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Do Community-Based Interventions Improve Risk Sharing?

Evidence from Malawi

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We study whether community based interventions improve risk sharing in rural Malawi. We focus on improvements in risk sharing arising as a result of design features of these interventions. We use a 2 year panel dataset collected within a cluster randomised trial to investigate whether two community based interventions - a participatory women's group intervention and a home-based infant feeding intervention - targeted at improving reproductive and infant health, improve risk sharing amongst households following crop losses. We find strong evidence that such interventions help protect household consumption against a crop loss. Investigation of underlying channels rules out direct health effects and income smoothing, and suggests that increased social interactions due to the interventions may be the main driver.

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JEL Classification: E21, G22, O12

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1. Introduction

Households in developing countries face a wide variety of risks and uncertainty, including agricultural risk, employment risk and health risks, which can have adverse consequences for household income. On top of this, formal insurance is very thin in these economies - in Malawi, the environment we study here, just 3% of adults own some kind of formal insurance product - and government welfare policies are nowhere near as widespread as in Western Europe and North America. Given this, households often seek other, less formal, ways to insure income, and hence consumption, against risk. Methods documented in the literature include sharing agricultural inputs, labour sharing agreements, inter-linked transactions, gifts and loans from family and friends, and credit co-operatives, among others (Besley, 1995).[1] However, there is an important body of evidence that suggests that the mechanisms that households put together to provide insurance fail to completely protect their consumption from risk, hardship and adverse events (Townsend (1994), Dercon and Krishnan (2000), Gertler and Gruber (2002), Attanasio and Szekely (2004)). Household consumption thus remains vulnerable to the vagaries of the economies in which they live.

The failure of full insurance suggests that there exist numerous barriers to sharing risk using informal arrangements in these environments, the most important ones being limited commitment, moral hazard and hidden income. Limited commitment arises from the fact that any informal arrangement needs to be self-sustaining: households receiving a higher income need to have incentives to induce them to continue participating in the informal agreement (Coate and Ravallion (1993), Kocherlakota (1996)). Moral hazard arises from the fact that individuals who are insured may lack the incentive to exert effort (unobservable to others) to prevent them from having to resort to that insurance (Ligon, 1997). Hidden income arises from the fact that households have an incentive to mask their true income: for instance, a household receiving a high income may not want to reveal this in order to avoid making transfer payments to other households, while households receiving a low income or experiencing an adverse event have an incentive to over-exaggerate the severity of the loss (Kinnan, 2010). Limited commitment could potentially be solved by mechanisms that improve commitment, such as those that increase trust between the parties of an informal arrangement. Problems of moral hazard and hidden income could potentially be solved by improved screening and monitoring, but both are costly to the insurer. A recent literature has

[1] Appendix 1 contains a more complete review of the literature relevant to this paper.

investigated theoretically the implications of these barriers on informal arrangements, and has tested these implications on household data. Ligon *et al* (2003) find, for India, that limited commitment can explain the response of consumption to income shocks, but not the distribution of consumption. Kinnan (2010) compares all three barriers in the context of Thailand and finds that hidden income is the most relevant barrier in this context. Yet the literature remains far from conclusive on the relative importance of these barriers in preventing full risk sharing.

Given this, government policies that – whether intentionally or not – offer scope for improved commitment, screening and monitoring, may also improve risk sharing amongst households. For instance, policies that bring villagers in closer contact with each other may increase social interactions amongst them, and open up opportunities for engaging in informal risk sharing by increasing trust and the sharing of information. Community-based interventions, particularly participatory ones, which have become increasingly popular in recent years, are well-placed to do this. By community-based intervention, we refer to interventions that involve the local community (most usually, a village) at some step of the intervention, be it in targeting, volunteering, or more extensive participation. Participatory community interventions are a subset of community-based interventions that rely on community engagement and participation, and that have in the past focused on health promotion activities aimed at changing individual behaviour, and more recently been used to allocate aid to local public goods projects (for example, the Malawi Social Action Fund encourages substantial community participation for local public goods). They involve community participation at numerous stages of the intervention, from group meetings to choosing local public goods and implementing the chosen goods. Though the direct aim of this type of policy is not to provide insurance or to encourage risk sharing, we consider in this paper the extent to which this may be a beneficial side effect of it. To the best of our knowledge, few existing studies investigate the effects of government policies in developing countries on consumption smoothing and risk sharing, particularly for policies that do not directly have consumption smoothing as one of its main goals. Exceptions include Albarran and Attanasio (2003), who find that conditional cash transfers are limited in improving consumption smoothing, as they crowd out informal risk sharing, Kaboski and Townsend (2006) who find that households in villages with well-run microfinance institutions attain better consumption smoothing in rural Thailand, and Fafchamps and La Ferrara (forthcoming) who find that self-help groups in urban Kenya play a mutual assistance role.

Understandably, evaluation of policies tends to prioritise the effects on the key outcomes being targeted by the policy - for instance on health, in the case of community-based participatory health interventions. In this paper however, we consider a potential indirect effect of this type of policy - its effect on consumption smoothing - and in so doing provide evidence for policy makers on the 'unplanned' impacts of policies. This is important for policy makers in designing policies going forward: if there is evidence that they have beneficial effects on unintended aspects of behaviour, it strengthens the case for promoting such policies even further.

This paper considers whether community-based interventions in Malawi that are aimed specifically at improving reproductive and infant health, also facilitate risk sharing and thus consumption smoothing. In particular, it examines the response of household consumption to household crop losses, and tests whether this is different across villages that do and do not receive the interventions. It considers two types of community-based interventions: a *participatory* women's group intervention, and a home-based infant feeding intervention. The former directly increases the amount of interaction amongst villagers, who come together in groups on a regular basis to discuss reproductive health issues; the latter involves home visits from an infant feeding counsellor, which could improve consumption smoothing by encouraging the sharing of information. The focus on crop losses is driven by the fact that this type of adverse event is relatively important in our setting – rural Malawi, where almost all households are engaged in agriculture - and can have important consequences for household well-being (Beegle *et al* (2006)). Further, the focus is on idiosyncratic household adverse events, crop losses.[2] Indeed, we include village-level dummy variables in the estimation, to net out the effects of aggregate village shocks.

We find strong evidence that consumption smoothing occurs in the presence of community-based interventions. Indeed, we find that potential losses to consumption due to crop losses are completely offset in the presence of the interventions. We consider three possible channels through which these improvements in consumption smoothing arise: an increase in social interactions, health improvements, and a reduction in the incidence of crop losses. We

[2] To our knowledge, there was no major drought or flood in our study area when the data we use were collected.

rule out the latter two channels and find evidence suggesting that increased social interactions created by these interventions drive the improved risk sharing.

Our results have important implications for policymakers. First, they highlight the importance of considering *unintended* consequences of policies when evaluating that policy. They also highlight the importance of cross-discipline collaboration in the policy design and evaluation process: while the programmes we evaluate focused on improving health, their particular designs generated improvements in socio-economic outcomes. Cross-disciplinary policy evaluation enables us to get a clearer picture of the efficiency and cost-effectiveness of these interventions, and also to obtain a more complete understanding of livelihood strategies employed by the communities in focus.

The paper proceeds as follows. Section 2 sets the scene – describing the background to the environment we are considering, and the community-based interventions we consider. It also includes a discussion of how the interventions may result in improved risk sharing. In section 3 we lay out the empirical model that is estimated. Sections 4 and 5 describe the data and findings respectively. In section 6 we investigate the channels through which consumption smoothing may be taking place. Section 7 summarises policy implications and section 8 concludes.

2. Background and Interventions

2.1 The Setting

Malawi is one of the poorest countries in Sub-Saharan Africa, with around three quarters of the population living on less than $1.25 a day.[3] Over 80% of the population live in rural areas, with agricultural activities providing the main source of income for a very substantial proportion of these. Further, infrastructure in rural areas is very weak, with around one in sixteen households having access to electricity, and one in five households having access to piped water.[4] Agriculture is mainly rain-fed, and agricultural crops and income are thus highly dependent on the unpredictable weather. Access to formal insurance and financial products and services is very rare, with only 3% of adults owning an insurance product and

[3] Source: World Bank, Development Research Group, available from http://data.worldbank.org/indicator/SI.POV.DDAY/countries/MW?display=graph

[4] Source: Malawi Population and Housing Census, 2008.

less than 20% having a formal bank account.[5] In this context, family, friends and community members are likely to be very important for consumption smoothing, particularly when households are hit by adverse shocks.

2.2 The Interventions

The interventions that we consider in this paper are both aimed at improving reproductive and infant health, and were set up by the Mai Mwana project, a research and development organisation based in Mchinji District, Central Malawi. Mchinji District lies to the west of the capital, Lilongwe, and on the border with Zambia and Mozambique. Socio-economic conditions in Mchinji are comparable to or poorer than the average for Malawi (in parentheses in what follows), with literacy rates of just over 60% (64%), poor quality flooring materials used by 85% (78%) of households, piped water access for 10% (20%) of households, and electricity access for just 2% (7%) of households.[6] Mai Mwana, along with researchers at University College London, set up a study to assess the effectiveness of these interventions in improving maternal and neonatal health outcomes. To this end, in 2005 the interventions were randomly assigned among 48 clusters in the District. The two interventions – a participatory women's group intervention and a home-based infant feeding counselling intervention – along with the experimental design, are described in more detail in what follows.

