. Food consumption is insured against shocks more effectively than non-food consumption.
Townsend (1995) - Thailand	Consumption insurance hypothesis rejected with MPC out of idiosyncratic changes of income of between 0.29 and 0.85 depending upon the region. Bangkok exhibits lowest degree of risk pooling. Farm households in north of Thailand exhibit highest degree of risk pooling and entrepreneurs the lowest.
Townsend (1994) - India	Health shocks and unemployment do not impact significantly on household consumption, and are therefore insured.

Table 2: Percentage of Households Receiving Remittances from Different Sources

Receive Remittance From:	Obs	Mean
Village	2355	18.3%
District	2355	11.2%
Other District	2355	7.7%
Urban Area	2355	1.9%
Abroad	2355	1.1%
Local*	2355	26.8%
Distant†	2355	10.6%
Total	2355	34.6%

*composed of village and district remittances; † composed of remittances from other districts, urban areas and abroad.

Table 3: Percentage of Households Suffering from Shocks

Variable	Total Sample		Remittance Receivers		Non Receivers	
	Obs	Mean	Obs	Mean	Obs	Mean
Health	2355	54.0%	816	56.7%	1539	52.5%
Death	2355	3.3%	816	4.0%	1539	2.9%
Flood	2355	6.5%	816	5.3%	1539	7.1%
Drought	2355	1.7%	816	1.6%	1539	1.8%

Table 4: Correlations between Shocks and Remittance Receipts

	Shock			
	Health	Death	Flood	Drought
Local Remittances (Dummy)	0.0308	0.0237	-0.0455*	-0.0364*
Distant Remittances (Dummy)	0.0294	0.0067	-0.0060	0.0493*
Local Remittances (Value)	0.0355*	0.0341*	-0.0408*	-0.0251
Distant Remittances (Value)	-0.0235	-0.0021	0.0788*	-0.0034

* indicates significance at the 10% level

Table 5: Probit Models Estimating Probability of Receiving Remittances

	Probit: Probability of Receiving Remittances			Random Effects Probit: Probability of Receiving Remittances		
	Total	Distant	Local	Total	Distant	Local
Sick Member Dummy	0.174***	0.131	0.161**	0.187***	0.141	0.171**
	(3.023)	(1.554)	(2.461)	(2.799)	(1.466)	(2.465)
Death Dummy	0.132	0.066	0.129	0.151	0.080	0.142
	(0.893)	(0.263)	(0.930)	(0.943)	(0.362)	(0.867)
Flood Dummy	-0.147	0.103	-0.310***	-0.181	0.141	-0.340**
	(-1.213)	(0.631)	(-2.663)	(-1.414)	(0.800)	(-2.446)
Drought Dummy	-0.083	0.506**	-0.527*	-0.066	0.525*	-0.523*
	(-0.380)	(2.023)	(-1.759)	(-0.279)	(1.841)	(-1.884)
Log Per Capita Income	-0.014	0.071***	-0.045*	-0.015	0.072**	-0.046**
	(-0.630)	(3.212)	(-1.887)	(-0.722)	(2.325)	(-2.096)
Female Head Dummy	0.256***	0.523***	0.041	0.267**	0.604***	0.040
	(3.069)	(3.927)	(0.421)	(2.490)	(3.839)	(0.362)
Age	0.008***	0.012***	0.004*	0.008***	0.013***	0.004*
	(3.080)	(3.348)	(1.810)	(3.502)	(3.692)	(1.813)
Education (Years)	0.024*	0.056***	0.003	0.027**	0.066***	0.004
	(1.917)	(2.867)	(0.303)	(2.208)	(3.530)	(0.338)
Household Size	-0.012	0.012	-0.016	-0.014	0.011	-0.017
	(-0.726)	(0.541)	(-1.045)	(-0.881)	(0.497)	(-1.083)
Head Married Dummy	-0.062	-0.083	-0.079	-0.062	-0.072	-0.082
	(-0.571)	(-0.413)	(-0.750)	(-0.506)	(-0.410)	(-0.659)
Member in Salaried Employment	0.163	-0.125	0.282**	0.169	-0.139	0.291***
	(1.252)	(-0.678)	(2.502)	(1.507)	(-0.789)	(2.591)
Born Abroad	-0.412***	-0.457**	-0.288**	-0.438***	-0.527*	-0.298*
	(-3.188)	(-2.155)	(-2.208)	(-2.619)	(-1.880)	(-1.777)
Member Accessed Credit in 12 Months before Round 1	0.253***	0.037	0.329***	0.265***	0.064	0.341***
	(2.767)	(0.385)	(3.489)	(2.576)	(0.420)	(3.311)
Livestock Index	0.006	0.058	-0.024	0.004	0.069*	-0.027
	(0.201)	(1.559)	(-0.773)	(0.158)	(1.732)	(-0.933)
Non-Livestock Asset Index	-0.019	-0.019	-0.024	-0.021	-0.025	-0.025
	(-0.810)	(-0.779)	(-1.011)	(-0.811)	(-0.677)	(-0.934)
Regional Dummies	Yes	Yes	Yes	Yes	Yes	Yes