2.2.1 Participatory women's group intervention

The goals of this intervention are to impart information and to mobilise the local community on issues relating to pregnancy, childbirth and newborn health.[7] It does this in a participatory manner, in the sense that community members are involved in every step of the intervention, and learning takes place in a collaborative manner. The way it works in practice is that Mai Mwana trains local facilitators nominated by locals, who then visit villages to encourage women to form groups to discuss the above issues. The groups, which meet fortnightly, follow a participatory action four-stage cycle of meetings where, under the guidance of the facilitator, the first stage involves identifying problems faced by group members relating to

[5] Source: Finscope Malawi Survey 2008. Report available at http://www.finscope.co.za/documents/2009/Brochure_Malawi08.pdf
[6] Source: Malawi Population and Housing Census 2008.
[7] We consider a community to be a set of households living in the same village. Throughout, we use the terms community and village interchangeably.

pregnancy, childbirth and newborn health.[8] In the second stage of the cycle, the groups share the results of their discussions with non-group members of the community, including men[9], and use these discussions to devise strategies to overcome identified problems.[10] The women's groups then report these strategies back to the community and, in the third stage of the cycle, involve the wider community to aid in the implementation of the strategies. In the final stage, the community evaluates the performance of these strategies and their impacts on their priorities. This intervention follows a similar design to interventions implemented in Nepal, India, Bangladesh and Bolivia, which have been shown to be effective at improving health in Bolivia[11], Nepal and India and ineffective in Bangladesh (see Manandhar *et al* (2004), Tripathy *et al* (2010), and Azad *et al* (2010) for more details). Participation rates in the women's groups studied here stand at just under 30% of all women aged 15 and over, compared with 2% of all men aged 15 and over.

2.2.2 Infant feeding counselling intervention

The second intervention implemented by Mai Mwana is an infant feeding counselling one, in which Mai Mwana trains volunteers nominated by the local community on issues relating to infant feeding. Following training, the volunteers visit expectant women five times in their homes – once before the birth of the child to discuss birth-preparedness, and the rest for up to 5 months after the birth to discuss issues relating to breastfeeding and post-breastfeeding nutrition for the infant. Participation in this intervention is higher than in the women's group one, with around 55% - 60% of women with infants born after 2005 report having been visited by a Mai Mwana counsellor.

2.3 The Experimental Design

The experimental evaluation was designed as follows[12]: Mchinji District was divided into 48 zones, each containing approximately 8,000 individuals. From this, around 3,000 individuals,

[8] Rosato *et al* (2007) summarise the problems identified by the groups in this setting relating to maternal health (anaemia, obstructed labour, malaria, retained placenta, and haemorrhaging, amongst others), while Rosato *et al* (2009) summarise those relating to neonatal and infant health (diarrhoea, pre-term births, tetanus, asphyxia, infection and malaria).

[9] While we refer to this intervention as a women's group intervention, the groups included men from the second stage of the cycle onwards.

[10] Some of the strategies that have been implemented include communal vegetable farms, animal husbandry, communal bakeries, bicycle ambulances and childcare centres.

[11] Note that these improvements were not identified from a randomised experimental study, but from a study comparing outcomes before and after the intervention.

[12] Lewycka *et al* (2010) contains more details.

living in the centre or close to the centre of each zone, were selected to be part of the study area, leaving buffer areas between the study areas in adjacent zones. The zones were randomised on a two-by-two factorial design, with 24 zones first randomly chosen to receive the women's group intervention. Thereafter, of the 24 zones with women's groups, 12 were chosen at random to also receive the infant feeding counselling intervention; similarly, of the 24 zones without women's groups, 12 were chosen randomly to receive the infant feeding counselling intervention. This results in 4 sets of treatments[13], each covering 12 zones:

T1: Control

T2: Women's Group only (**WG**)

T3: Infant Feeding Counselling only (**IFC**)

T4: Women's Groups and Infant Feeding Counselling (**BOTH**)

In 2004 all women aged 10 to 49 living in the study areas were enrolled in the study. Women in this age range who later moved into the study areas were also subsequently enrolled. There is an average of 17 villages within each zone. The village is the unit at which we consider consumption smoothing to take place. This is for a number of reasons. First, women's groups are generally formed within a village. Second, the village forms an important hub of social life in rural Malawi, and so a majority of social interactions take place within it. Third, households are more likely to interact with other households that are geographically close to them, and turn to them for support in the case of idiosyncratic adverse events.

2.4 How might the interventions improve consumption smoothing?

The design of the interventions provides a range of channels through which they can improve consumption smoothing. As mentioned in the introduction, the key focus of this paper is on idiosyncratic crop losses (measurement discussed in section 4).[14] It is important to distinguish between idiosyncratic and aggregate events when analysing the extent to which consumption smoothing takes place: full insurance protects against idiosyncratic (household-specific) adversities, but not against aggregate (village-wide) ones. So our test of risk sharing is a test of whether household consumption is protected against idiosyncratic adverse events. We next summarise the three key pathways through which community-based interventions might improve consumption smoothing following an idiosyncratic crop loss.

[13] Throughout, the terms 'treatment' and 'intervention' are used interchangeably.

[14] Throughout, we take the household to be the main unit of observation, and so an idiosyncratic event refers to a household-level event.

2.4.1 Improved informal risk sharing

The participatory women's group intervention provides, first and foremost, a forum for women to interact on a frequent basis with other community members, facilitating the sharing of information, not just about health, but also about other topics and local issues, thus reducing asymmetric information amongst community members. But there is another, more subtle, feature of the intervention which can improve informal risk sharing: by providing a forum for regular meetings, it facilitates the enforceability of risk sharing arrangements. The way in which it does this is by increasing the cost of deviation: if a household deviates from an informal insurance arrangement, other households have available a credible threat to punish it - to take an extreme example – by expelling it from the group (much like in micro-credit group loans), thus denying it access not only to valuable health information, but also to potential monetary and in-kind benefits[15], and other potential non-monetary benefits such as organisational skills and improved access to jobs. Put differently, the intervention, by increasing the range of punishments available, increases the cost of deviation, thus relaxing the limited commitment barrier described in the introduction, and allowing for a wider set of informal arrangements to be sustained.

The infant feeding intervention may increase information sharing generally in the village, by encouraging women to share information on reproductive health and infant care practices, along with other local issues. This increased sharing of information can improve risk sharing by easing the asymmetric information barrier to informal risk sharing.

2.4.2 Improved health

Though the interventions are targeted at reproductive and infant health, it is not infeasible that they also result in better health more generally within the household, for instance by increasing awareness of health issues. This may put households in a better position to cope with any adverse events that occur – being in good condition physically may mean that a householder can work harder, or diversify into different activities when faced with an adverse event, for instance.

[15] There is evidence from informal discussions with programme staff that households involved in women's groups form collective vegetable gardens and share the proceeds from these.

2.4.3 Reduced prevalence and/or severity of adverse events

The interventions could reduce the incidence of crop losses, thereby directly smoothing the household's income stream and improving consumption smoothing. This could happen in at least two ways. First, as discussed above, the interventions may result in better health more generally within the household, which may directly reduce the incidence and/or prevalence of adverse events. For instance, it may result in increased effort and/or resources being put into agricultural production, thus reducing vulnerability to adverse events such as crop loss. Second, as mentioned above, the interventions may engender increased co-operation within the village, which may result in the increased sharing of important inputs (such as farming tools and labour) and knowledge, and thereby reduce exposure to crop losses. In section 6, we investigate which is likely to be the most relevant factor in any observed improved consumption smoothing.

3. Empirical Model

To identify whether community-based interventions improve consumption smoothing, we exploit the cluster randomised allocation of the interventions described above. The empirical model is based on tests derived by Cochrane (1991), Mace (1991), and Townsend (1994). Our main specification is as follows:

$$\Delta \log c_{hvt} = \alpha \Delta crop_{hvt} + \gamma \Delta crop_{hvt} * treat + \Delta X_{hvt} + v_t + \Delta \varepsilon_{hvt} \qquad (1)$$

where $\Delta \log c_{hvt}$ is the consumption growth rate for household *h*, living in village *v* between times *t-1* and *t*, $\Delta crop_{hvt}$ refers to changes between times *t-1* and *t* in crop loss indicators (incidence and severity, separately) for household *h* in village *v*, treat is an indicator variable that equals 1 if household *h* lives in a zone receiving either or both of the community interventions in 2004 (*before* the start of any of the interventions), X_{hvt} is a vector of household level time-varying characteristics such as household size and demographics, and v_t is a set of village-specific time dummies which are included in order to control for any village-level events – in particular, to control for village-specific adversities that occur, which we refer to as aggregate in line with the terminology of the related literature.

Under perfect consumption smoothing (or full insurance), the consumption growth rate should move one-to-one with the aggregate consumption growth rate. In our case, we take the village to be the level at which we believe risk sharing takes place, and so aggregate consumption in this case would be village level consumption. If households are able to

perfectly smooth their consumption through existing mechanisms, in the absence of community based interventions, then we would expect the coefficient α to be equal to zero. If, however, they are unable to smooth their consumption following a crop loss, the coefficient would be negative. γ identifies the consumption smoothing available to households in treatment areas experiencing a crop loss. The sum of the coefficients $\alpha + \gamma$ reveals whether households in intervention zones are perfectly able to smooth their consumption following an idiosyncratic crop loss.

Equation (1) is derived from a model in which households have a utility function of the constant relative risk aversion (CRRA) form. Mace (1991) derives an additional test from a model where households have a utility function of the constant absolute risk aversion (CARA) form. This test is very similar to that in equation (1), except that the left hand side variable relates to consumption growth (Δc_{hut}) rather than the consumption growth rate ($\Delta \log c_{hut}$). In the empirical analysis that follows, we estimate both models, to assess robustness of findings to functional form assumptions.

Two main measures of consumption are used in this study: total household non-durable consumption and household food consumption. The measurement and construction of these variables is described in section 4. We use three measures of crop loss events: a prevalence measure - whether a household experienced a crop loss; and two severity measures - the size of the crop loss in absolute terms, and the size of the crop loss relative to predicted household consumption. This third measure provides a better metric of the intensity of the crop loss for the household. Household predicted consumption is computed on the basis of pre-intervention household characteristics including housing conditions, assets, and the education level of the survey respondent. The different measures allow us to detect household consumption smoothing on different margins.

From the discussion in section 2, it is apparent that the effects of the interventions on consumption smoothing may vary depending on the type of intervention – infant feeding counselling, participatory women's groups, or both. In the second specification, we test for this by allowing for different effects by type of intervention:

$$\Delta \log c_{hut} = \alpha \Delta crop_{hut} + \beta_1 \Delta crop_{hut} * WG + \beta_2 \Delta crop_{hut} * IFC + \beta_3 \Delta crop_{hut} * BOTH + \Delta X_{hut} + v_t \quad (2)$$

where variables are as defined for equation (1), and in addition, WG is a dummy variable that equals 1 if the household is living in a zone with women's groups only, IFC is a dummy which equals one if the household is living in a zone with infant feeding counselling only, and BOTH is a dummy variable which equals one if the household is living in a zone with both women's groups and infant feeding counselling. β_1 can be interpreted as the extent to which women's group interventions protect the consumption growth rate of households in the presence of a crop loss, β_2 estimates this for the infant feeding counselling intervention, and β_3 for the villages in which both interventions are in place. As before, total consumption smoothing following a crop loss in communities with women's groups only is given by $\alpha + \beta_1$. For communities with infant feeding counselling only, and for communities with both interventions, the parameters are $\alpha + \beta_2$ and $\alpha + \beta_3$ respectively.

4. Data

The main source of data used in this paper is a two year panel of just under 3,000 households collected by the authors in collaboration with Mai Mwana in 2008-09 and 2009-10, around 3-4 years after the interventions started. We refer to this as the survey data. It was designed with two purposes in mind. First, to evaluate the economic impacts of the Mai Mwana interventions - it contains a wealth of socio-economic information such as non-durable consumption, education, labour supply, and self-reported health and anthropometric measurements for young children. Second, to investigate risk sharing issues such as the one being considered here - it contains data on adverse events experienced by the household, family networks, and social interactions measured as one-to-one chats. During the 2009-10 survey, we succeeded in re-visiting 91% of the 2008-09 households.

The two waves of panel data were collected using Personal Digital Assistants (PDAs), which improved the accuracy of the data relative to paper questionnaires.[16] In addition to the household survey, we collected detailed information on market level food prices, with repeat visits to the same markets in different months to attenuate any seasonality effects.

As it is common practice in the consumption smoothing literature, we restrict the sample to households that were resident in the *same* village over both survey rounds. This is in order to

[16] In-built consistency checks reduced the recording of unrealistic values, and automated skip patterns reduced interview times and fatigue for both the interviewer and respondent.

control for aggregate (village-level) adverse events. This results in dropping 9% of the sample (of those present in both waves), leaving a final sample of 2,735 households.[17]

In order to assess the success of the randomisation, and to compute predicted consumption (see section 3), the paper also makes use of data from a Census of all households with women of reproductive age, which was conducted by Mai Mwana in 2004, a year *before* the interventions started. This data set has information on basic socio-economic characteristics of households such as asset holdings, quality of housing and education levels of women in the household.

4.1 Pre-Intervention Descriptive Statistics

Table 1 displays the pre-intervention (baseline) characteristics of households in our analysis sample. Households are large, with just under 6 members on average. Housing conditions are poor, as demonstrated by the roofing and flooring materials. Less than 6% of households have access to piped water and less than 1% have access to electricity. Among assets, most households own a paraffin lamp, 64% own a radio, and 52% own a bicycle. Ownership of other assets such as cars, motorbikes and oxcarts is very low. Almost all households are involved in agriculture.

Table 1: Baseline Descriptive Statistics

Variable	Mean	Std. Dev.
Main flooring material: dirt, sand or dung	0.907	0.291
Main roofing material: natural	0.857	0.350
Agricultural Household (yes=1)	0.991	0.093
Traditional pit toilet (yes = 1)	0.802	0.398
Piped water (yes=1)	0.056	0.229
# of hh members	5.891	2.480
# of sleeping rooms	2.207	1.024
Household has electricity (yes=1)	0.005	0.069
Household has radio (yes=1)	0.641	0.480
Household has bicycle (yes=1)	0.523	0.500
Household has motorcycle (yes=1)	0.007	0.083
Household has car (yes=1)	0.004	0.060
Household has paraffin lamp (yes=1)	0.950	0.218
Household has oxcart (yes=1)	0.051	0.220
N	2,728	

Notes to table: Source: 2004 Mai Mwana Census Data.

[17] We note that the likelihood of being dropped from the sample is not a function of whether or not a crop loss was experienced in the first wave, and this statement is true across all intervention and control areas.

4.2 Sample Balance

Next, we check for the success of the random allocation of the interventions across zones, by comparing the means of available pre-intervention observable characteristics between the treatment zones and the control zone for each of the different treatment arms. Table 2 presents the results of this comparison. Overall, the sample is well-balanced. Though there are a handful of differences in household-level characteristics between the women's group only zones and the control zones, and between the infant feeding only zones and the control zones, the differences are very low, and none are significant at or below the 5% level.

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Table 2: Sample Balance

	Control Group	Difference WG Only - Control	p-value	Difference IFC Only - Control	p-value	Difference BOTH - Control	p-value
Household Characteristics							
Main Flooring Material: dirt, sand or dung	0.920	-0.011	0.631	-0.019	0.562	-0.025	0.495
Main roofing Material: natural	0.864	-0.015	0.594	-0.01	0.815	-0.005	0.909
Agricultural Household (yes=1)	0.994	0.003	0.462	0.003	0.513	-0.017	0.15
Traditional pit toilet (yes = 1)	0.791	-0.007	0.875	0.053	0.231	0.001	0.981
Piped water (yes=1)	0.012	0.107	0.237	0.032	0.33	0.038	0.39
# of hh members	5.948	-0.265	0.065	0.037	0.92	-0.009	0.963
# of sleeping rooms	2.174	-0.037	0.716	0.124	0.203	0.042	0.692
Household has electricity (yes=1)	0.003	-0.001	0.551	0.003	0.454	0.006	0.469
Household has radio (yes=1)	0.662	-0.047	0.156	-0.005	0.88	-0.033	0.322
Household has bicycle (yes=1)	0.522	-0.006	0.879	-0.004	0.931	0.013	0.713
Household has motorcycle (yes=1)	0.007	0	0.978	0	0.998	-0.002	0.677
Household has car (yes=1)	0.007	-0.006	0.058	-0.006	0.054	-0.003	0.364
Household has paraffin lamp (yes=1)	0.947	0.007	0.773	0.012	0.58	-0.006	0.801
Household has oxcart (yes=1)	0.059	-0.011	0.45	-0.024	0.059	0.002	0.863
Sample Observations	678	666		679		706	

Notes to Table: * indicates significant at the 10% level, ** indicates significant at the 5% level. Note that standard errors are clustered at the zone level when computing the p-values. The results of the t-tests are also robust to the wild cluster bootstrap-t method recommended by Cameron *et al* (2007), which is shown to perform well when the number of clusters is below 30.

4.3 Measuring Consumption

Our measures of consumption merit in-depth discussion. The survey contained an extensive consumption module, asking respondents to report, at the household level, the *quantity* consumed and purchased, and the *amount spent* on the purchase, of 25 different food items in the week prior to the interview. It also elicited expenditures on other important household items including clothing, health, education, and housing improvements, among others. The latter items were collected for recall periods of 1 month (for items such as fuel, utilities and transport), 12 months/since the last survey (9-11 months) (for items such as house improvements, clothing, health, and education expenditures). Further, food prices were collected from the local markets and trading centres most regularly visited by our sample of households. These food price surveys were administered multiple times over the survey period, in order to reduce seasonality issues. In the 2009-10 survey, information was also collected on conversion units, allowing us to convert non-standard units of measurements (such as a cup of beans) to standard units of measurement (such as kilograms and grams).

Total household food consumption is computed by aggregating expenditures on food and the imputed values of non-purchased food. We employ the following procedure to value food that was not purchased: we first use the conversion units collected in 2009-10 to convert foods measured in non-standard units into standard units. Then, we use median unit-values (computed by dividing expenditure on a certain good by the quantity purchased, and taking the median at the zone and district levels) to value this non-purchased consumption. An alternative method is to use the market prices. This is not our preferred method, since most households rarely purchase the foods they commonly consume from the markets, and so we may over-value their consumption this way. Reassuringly though, valuing consumption by either method yields the same food consumption share of total non-durable consumption of 0.86.

Total non-durable consumption is computed by converting all consumption and expenditure values into monthly terms and adding them together. The average monthly food consumption for households in our sample is about 10,570 MK (~US$75), while average total monthly non-durable consumption is 12,600MK (~US$90).

4.4 Measuring Adverse Events

We next describe the incidence of crop losses in the survey (post-intervention) data. This is a key variable in the paper. A large literature considers the effect of such adverse events on consumption smoothing, the idea being that under complete insurance, they should have no effect on household consumption, but that as one moves away from full insurance, they are likely to affect household consumption.