Round Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-1.090***	-3.544***	-0.628*	-1.163***	-4.060***	-0.665**
	(-2.900)	(-5.651)	(-1.759)	(-3.815)	(-7.151)	(-2.162)
lnsig2u				-2.271***	-1.291***	-2.632***
				(-4.884)	(-3.859)	(-3.879)
N	1803	1803	1803	1803	1803	1803
r2_p	0.031	0.076	0.031			
% Correct Predictions	66.78%	89.46%	74.38%			
rho				0.094	0.216	0.067

t-values in parenthesis, *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively. Rho indicates the proportion of total variance due to between estimates.

Table 6: Potential Econometric Issues and Correction or Robustness Test Undertaken

Potential Econometric Issue	**Correction or Robustness Test**
Unobserved heterogeneity	* Use White corrected standard errors
Clustering of errors in small geographical areas	* Report standard errors that correct for clustering.
	* Include Round and Regional Dummies as well as district level shocks
Endogeneity of household characteristics	* Use initial household characteristics
	* Verify results robust to fixed effects
Self-reported health shocks contain non-random error	* Verify results robust to fixed effects
	* Control for education and other household characteristics
	* Instrument health shocks
Health shocks are predictable	* Run a probit to predict health shocks, then re-run basic regressions excluding correctly predicted health shocks
Health shocks increase health (and food?) consumption	* Verify results estimating food and non-food separately and exclude health consumption from dependent variable
Health shocks may be simultaneously determined with change in consumption for those with low consumption levels	* Estimate excluding households in bottom 25% of per capital consumption levels which have suffered negative consumption growth.

Table 7: OLS (Pooled Panel). Dependent Variable: Change in Log of Consumption per capita

			Receive Distant Remittances		**Receive Local Remittances**	
	1	**2**	**Yes**	**No**	**Yes**	**No**
Sick Member Dummy	0.534***	0.640***	-0.172	0.583***	0.239	0.637***
	(4.868)	(4.707)	(-0.602)	(4.847)	(1.277)	(4.966)
Sick*RemLocal		-0.372**				
		(-2.271)				
Sick*RemDistant		0.001				
		(0.006)				
Death Dummy	-0.071	0.188	-1.160**	0.112	-0.008	-0.049
	(-0.265)	(0.475)	(-2.138)	(0.380)	(-0.014)	(-0.144)
Death*RemLocal		-0.338				
		(-0.468)				
Death*RemDistant		-0.828				
		(-1.340)				
Flood Dummy	0.141	0.015	0.417	0.046	0.324	0.153
	(0.870)	(0.079)	(1.125)	(0.297)	(0.922)	(0.871)
Flood*RemLocal		0.174				
		(0.500)				