Information on crop losses was collected from two questions within an extensive module on adverse events. In the first wave, households were asked whether they had experienced a crop loss in the year prior to the survey. If yes, households were asked to report the size (severity) of the crop loss, in terms of the estimated income loss associated with it. The second wave of data collection asked the same questions, but the recall period related to the time since the previous survey, between 9-11 months for most households.

Table 3 displays the prevalence and severity of crop losses in our sample. The top panel shows the incidence and size of crop loss events when data from both rounds are pooled, while the bottom two panels show the incidence and severity for each round of data collection.

Table 3: Incidence and severity of crop loss

Variable	Obs	Mean	Std. Dev.
Aggregating waves 1 and 2			
Crop loss in past 12 months/ since last survey (yes=1)	5,454	0.314	0.464
Size of crop loss (1000's MK)	5,364	4.305	14.687
Wave =1			
Crop loss in past 12 months (yes=1)	2,730	0.396	0.489
Size of crop loss (1000's MK)	2,668	6.139	19.120
Wave = 2			
Crop loss since first wave (yes=1)	2,724	0.231	0.421
Size of crop loss (1000's MK)	2,696	2.489	7.799

Notes to table: Extreme outlying values for the size of the crop loss are dropped.
Size of crop loss includes zeroes for households that did not experience a crop loss.

On average across both waves, 31% of households report having experienced a crop loss. There is substantial variation in the incidence of crop loss, as can be seen from the standard

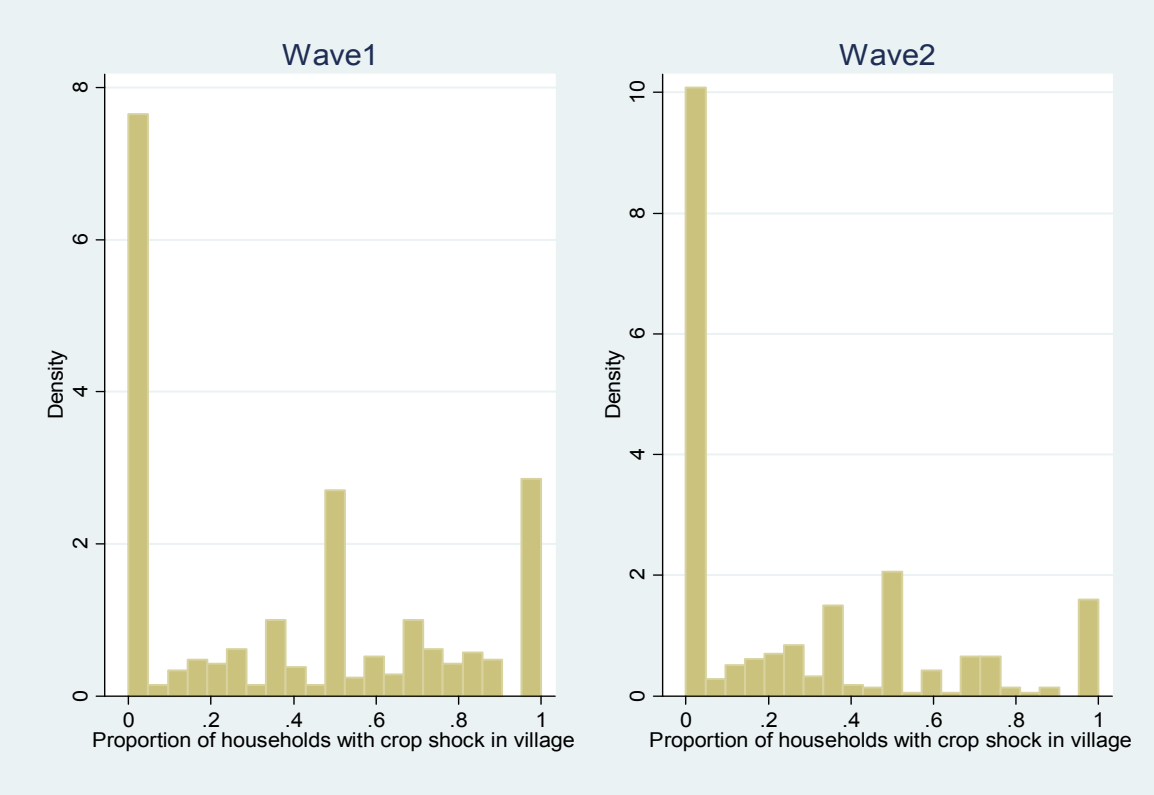
deviations in the table. The average income lost is almost 4,305 MK (approximately $31)[18], which, at 40% of average monthly consumption, masks a lot of variation. Among those households that were hit by a crop loss, the average crop loss is 14,253 MK (~US$102), which corresponds to just over one month of average monthly consumption for households in the sample.

Disaggregating by wave highlights differences in the incidence of crop loss events and the size of the crop loss between waves, with a substantially higher incidence and size of crop loss in the first wave compared to the second. This is most likely for two reasons. First, the incidence of crop losses in the second wave relates to a shorter period of 9 to 11 months (as opposed to 12 months). Second, data collection in the second (first) wave took place during (after) the main growing season, and so not all crop losses would have been realised by the time of the interview. Note that we control for the differing recall periods throughout the empirical work.

For the empirical tests, it is crucial that crop losses represent idiosyncratic (household-level) and not aggregate (village-level) adverse events. Crop losses could affect all households in a village if they are caused by common weather shocks or natural disasters affecting the whole village. To assess this, Figure 1 contains a histogram of the village level variance of the incidence of crop losses in our sample.

[18] The exchange rate at the time of data collection was approximately 140MK = $1.

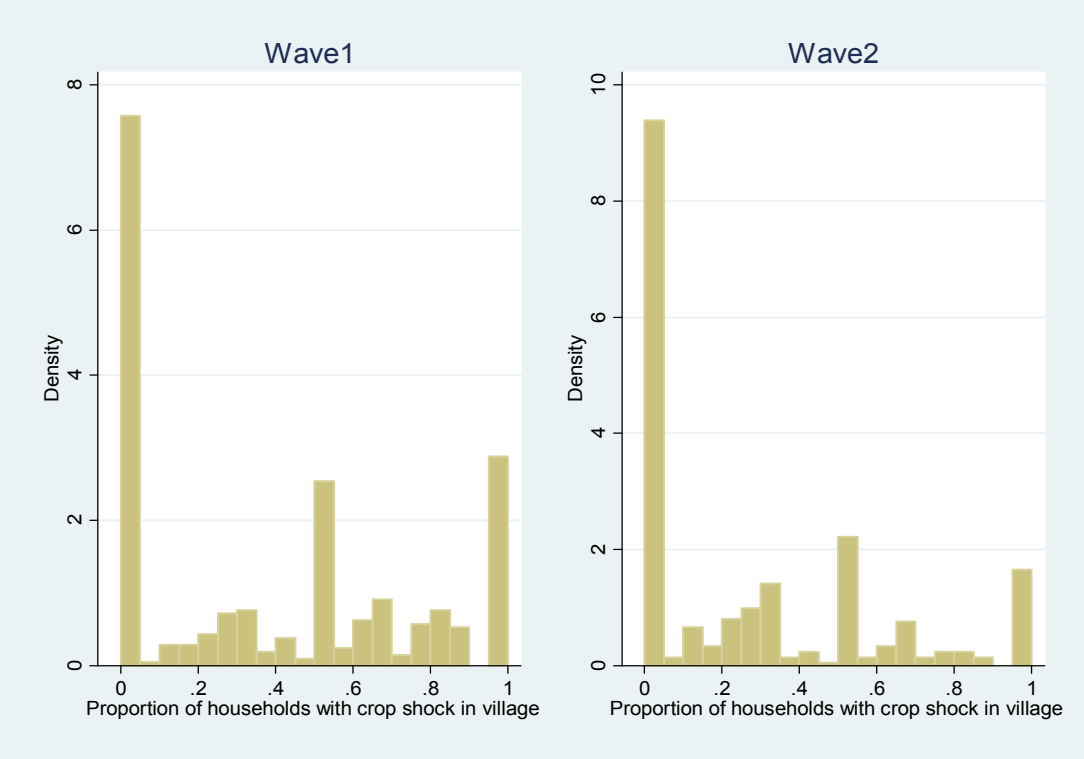
Figure 1: Histogram of proportion of households with crop losses in village



The left (right) panel of the figure shows the density of the village level variance of the incidence of crop losses in the first (second) wave. Both show substantial variation within the village in the incidence of crop losses, though there are some villages where no household experienced a crop loss and others where all households experienced a crop loss.

Reassuringly, this variation does not simply reflect variation in the distribution of occupations across villages, as can be seen in Figure 2, which plots village level variance of the incidence of crop losses among households where the head or spouse report agriculture as their main income generating activity.

Figure 2: Histogram of proportion of households with crop losses in village among agricultural households



In any event, we note that we net out the effect of any aggregate (village-wide) events by controlling for village-specific dummies in the estimation, so the crop loss picks up the effects conditional on this.

5. Results

We next turn to the main findings of the paper, as estimated from the specifications described in section 3. We first report results pooling all treatments, and then when we allow for heterogeneous effects by type of intervention.

5.1 Pooling Treatments

Table 4 displays the results pooling together all three treatments (WG, IFC, BOTH). The first three columns present results for the specification with a CARA utility function (consumption in levels), while the next three columns present the results for the specification with a CRRA utility function (consumption in logs). The dependent variable relates to total household non-durable consumption.