Flood*RemFar		0.626				
		(1.579)				
Drought Dummy	-0.806***	-0.960***	-0.600	-1.092***	-1.995***	-0.688***
	(-3.616)	(-4.098)	(-0.826)	(-5.748)	(-4.514)	(-2.767)
Drought*RemLocal		-1.078***				
		(-3.043)				
Drought*RemDistant		1.055**				
		(2.044)				
Female Head Dummy	-0.008	-0.023	-0.559	0.049	0.263	-0.140
	(-0.091)	(-0.239)	(-1.681)	(0.457)	(1.086)	(-1.107)
Age	0.002	0.003	-0.058	0.011	0.023	-0.005
	(0.157)	(0.263)	(-1.375)	(0.768)	(0.673)	(-0.297)
Age Squared	0.000	-0.000	0.001*	-0.000	-0.000	0.000
	(0.124)	(-0.030)	(1.805)	(-0.733)	(-0.482)	(0.380)
Education (Years)	0.027**	0.025*	0.090	0.018	0.040	0.017
	(2.162)	(1.927)	(1.663)	(1.294)	(1.114)	(0.945)
Log Initial Income	-0.111***	-0.113***	-0.388***	-0.089**	0.126	-0.196***
	(-3.375)	(-3.397)	(-2.936)	(-2.461)	(1.625)	(-4.537)
Household Size	-0.048***	-0.050***	-0.106*	-0.050***	-0.126***	-0.020
	(-3.959)	(-3.832)	(-1.753)	(-2.967)	(-2.860)	(-1.125)
Head Married Dummy	-0.026	-0.021	-0.566	0.112	-0.115	0.026
	(-0.234)	(-0.182)	(-1.361)	(0.743)	(-0.372)	(0.188)
Member in Salaried Employment	-0.097	-0.095	-1.157***	-0.022	-0.493*	0.108
	(-0.848)	(-0.820)	(-2.901)	(-0.172)	(-1.981)	(0.658)
Born Abroad	0.383***	0.367***	-0.665	0.404***	0.344	0.416**
	(3.315)	(3.083)	(-0.552)	(2.823)	(0.643)	(2.179)
Member Accessed Credit in 12 Months before Round 1	-0.060	-0.060	0.449	-0.095	-0.280	0.086
	(-0.654)	(-0.615)	(1.600)	(-0.818)	(-1.396)	(0.668)
Receive Remittances	0.037	0.197		-0.099		0.318*
	(0.363)	(1.258)		(-0.773)		(1.949)
Livestock Index	-0.040*	-0.047**	0.011	-0.061**	-0.093	-0.032
	(-2.023)	(-2.277)	(0.114)	(-2.438)	(-1.575)	(-1.190)
Non-Livestock Asset Index	-0.006	-0.005	0.116	-0.016	0.012	-0.014
	(-0.270)	(-0.218)	(1.222)	(-0.641)	(0.168)	(-0.448)
Regional Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Round Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.133	-0.145	1.121	-0.442	-2.041	0.641
	(-0.224)	(-0.246)	(0.732)	(-0.750)	(-1.299)	(1.054)
N	1270	1270	140	1130	381	889
r2	0.055	0.063	0.273	0.057	0.094	0.075
F	14.771	105.925	.	9.099	9.326	11.313

t-values in parenthesis, *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively

Table 8: Robustness Test: Predicting Health Shocks, and Excluding Predictable Shocks

	Probit for household having a sick member.		OLS: Dependent Variable: Change in log per capita consumption	
	Probit 1	Probit 2	Correct Positive Predictions from Probit 1 Excluded	Correct Positive Predictions from Probit 2 Excluded
Sick Member Dummy			0.521***	0.595***
			(4.460)	(4.817)
Death Dummy			0.110	-0.095
			(0.311)	(-0.293)
Flood Dummy	0.324***	0.361***	0.371*	0.459*
	(2.935)	(3.765)	(1.753)	(1.999)
Drought Dummy	-0.429***	-0.479***	-0.789***	-0.807***
	(-2.631)	(-2.744)	(-3.757)	(-3.861)
N	1187	2239	1030	1058
r2	0.024	0.018	0.059	0.063
F			15.340	18.080
% Correct Predictions (0.5 cutoff)	58.71%	56.19%		

t-values in parenthesis, *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively. Only key coefficients reported. Other variables included are Female Head; Age; Age squared; Education; Household Size; Head Married Dummy; Born Abroad dummy; Whether Accessed Credit; Livestock and Non-Livestock Asset Indexes; Remittance Receipt Dummy; Log of Initial Per Capita Income; and Round and Region dummies.

Table 9: Food versus Non-Food Consumption. Dependent Variable: Change in Log of Consumption per capita