The Table reveals strong evidence of consumption smoothing in intervention villages: indeed, the figures in the Table suggest that households living in villages in intervention zones are managing to completely protect their consumption against the vagaries of crop losses. This finding is particularly strong for the 'severity' measure of crop losses, as can be seen from Columns [2], [3], [5] and [6]. For instance, we see from Column [2] that for every additional 1,000 Kwacha (MK) lost due to the crop loss, consumption growth decreases by 43.5 MK. However, in villages where the intervention is in place, the decrease in consumption growth is almost completely offset (42.05 MK). From this evidence it appears that community-based interventions can help households to completely smooth even fairly large crop losses. This finding remains when we consider consumption in logs as opposed to levels, as in Column [5] of the Table: the consumption growth rate is protected in intervention areas after the crop loss, whereas it is significantly reduced in non-intervention (control) areas.

The result is also robust to the second measure of intensity used, in which the size of the crop loss is measured as a proportion of household resources (as measured by predicted consumption - see section 3), as can be seen for both consumption levels and logs, in Columns [3] and [6] respectively. Finally, Columns [1] and [4] show the effects for the incidence of a crop loss, as opposed to intensity. Whilst the general picture remains the same, the findings are not significant at conventional levels. This suggests that the crop loss dummy variable (the one most commonly used in the literature) is a rather blunt measure of the adverse event, and data on its severity is considerably more informative.

Table 4: Consumption smoothing, pooling treatments, household non-durable consumption

VARIABLES	[1] ΔCONS	[2] ΔCONS	[3] ΔCONS	[4] ΔLN(CONS)	[5] ΔLN(CONS)	[6] ΔLN(CONS)
Δcrop	-1847			-0.0961*		
	[1188]			[0.053]		
Δcrop*treat	2569**			0.131**		
	[1217]			[0.058]		
Δcrop loss size		-43.48**			-0.00240***	
		[20.8]			[0.00067]	
Δcrop loss size*treat		42.05*			0.00230***	
		[23.3]			[0.00086]	
Δ(crop loss size/predicted cons)			-889986*			-46.81***
			[451844]			[12.8]
Δ(crop loss size/predicted cons)*treat			886628*			45.47***
			[469337]			[14.7]
Observations	2539	2456	2447	2539	2456	2447
R-squared	0.33	0.33	0.33	0.39	0.39	0.39

Notes to table: Clustered standard errors in brackets. *** p<0.01, ** p<0.05, *p<0.1. All regressions include controls for household demographics (changes in number of household members aged under 6, 6-12 years, 12-18 years and over 18), seasonality and village fixed effects.

'Cons' is shorthand for total household non-durable consumption in the past month, measured as detailed in section 4.3.

Crop loss size is the monetary loss (in Malawian Kwacha) associated with the crop loss - section 4.4.

Crop loss size/predicted cons is a measure of the relative importance of the loss to the household - section 4.4.

Table 5 presents the results for total household food consumption. The results are qualitatively similar to those just reported for household non-durable consumption. Households reduce food consumption in order to deal with more severe crop losses, and community-based interventions appear to aid households in protecting their food consumption, as evidenced from the positive coefficients on the interaction terms. All coefficients on the interaction terms have the expected sign and are statistically significant in most specifications. Finally note that, as for non-durable consumption, the larger the crop loss, the more likely it is that risk sharing takes place – the more blunt measure of a crop loss, the dummy variable as to whether or not one occurred, appears to mask this.

Table 5: Consumption smoothing, pooled treatments, household food consumption

VARIABLES	[1] ΔCONS	[2] ΔCONS	[3] ΔCONS	[4] ΔLN(CONS)	[5] ΔLN(CONS)	[6] ΔLN(CONS)
Δcrop	-1683			-0.101*		
	[1030]			[0.058]		
Δcrop*treat	2299**			0.136**		
	[1061]			[0.062]		
Δcrop loss size		-29.51			-0.00193***	
		[20.1]			[0.00065]	
Δcrop loss size*treat		28.42			0.00182**	
		[21.5]			[0.00089]	
Δ(crop loss size/predicted cons)			-631301			-38.87***
			[433573]			[14.5]
Δ(crop loss size/predicted cons)*treat			618587			36.76**
			[442240]			[16.4]
Observations	2539	2456	2447	2537	2454	2445
R-squared	0.33	0.33	0.33	0.38	0.38	0.38

Notes to table: Clustered standard errors in brackets. *** p<0.01, ** p<0.05, *p<0.1. All regressions include controls for household demographics (changes in number of household members aged under 6, 6-12 years, 12-18 years and over 18), seasonality and village fixed effects.
'Cons' is shorthand for total household food consumption in the past month, measured as detailed in section 4.3.
Crop loss size is the monetary loss (in Malawian Kwacha) associated with the crop loss - section 4.4.
Crop loss size/predicted cons is a measure of the relative importance of the loss to the household - section 4.4.

5.2 By Treatment Type

The discussion in section 2.4 suggests that different community-based interventions have potentially different effects on consumption smoothing. Some interventions could help overcome certain barriers to risk sharing such as imperfect information and limited commitment. Interventions such as the women's groups can engender co-operation within the community and hence improve consumption smoothing by reducing the incidence and severity of adverse events. Hence, the type of community intervention may matter for consumption smoothing.

To investigate whether this is the case, Tables 6 and 7 present results from specifications that allow for heterogeneous effects of the different interventions on consumption smoothing. The coefficients on the interaction terms for the different interventions are very similar (and cannot be statistically distinguished to be different) for all outcomes and measures of crop losses. Therefore, the two different community interventions and the interaction of these two result in similar levels of consumption smoothing following a crop loss.

Table 6: Consumption smoothing, by Intervention, household non-durable consumption

VARIABLES	[1] ΔCONS	[2] ΔCONS	[3] ΔCONS	[4] ΔLN(CONS)	[5] ΔLN(CONS)	[6] ΔLN(CONS)
Δcrop	-1849			-0.0959*		
	[1190]			[0.053]		
Δcrop*WG	2393*			0.151*		
	[1413]			[0.080]		
Δcrop*IFC	2870**			0.121*		
	[1267]			[0.063]		
Δcrop*BOTH	2480*			0.124**		
	[1261]			[0.059]		
Δcrop loss size		-43.45**			-0.0024***	
		[20.8]			[0.0006]	
Δcrop loss size*WG		30.02			0.0013	
		[22.6]			[0.0007]	
Δcrop loss size*IFC		43.24			0.0026***	
		[27.8]			[0.0009]	
Δcrop loss size*BOTH		53.96*			0.0029**	
		[28.6]			[0.0012]	
Δ(crop loss size/predicted cons)			-889526*			-46.75***
			[452200]			[12.8]
Δ(crop loss size/predicted cons)*WG			778209			35.42**
			[474180]			[13.9]
Δ(crop loss size/predicted cons)*IFC			900793*			50.23***
			[515879]			[16.1]
Δ(crop loss size/predicted cons)*BOTH			1026214*			54.53***
			[519879]			[18.7]
Constant	1373**	1262**	1291**	0.125***	0.121**	0.122***
	[538]	[545]	[538]	[0.044]	[0.045]	[0.045]
Observations	2539	2456	2447	2539	2456	2447
R-squared	0.33	0.33	0.33	0.39	0.39	0.39

Notes to table: Clustered standard errors in brackets. *** p<0.01, ** p<0.05, *p<0.1. All regressions include controls for household demographics (changes in number of household members aged under 6, 6-12 years, 12-18 years and over 18), seasonality and village fixed effects.
'Cons' is shorthand for total household non-durable consumption in the past month, measured as detailed in section 4.3.
Crop loss size is the monetary loss (in Malawian Kwacha) associated with the crop loss – section 4.4.
Crop loss size/predicted cons is a measure of the relative importance of the loss to the household - section 4.4.

Table 7: Consumption smoothing, by Intervention, household food consumption

VARIABLES	[1] ΔCONS	[2] ΔCONS	[3] ΔCONS	[4] ΔLN(CONS)	[5] ΔLN(CONS)	[6] ΔLN(CONS)
Δcrop	-1686			-0.101*		
	[1032]			[0.058]		
Δcrop*WG	1940			0.157*		
	[1189]			[0.080]		
Δcrop*IFC	2628**			0.120*		
	[1127]			[0.070]		
Δcrop*BOTH	2331**			0.131*		
	[1139]			[0.067]		
Δcrop loss size		-29.48			-0.00193***	
		[20.1]			[0.00065]	
Δcrop loss size*WG		21.15			0.00094	
		[22.6]			[0.00087]	
Δcrop loss size*IFC		37.93*			0.00270**	
		[20.9]			[0.0011]	
Δcrop loss size*BOTH		25.65			0.00178	
		[26.7]			[0.0012]	
Δ(crop loss size/predicted cons)			-630696			-38.80**
			[433869]			[14.5]
Δ(crop loss size/predicted cons)*WG			568238			28.89*
			[458334]			[16.2]
Δ(crop loss size/predicted cons)*IFC			721132			47.63**
			[436536]			[18.6]
Δ(crop loss size/predicted cons)* BOTH			575664			35.85*
			[490198]			[20.1]
Constant	1446***	1372***	1402***	0.178***	0.175***	0.177***
	[428]	[449]	[438]	[0.042]	[0.042]	[0.042]
Observations	2539	2456	2447	2537	2454	2445
R-squared	0.33	0.33	0.33	0.38	0.38	0.38

Notes to table: Clustered standard errors in brackets. *** p<0.01, ** p<0.05, *p<0.1. All regressions include controls for household demographics (changes in number of household members aged under 6, 6-12 years, 12-18 years and over 18), seasonality and village fixed effects.
'Cons' is shorthand for total household food consumption in the past month, measured as detailed in section 4.3.
Crop loss size is the monetary loss (in Malawian Kwacha) associated with the crop loss – section 4.4.
Crop loss size/predicted cons is a measure of the relative importance of the loss to the household - section 4.4.

6. How can Community Based Interventions Improve Consumption Smoothing?

6.1 Social Interactions

In this section, we scrutinise empirically the possible channels highlighted in section 2.4 regarding how the interventions may improve consumption smoothing. We first examine the role of social interactions, which might be associated with risk sharing improvements through reductions in asymmetric information and limited commitment. Table 8 shows the results of estimating equation (2) but using as the dependent variable, changes in whether the individual spoke one-to-one with a relative or friend about selected topics. Though there is some variability in the results depending on the topic of the chat and the measure of loss, in general we find that individuals living in treatment areas, and who suffered from a crop loss, are more likely to talk to a friend or relative compared to individuals living in control area who suffered a crop loss. Table 9 shows the results considering the interventions separately. As in Table 8, the significance of the results depend on the topic of the chat and the crop loss measures, but in general it seems that both IFC and WG help increase the social interactions of those who suffered a crop loss. This is agreement with our previous results that both IFC and WG contributed in a similar manner to consumption smoothing.

Table 8: Change in the probability of one-to-one chats as a function of different measures of crop loss. All interventions pooled.

Dep vble: change in probability of one-to-one chats on →	Credit			Politics			Jobs			Children's schooling		
Δcrop	-0.059**			-0.003			-0.018			-0.068		
	[0.023]			[0.043]			[0.063]			[0.048]		
Δcrop*treat	0.115***			0.037			0.005			0.096		
	[0.036]			[0.059]			[0.068]			[0.059]		
Δcrop loss size		-0.0003			-0.002**			-0.0001			-0.001	
		[0.0004]			[0.001]			[0.0004]			[0.001]	
Δcrop loss size*treat		0.002			0.002*			0.002**			0.003*	
		[0.002]			[0.001]			[0.001]			[0.002]	
Δ(crop loss size/predicted cons)			-5.699			-33.497**			-1.497			-24.117
			[9.640]			[13.581]			[11.220]			[20.311]
Δ(crop loss size/predicted cons)*treat			30.108			37.153*			24.125			47.813*
			[21.382]			[18.523]			[14.461]			[25.375]
Observations	2596	2513	2447	2593	2510	2445	2595	2512	2446	2593	2510	2444

Notes to table: Clustered standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 9: Change in the probability of having one-to-one chats as a function of different measures of crop loss, by intervention.

Dep vble: change in probability of one-to-one chats on →	Credit		Politics		Jobs		Children's schooling	
Δcrop	-0.059**		-0.004		-0.018		-0.069	
	[0.023]		[0.043]		[0.064]		[0.048]	
Δcrop*WG	0.088**		-0.061		-0.008		0.067	
	[0.042]		[0.052]		[0.088]		[0.069]	
Δcrop*IFC	0.179***		0.097		0.063		0.130	
	[0.0508]		[0.081]		[0.071]		[0.080]	
Δcrop*BOTH	0.086*		0.067		-0.030		0.092	
	[0.049]		[0.073]		[0.070]		[0.069]	
Δcrop loss size		-0.0003		-0.002**		-0.0001		-0.001
		[0.0004]		[0.001]		[0.0004]		[0.0007]
Δcrop loss size*WG		0.002***		0.001		0.003***		0.004***
		[0.001]		[0.001]		[0.001]		[0.001]
Δcrop loss size*IFC		0.0006		0.004**		0.0006		0.001
		[0.004]		[0.002]		[0.001]		[0.002]
Δcrop loss size*BOTH		0.003**		0.003		0.002		0.003
		[0.0015]		[0.002]		[0.001]		[0.003]
Observations	2596	2513	2593	2510	2595	2512	2593	2510

Table 9 continued overleaf.

Table 9 contd.: Change on the probability of having one to one chats as a function of different measures of crop loss, by intervention

Dep vble: change in probability of one-to-one chats on →	**Credit**	**Politics**	**Jobs**	**Children's schooling**
Δ(crop loss size/predicted cons)	-5.750	-33.347**	-1.595	-24.173
	[9.676]	[13.588]	[11.220]	[20.321]
Δ(crop loss size/predicted cons)*WG	31.173**	18.272	35.770**	56.510**
	[13.269]	[15.862]	[14.612]	[24.915]
Δ(crop loss size/predicted cons)*IFC	18.584	56.506**	10.693	42.112
	[54.206]	[22.544]	[16.657]	[31.265]
Δ(crop loss size/predicted cons)*BOTH	41.518*	42.516	22.497	41.735
	[22.035]	[30.234]	[21.936]	[39.775]
Observations	2447	2445	2446	2444

Notes to table: Clustered standard errors in brackets. *** p<0.01, ** p<0.05, *p<0.1

6.2 Improved Health

As discussed in section 2.4, health gains due to the interventions could directly improve consumption smoothing, because households living in treatment areas could, for instance, smooth their consumption better by working harder, and/or taking on extra work if they are in better health. Though this is not what we would expect - the interventions focused specifically on reproductive and infant health - it would difficult to rule out *a priori* spillovers on general adult health. To investigate this, Tables 10 and 11 report the effect of the interventions on several indicators of adult health, separately for males and females. We also display the coefficients on education, which replicate the well-known education gradient in reported health: the more educated are significantly less likely to report many of the health problems considered. This provides us with considerable confidence in our measures of self-reported health. According to the results in the Table, there is no evidence that the interventions improved adult health in a significant way.[19]

[19] The Women's Group intervention could have reduced maternal mortality, though this is unlikely to explain our consumption smoothing results because maternal mortality is 510 per 100,000 live births (http://www.childinfo.org/maternal_mortality_countrydata.php). Our sample does not have enough power to detect significant differences in maternal mortality.

Table 10: Effects of the Interventions on Health for Male Adults

VARIABLES	[1] Diarrhoea in last 30 days	[2] Fever in last 30 days	[3] Cough in last 30 days	[4] Chills in last 30 days	[5] Vomiting in last 30 days	[6] Any symptom in last 30 days	[7] Unable to carry out daily activities	[8] Can easily carry a load of 10 kg for 20 metres	[9] Can easily walk 5 km
IFC	-0.009	0.076*	0.004	0.026	0.017	0.066	0.083**	-0.008	-0.062
	[0.012]	[0.046]	[0.056]	[0.031]	[0.019]	[0.063]	[0.038]	[0.032]	[0.050]
WG	0.001	0.072*	-0.02	0.001	-0.017	0.03	0.037	0.024	0.044
	[0.014]	[0.043]	[0.050]	[0.029]	[0.018]	[0.058]	[0.037]	[0.029]	[0.031]
BOTH	0.006	0.039	-0.04	0.025	0	-0.009	0.042	0.02	0.039
	[0.013]	[0.047]	[0.045]	[0.031]	[0.017]	[0.059]	[0.044]	[0.026]	[0.033]
Age	0.001**	0.001**	0.001	0.001	0	0.001	0.002***	-0.003***	-0.005***
	[0.000]	[0.001]	[0.001]	[0.000]	[0.000]	[0.001]	[0.001]	[0.001]	[0.001]
Primary education 1-3	-0.01	0.01	-0.005	0.006	-0.003	0.001	0.021	0.002	0.01
	[0.008]	[0.019]	[0.022]	[0.014]	[0.013]	[0.027]	[0.021]	[0.012]	[0.013]
Primary education 4-6	-0.007	-0.005	-0.019	-0.003	-0.028**	-0.035	-0.019	0.014	0.007
	[0.008]	[0.018]	[0.020]	[0.014]	[0.011]	[0.023]	[0.018]	[0.013]	[0.013]
Secondary education or above	-0.020*	-0.015	-0.053**	-0.011	-0.032**	-0.074**	-0.065**	0.019	0.014
	[0.012]	[0.032]	[0.022]	[0.019]	[0.015]	[0.035]	[0.029]	[0.016]	[0.018]
Observations	5678	5683	5690	5677	5685	5669	5760	5767	5766

Notes to table: Clustered standard errors in brackets. *** p<0.01, ** p<0.05, *p<0.1; Marginal effects from probit models.