	Food Consumption		Non-Food Consumption		Non-Food Excl. Health	
	1	2	1	2	1	2
Sick Member Dummy	0.565***	0.609***	0.395***	0.539***	0.383**	0.485**
	(5.016)	(3.898)	(2.821)	(3.321)	(2.587)	(2.505)
Sick*RemLocal		-0.108		-0.519***		-0.321
		(-0.497)		(-3.071)		(-1.484)
Sick*RemDistant		-0.133		0.107		-0.063
		(-0.420)		(0.480)		(-0.255)
Death Dummy	0.096	0.236	-0.294	-0.380	-0.390	-0.623
	(0.283)	(0.604)	(-0.837)	(-0.721)	(-1.027)	(-1.046)
Death*RemLocal		0.154		0.521		0.475
		(0.177)		(0.895)		(0.696)
Death*RemDistant		-1.354**		-0.819		0.247
		(-2.310)		(-0.960)		(0.251)
Flood Dummy	-0.009	-0.145	0.370*	0.286	0.168	0.129
	(-0.056)	(-0.778)	(1.817)	(1.101)	(0.770)	(0.440)
Flood*RemLocal		0.173		0.167		0.123
		(0.560)		(0.440)		(0.277)
Flood*RemFar		0.841		0.177		0.021
		(1.459)		(0.397)		(0.042)
Drought Dummy	-1.123***	-1.228**	-0.756***	-0.738***	-0.531***	-0.472**
	(-3.004)	(-2.574)	(-5.980)	(-4.334)	(-3.118)	(-2.242)
Drought*RemLocal		-1.571***		0.262		-0.122
		(-3.549)		(0.290)		(-0.133)
Drought*RemDistant		1.267*		-0.536**		-0.377
		(1.912)		(-2.227)		(-0.678)
N	1162	1162	1121	1121	1036	1036
r2	0.054	0.063	0.046	0.048	0.041	0.036
F	6.078	686.144	18.377	77.116	12.337	18.437

t-values in parenthesis, *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively. Only key coefficients reported. Other variables included are Female Head; Age; Age squared; Education; Household Size; Head Married Dummy; Born Abroad dummy; Whether Accessed Credit; Livestock and Non-Livestock Asset Indexes; Remittance Receipt Dummy; Log of Initial Per Capita Income; and Round and Region dummies.

Table 10: Fixed Effects Regression. Dependent Variable: Change in Log of Consumption per capita

			Receive Distant Remittances		Receive Local Remittances	
	1	2	Yes	No	Yes	No
Sick Member Dummy	0.984***	1.146***	0.114	1.016***	1.128***	1.190***
	(6.411)	(6.833)	(0.186)	(5.937)	(2.762)	(6.419)
Sick*RemLocal		-0.550**				
		(-2.348)				
Sick*RemDistant		-0.070				
		(-0.180)				
Death Dummy	-0.292	0.207	-2.059***	-0.253	-0.718	-0.252
	(-0.970)	(0.460)	(-12.733)	(-0.685)	(-0.817)	(-0.755)
Death*RemLocal		-0.935				
		(-0.965)				
Death*RemDistant		-1.065				
		(-1.627)				
Flood Dummy	0.389	0.190	-1.231	0.047	0.949*	0.594**
	(1.389)	(0.718)	(-1.168)	(0.160)	(1.760)	(2.149)
Flood*RemLocal		-0.164				
		(-0.237)				
Flood*RemFar		1.531**				
		(2.432)				
Drought Dummy	-0.884***	-0.975***	-1.583***	-1.223***	-1.972***	-0.620*
	(-3.926)	(-3.005)	(-2.967)	(-3.803)	(-3.41e+15)	(-1.781)
Drought*RemLocal		-1.602***				
		(-2.829)				
Drought*RemDistant		1.044**				
		(2.377)				
Receive Remittances	0.046	0.325*		-0.165		0.331
	(0.324)	(1.880)		(-0.966)		(1.160)
Constant	-0.851***	-0.935***	0.130	-0.787***	-0.972***	-1.003***
	(-7.469)	(-8.074)	(0.301)	(-6.781)	(-3.751)	(-8.590)
N	1434	1434	170	1264	443	991
r2	0.070	0.088	0.210	0.075	0.095	0.104
F	17.027	54.277	67.823	15.866	3.452	13.696
rho	0.247	0.254	0.568	0.291	0.462	0.348

t-values in parenthesis, *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively. Rho indicates the proportion of total variance due to between estimates.

Table 11: Excluding the Extreme Poor. Dependent Variable: Change in Log of Per Capita Consumption

	Total Consumption	Food Consumption	Non-Food Consumption	Non-Food excl. Health
Sick Member Dummy	0.272***	0.328***	0.226*	0.174
	(2.965)	(3.304)	(1.987)	(1.326)
Death Dummy	-0.039	0.138	-0.438	-0.427
	(-0.124)	(0.442)	(-1.078)	(-1.096)
Flood Dummy	0.063	-0.064	0.354*	0.242
	(0.488)	(-0.422)	(1.939)	(1.233)
Drought Dummy	-0.555***	-0.658**	-0.719***	-0.492*
	(-2.991)	(-2.212)	(-4.899)	(-1.769)
N	1008	945	903	846
F	48.964	18.376	76.608	19.184
r2	0.152	0.104	0.114	0.084

t-values in parenthesis, *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively. Only key coefficients reported. Other variables included are Female Head; Age; Age squared; Education; Household Size; Head Married Dummy; Born Abroad dummy; Whether Accessed Credit; Livestock and Non-Livestock Asset Indexes; Remittance Receipt Dummy; Log of Initial Per Capita Income; and Round and Region dummies.