Table 11: Effects of the Interventions on Health for Female Adults

VARIABLES	[1] Diarrhoea in last 30 days	[2] Fever in last 30 days	[3] Cough in last 30 days	[4] Chills in last 30 days	[5] Vomiting in last 30 days	[6] Any symptom in last 30 days	[7] Unable to carry out daily activities	[8] Can easily carry a load of 10 kg for 20 metres	[9] Can easily walk 5 km
IFC	-0.008	0.073	-0.009	0.007	0.001	0.054	0.058	0.013	-0.071
	[0.012]	[0.047]	[0.053]	[0.043]	[0.035]	[0.055]	[0.044]	[0.036]	[0.053]
WG	0.007	0.048	0.032	0.004	0.006	0.043	0	0.034	0.024
	[0.019]	[0.041]	[0.050]	[0.042]	[0.029]	[0.058]	[0.041]	[0.032]	[0.037]
BOTH	-0.003	0.064	0.029	0.048	0.044	0.04	0.028	0.014	0.037
	[0.018]	[0.049]	[0.050]	[0.047]	[0.029]	[0.063]	[0.043]	[0.034]	[0.035]
Age	0	0.003***	0	0.001*	-0.001**	0.002*	0.003***	-0.004***	-0.005***
	[0.000]	[0.001]	[0.001]	[0.000]	[0.000]	[0.001]	[0.001]	[0.001]	[0.001]
Primary education 1-3	0.001	0.021	-0.022	-0.013	0.035**	0.023	0.02	0.016	0.014
	[0.010]	[0.023]	[0.021]	[0.019]	[0.015]	[0.025]	[0.024]	[0.017]	[0.015]
Primary education 4-6	-0.004	-0.008	-0.013	-0.025*	-0.003	-0.019	-0.008	0.038***	0.023*
	[0.011]	[0.019]	[0.019]	[0.015]	[0.013]	[0.021]	[0.020]	[0.012]	[0.013]
Secondary education or above	-0.018	-0.044	-0.043	-0.051**	-0.037**	-0.065**	-0.082***	0.040**	0.024
	[0.014]	[0.030]	[0.029]	[0.025]	[0.015]	[0.033]	[0.030]	[0.017]	[0.019]
Observations	6,475	6,471	6,477	6,468	6,457	6,459	6,517	6,517	6,518

Notes to table: Clustered standard errors in brackets. *** p<0.01, ** p<0.05, *p<0.1; Marginal effects from probit models.

Next, we examine the effects of the interventions on child health. Improvements in child health could improve consumption smoothing in at least two ways: healthier children require less care and free up household labour, and/or households might need to spend less on health care and are able to save more, thus facilitating consumption smoothing. Table 12 shows the effects of the interventions on child morbidity. There appears to be no significant reduction in the probability that a child suffers from diarrhoea, fast breathing or vomiting. Although there is no apparent improvement in morbidity, the height of children below 24 months has improved due to IFC. In particular, Table 13 shows that IFC improved children's height, a measure of long term health, by 30.4% of one standard deviation.[20] However, there are no significant improvements in child's anthropometric outcomes in WG areas.

According to these results, IFC helped families to improve the nutrition of their children. In principle, we cannot be certain whether the observed improvement in consumption smoothing in IFC areas is due to an improvement in children's nutritional status rather than reduction in asymmetric information or increased enforcement. However, from a purely intuitive point of view, it is hard to think that the large improvements in consumption smoothing that we have found could be due to an improvement in the nutritional status of young children. To provide evidence in this regard, we estimate equation (2) on the sub-sample of households with children older than 24 months, for whom no direct health improvements from the interventions have been detected. The results, reported in Tables 14 and 15, still show evidence of consumption smoothing even among households that did not directly benefit from improved child health outcomes through the interventions. All of these pieces of evidence put together suggest that health improvements as a result of the interventions are not driving the observed improvements in consumption smoothing.

[20] The dependent variables in Table 13 are height-for-age, weight-for-age, and weight-for-height. Height-for-age is built as the difference between a child's height minus the median height of children of the same age in the World Health Organization (WHO) reference population, divided by the standard deviation of height for children of the same age in the WHO reference population. The variables weight-for-age and weight-for-height are built in a similar manner. The results can be interpreted in terms of standard deviations. See http://www.who.int/childgrowth/standards/en/ for more information.

Table 12. Effect of the interventions on child morbidity.
Marginal effects using Probit models

	[1]	[2]	[3]	[4]	[5]	[6]
VARIABLES	**Diarrhoea 0-24 mths**	**Diarrhoea 24-48 mths**	**Fast Breathing 0-24 mths**	**Fast Breathing24-48 mths**	**Vomiting 0-24 mths**	**Vomiting 24-48 mths**
IFC	-0.009	0.076*	0.004	0.026	0.017	0.066
	[0.012]	[0.046]	[0.056]	[0.031]	[0.019]	[0.063]
WG	0.001	0.072*	-0.02	0.001	-0.017	0.03
	[0.014]	[0.043]	[0.050]	[0.029]	[0.018]	[0.058]
BOTH	0.006	0.039	-0.04	0.025	0	-0.009
	[0.013]	[0.047]	[0.045]	[0.031]	[0.017]	[0.059]
Age	0.001**	0.001**	0.001	0.001	0	0.001
	[0.000]	[0.001]	[0.001]	[0.000]	[0.000]	[0.001]
Primary educ 1-3	-0.01	0.01	-0.005	0.006	-0.003	0.001
	[0.008]	[0.019]	[0.022]	[0.014]	[0.013]	[0.027]
Primary educ 4-6	-0.007	-0.005	-0.019	-0.003	-0.028**	-0.035
	[0.008]	[0.018]	[0.020]	[0.014]	[0.011]	[0.023]
Secondary educ or more	-0.020*	-0.015	-0.053**	-0.011	-0.032**	-0.074**
	[0.012]	[0.032]	[0.022]	[0.019]	[0.015]	[0.035]
Observations	2,709	2,722	2,711	2,719	2,707	2,726

Clustered standard errors in brackets.
*** p<0.01, ** p<0.05, * p<0.1

Table 13. Effect of the interventions in child's anthropometrics (measured in standard deviations)

VARIABLES	[1] Height-for-age, 0-24 mths	[2] Height-for-age, 24-48 mths	[3] Weight-for-age, 0-24 mths	[4] Weight for age, 24-48 mths	[5] Weight-for-height, 0-24 mths	[6] Weight-for-height, 24-48 mths
IFC	0.304**	0.123	-0.0501	0.0246	-0.376**	-0.0882
	[0.137]	[0.120]	[0.0953]	[0.126]	[0.149]	[0.117]
WG	0.0727	0.0819	-0.0808	0.0433	-0.263**	-0.0706
	[0.174]	[0.121]	[0.107]	[0.101]	[0.121]	[0.110]
BOTH	0.298**	0.234*	-0.0096	0.0894	-0.295*	-0.105
	[0.136]	[0.118]	[0.0973]	[0.107]	[0.149]	[0.0995]
Primary educ 1-3	-0.037	-0.245**	0.0257	-0.107	0.0444	-0.0243
	[0.119]	[0.118]	[0.0874]	[0.0816]	[0.0948]	[0.0747]
Primary educ 4-6	-0.123	-0.0104	0.12	0.0581	0.179**	0.07
	[0.105]	[0.111]	[0.0876]	[0.0894]	[0.0807]	[0.0625]
Secondary educ or more	0.0281	0.349**	0.372**	0.338***	0.396**	0.14
	[0.141]	[0.141]	[0.166]	[0.107]	[0.153]	[0.105]
Observations	2,431	2,440	2,538	2,491	2,476	2,447

Clustered standard errors in brackets.

*** p<0.01, ** p<0.05, * p<0.1

Table 14. Consumption Smoothing, by intervention.
Households without children younger than 24 months

VARIABLES	[1] Δtot_cons	[2] Δtot_cons	[3] Δtot_cons	[4] Δltot_cons	[5] Δltot_cons	[6] Δltot_cons
Δcrop	-2,039**			-0.147**		
	[911.8]			[0.0604]		
Δcrop*WG	2,311			0.248*		
	[1,841]			[0.138]		
Δcrop*IFC	3,612**			0.208**		
	[1,420]			[0.0925]		
Δcrop*BOTH	4,265***			0.247**		
	[1,481]			[0.0950]		
Δinc_crop		-63.09*			-0.00573***	
		[37.49]			[0.00209]	
Δinc_crop*WG		114.2			0.00897**	
		[69.84]			[0.00432]	
Δinc_crop*IFC		144.0**			0.0105***	
		[60.01]			[0.00346]	
Δinc_crop*BOTH		26.17			0.00511**	
		[50.69]			[0.00252]	
Δshare			-708,154*			-64.26**
			[354,340]			[27.90]
Δshare*WG			1,532,000***			109.7**
			[559,703]			[41.93]
Δshare*IFC			1,849,000***			128.6***
			[620,882]			[41.75]
Δshare* BOTH			181,435			56.4
			[617,023]			[35.10]
Constant	1,546**	1,560**	1,705**	0.126*	0.136**	0.141**
	[753.0]	[715.8]	[707.7]	[0.0649]	[0.0638]	[0.0639]
Observations	1,089	1,052	1,050	1,089	1,052	1,050
R-squared	0.483	0.483	0.486	0.549	0.549	0.55

Robust standard errors in brackets.

*** p<0.01, ** p<0.05, *<0.1

Table 15. Consumption Smoothing (Food), by intervention.
Households *without* children younger than 24 months

	[1]	[2]	[3]	[4]	[5]	[6]
VARIABLES	**Δtot_cons**	**Δtot_cons**	**Δtot_cons**	**Δltot_cons**	**Δltot_cons**	**Δltot_cons**
Δcrop	-1,393*			-0.106*		
	[765.5]			[0.0616]		
Δcrop*WG	1,509			0.216		
	[1,600]			[0.147]		
Δcrop*IFC	2,767**			0.160*		
	[1,232]			[0.0950]		
Δcrop*BOTH	3,722**			0.239**		
	[1,470]			[0.0957]		
Δinc_crop		-25.48			-0.00249	
		[31.98]			[0.00289]	
Δinc_crop*WG		62.74			0.00629	
		[69.00]			[0.00601]	
Δinc_crop*IFC		81.99*			0.00623	
		[42.70]			[0.00397]	
Δinc_crop*BOTH		-19.02			0.0027	
		[45.86]			[0.00309]	
Δshare			-246,882			-27.23
			[353,309]			[38.90]
Δshare*WG			954,043			83.98
			[610,272]			[59.95]
Δshare*IFC			1.055e+06**			77.21
			[498,768]			[50.25]
Δshare* BOTH			-370,042			32.01
			[599,708]			[43.22]
Constant	1,904***	1,799***	1,950***	0.206***	0.215***	0.221***
	[597.6]	[544.2]	[530.9]	[0.0663]	[0.0663]	[0.0664]
Observations	1,089	1,052	1,050	1,088	1,051	1,049
R-squared	0.483	0.482	0.484	0.539	0.539	0.54

Robust standard errors in brackets.