Table 12: Percentage of Households Suffering Health Shocks

Health Shock	Obs	Mean	Min	Max
Any Member	2355	54.0%	0	1
Adult Female	2355	29.3%	0	1
Adult Male	2355	21.8%	0	1
Girl*	2355	10.4%	0	1
Boy*	2355	11.7%	0	1

*Children are defined as being under 15 years

Table 13: Correlations between Health Shocks and Remittance Receipts

	Health Shock			
	Male	**Female**	**Boy***	**Girl***
Local Remittances (Dummy)	-0.0331	0.0584*	0.0840*	0.0674*
Distant Remittances (Dummy)	-0.0276	0.0369*	-0.0008	-0.0041
Local Remittances (Value)	0.0104	0.0331	0.0703*	0.0421*
Distant Remittances (Value)	-0.0157	-0.0133	-0.0028	-0.0093

*Children are defined as being under 15 years

Table 14: Impact of Sickness of Different Household Members. Dependent Variable: Change in Log of Per Capita Consumption

	Food Consumption	Non-Food Consumption	Non-Food excl. Health
Sick Adult Female	-0.009	-0.172	-0.197
	(-0.068)	(-1.205)	(-1.206)
Sick Adult Male	0.366***	0.266**	0.171
	(3.270)	(2.386)	(1.450)
Sick Girl	0.443***	0.492***	0.614***
	(3.589)	(3.383)	(4.196)
Sick Boy	0.489***	0.298**	0.305**
	(3.859)	(2.612)	(2.222)
Flood Dummy	0.005	0.383*	0.202
	(0.030)	(1.915)	(0.942)
Drought Dummy	-1.034***	-0.680***	-0.433**
	(-2.792)	(-4.758)	(-2.156)
Female Head Dummy	-0.023	0.164	0.121
	(-0.180)	(1.409)	(0.878)
N	1162	1121	1036
r2	0.063	0.076	0.076
F	10.597	20.820	25.788

t-values in parenthesis, *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively. Only key coefficients reported. Other variables included are Female Head; Age; Age squared; Education; Household Size; Head Married Dummy; Born Abroad dummy; Whether Accessed Credit; Livestock and Non-Livestock Asset Indexes; Remittance Receipt Dummy; Log of Initial Per Capita Income; and Round and Region dummies.

Table 15: Health Shocks in Male and Female Headed Households. Dependent Variable: Change in Log of Consumption per capita

	Food Consumption		Non-Food Consumption		Non-Food excl. Health	
	Female Head	**Male Head**	**Female Head**	**Male Head**	**Female Head**	**Male Head**
Sick Adult Female	0.624**	-0.252	0.213	-0.325*	0.123	-0.317
	(2.304)	(-1.570)	(0.941)	(-1.874)	(0.433)	(-1.644)
Sick Adult Male	0.392	0.371***	0.347	0.276**	0.046	0.203
	(1.125)	(2.871)	(1.206)	(2.321)	(0.169)	(1.433)
Sick Girl	0.330	0.469***	0.603**	0.503***	0.708*	0.639***
	(0.971)	(3.363)	(2.283)	(2.964)	(1.961)	(3.440)
Sick Boy	0.364	0.537***	0.212	0.308**	0.008	0.339**
	(1.055)	(4.121)	(0.825)	(2.671)	(0.026)	(2.380)
Flood Dummy	-0.225	0.093	0.453	0.390*	-0.152	0.315
	(-0.726)	(0.612)	(1.223)	(1.771)	(-0.353)	(1.475)
Drought Dummy	-0.439	-1.272***	-0.878	-0.592***	-0.506	-0.351
	(-0.516)	(-3.321)	(-1.198)	(-2.744)	(-0.446)	(-1.417)
N	268	894	257	864	233	803
r2	0.113	0.073	0.162	0.073	0.152	0.076
F	20.107	10.526	13.507	9.799	8.057	11.719

t-values in parenthesis, *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively. Only key coefficients reported. Other variables included are Female Head; Age; Age squared; Education; Household Size; Head Married Dummy; Born Abroad dummy; Whether Accessed Credit; Livestock and Non-Livestock Asset Indexes; Remittance Receipt Dummy; Log of Initial Per Capita Income; and Round and Region dummies.