*** p<0.01, ** p<0.05, * <0.1

6.3 Reduced prevalence and/or severity of adverse events

Another way in which the interventions could improve consumption smoothing is by reducing the incidence of crop losses in the first place. We test whether this is true empirically using the following specification:

$$crop_t = \alpha + \beta treat + \varepsilon_t \qquad (3)$$

where $crop_t$ represents, at time t, the incidence of the adverse event and its severity as measured by income loss and the other variables are as defined in section 3. If the reduced prevalence and/or severity story is the relevant one here, we would expect β to be negative and statistically significant from zero. We estimate specification (3) using ordinary least squares, clustering standard errors at the level of the zone. Table 16 displays the results for waves 1 and 2 separately.

Table 16: Incidence and Intensity of Crop Losses, Pooled

	Wave 1		Wave 2	
	[1]	[2]	[3]	[4]
VARIABLE	Crop loss	Crop loss size	Crop loss	Crop loss size
Treat	0.117	1.37	0.0591	0.627
	[0.091]	[1.68]	[0.059]	[0.84]
Constant	0.308***	5.124***	0.186***	2.008***
	[0.077]	[1.39]	[0.044]	[0.70]
Observations	2726	2664	2713	2686
R-squared	0.01	0	0	0

Notes to table: Clustered standard errors in brackets. *** p<0.01, ** p<0.05, *p<0.1

From the Table, we see that all of the coefficients are greater than zero and are statistically insignificant from zero, suggesting that reduced prevalence/severity is not driving the improvement in consumption smoothing.

Next, we check whether this conclusion holds when we allow for different effects for the different interventions. We estimate equation 4 below

$$crop_t = \alpha + \beta_1 IFC + \beta_2 WG + \beta_3 BOTH + \varepsilon_t \qquad (4)$$

where the variables are defined as before. Table 17 below displays the results for waves 1 and 2 separately. As above, none of the coefficients are negative and all but one is statistically significant from zero, confirming that reduced prevalence/severity of adverse events is not driving consumption smoothing.

Table 17: Incidence and Intensity of Crop Loss Shocks, by treatment

	Wave 1		Wave 2	
	[1]	[2]	[3]	[4]
VARIABLE	Crop loss	Crop loss size	Crop loss	Crop loss size
IFC	0.0793	1.743	0.0525	0.706
	[0.12]	[2.45]	[0.087]	[1.16]
WG	0.0746	0.645	0.0617	0.255
	[0.11]	[2.04]	[0.073]	[0.93]
BOTH	0.193*	1.711	0.0629	0.901
	[0.099]	[1.92]	[0.083]	[1.10]
Constant	0.308***	5.124***	0.186***	2.008***
	[0.078]	[1.39]	[0.044]	[0.70]
Observations	2726	2664	2713	2686
R-squared	0.02	0	0	0

Notes to table: Clustered standard errors in brackets. *** p<0.01, ** p<0.05, *p<0.1

7. Policy Implications

In this section, we summarise the most salient policy implications of our findings. The first implication is that community-based interventions aimed at improving health can in fact also aid households in smoothing consumption. This appears to be due to the increased social interactions fostered by such interventions, particularly among communities exposed to a participatory intervention. In particular, the participatory groups seem to provide an important source of information on obtaining credit for households hit by a crop loss.

A note of caution is in order though. The effects estimated in this paper may not generalise to all community-based interventions. The design of the intervention and the coverage of beneficiaries matters. For instance, there is evidence that external aid can leave community groups vulnerable to elite capture problems, where the elite are arguably among those who are already well able to smooth their consumption (Gugerty and Kremer, 2008). Other potential factors to consider are whether the groups are pre-existing or newly-formed, the duration of the intervention, how participatory it is, as well as the benefits of participating in the intervention.

8. Conclusion

Using a two wave panel collected in rural Malawi within a cluster randomised trial of two community interventions, we find, first of all, that households are not fully insured against crop losses. More interestingly, we find evidence that community interventions greatly

improve households' consumption smoothing possibilities. Indeed, the evidence is strong, with potential losses to consumption due to crop losses being completely offset in intervention areas.

We investigate three channels through which community interventions may have improved consumption smoothing. We can rule out that the interventions improved general adult health in a significant way, as well as that crop losses are simply less severe in intervention areas. Whilst we cannot rule out that the improvement in consumption smoothing could be due, at least partially, to improvements in child's health in IFC areas, this channel does not seem to have been important in WG areas. Of the channels that we investigate, increases in social interactions seem to play an important role in explaining consumption smoothing.

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APPENDIX 1: LITERATURE REVIEW

1.1 What is consumption smoothing?

Consumption smoothing refers to the process of protecting living standards (as measured by consumption) from fluctuations in income. In rural areas of developing countries, where risk is very prevalent and shocks can have disastrous consequences, consumption smoothing is particularly important. Not only does failing to smooth consumption has direct negative consequences on welfare but it also affects productivity because forward-looking households who are unable to effectively smooth consumption will choose production methods, activities, and investments (including human capital investments) that are less risky even if they yield lower returns (Morduch, 1995).

Important workhorse models in economics (permanent income hypothesis (Friedman (1957), the life cycle model of Modigliani and Brumberg (1954)) all predict that individuals and households prefer to smooth their consumption across time and states of the world. In particular, the permanent income hypothesis predicts that individuals and households will save transitory shocks to their incomes and only spend permanent shocks to their incomes. Similarly, the life cycle hypothesis model derives the prediction that economic agents with a utility function that is concave in consumption will want a smooth consumption stream across time and across states of the world (by states of the world we mean for instance "good" times and "bad" times).

An implicit assumption in the derivation of these predictions relates to the available markets. In the presence of complete markets (in which agents can trade claims for any possible state of the world), agents will be able to smooth consumption across states (as well as time) and thus perfectly insure consumption (Diamond (1967)). In other words, in the presence of complete markets, agents can use instruments such as savings, credit and insurance to protect their consumption against shocks. However, if markets are not complete, consumption may not be fully insured.

1.2 How is consumption smoothing achieved in developing countries: What is informal risk sharing?

As mentioned above, under the assumption of complete markets, economic agents have available effective instruments such as savings, credit and insurance instruments to fully smooth their consumption. However, in rural areas of developing countries, fully functioning credit and insurance markets are generally unavailable. Furthermore, government institutions are usually weak, making it virtually impossible to write contracts that would be enforceable

in a court of law to deal with risk. In such environments, households turn to numerous informal institutions and instruments to cope with the consequences of risk[21].

It is important to differentiate between measures taken to reduce the amount of risk faced, and measures employed to cope with the consequences of risk. The former include strategies such as diversification of income streams, choosing technologies yielding a safe return and adoption of preventive health behaviours, among others. These reduce the probability of occurrence of adverse events, but at the expense of lower future returns on investments (Morduch, 1995). The latter – informal instruments and institutions used to cope with the consequences of risk - are referred to as informal risk sharing. Besley (1995a) provides a comprehensive review of the different types of commonly used informal institutions and tools. These include informal credit and insurance arrangements, rotating savings and credit associations, informal transfers and gifts in networks of friends and family, credit co-operatives, inter-linked transactions, and saving amongst others.

While households can save, the available savings instruments are highly imperfect: Financial instruments such as bank accounts are rarely available, and if available, may be too expensive to maintain; excess grain that is stored may rot or be destroyed by pests while money stored under the mattress is vulnerable to theft and inflation. Assets including livestock could be considered to be a store of value and can be liquidated in case of adverse shocks, including aggregate shocks, as shown by Rosenzweig & Wolpin (1993) and Czukas, Fafchamps and Udry (1998).

A vital consideration though is that the instruments used for informal risk sharing are more effective in protecting consumption against idiosyncratic shocks, rather than aggregate shocks. For instance, livestock may be worthless in the case of aggregate shocks due to general equilibrium effects: If all households in a community choose to sell their livestock to cope with an adverse aggregate shock, in the absence of sufficient buyers, the price of livestock will fall and so this form of saving will be ineffective. This has been documented in the case of Burkina Faso by Kazianga and Udry (2006). Other instruments may also become ineffective in the face of an aggregate shock: Households cannot rely of informal gifts, loans or transfers from friends and neighbours, since they are also in need of help!

1.3 How efficient is informal risk sharing in smoothing consumption?

We now turn to assessing the effectiveness of these institutions and tools in smoothing household consumption. The literature focuses primarily on assessing the efficiency of

[21] When considering the risk faced by economic agents in such environments, it is crucial to distinguish between idiosyncratic and aggregate risk. Idiosyncratic risk refers to risk experienced by random members of a community. Aggregate risk, however, affects all members of a community. Note that aggregate risk could interact with idiosyncratic risk in determining the wellbeing of the agent. For example, death of a household member affects one household only within a community (idiosyncratic shock), but a drought would affect all households in the community (aggregate shock), but could have more drastic consequences for the household that experienced the death.

informal risk sharing strategies in smoothing consumption. The main approach taken in the literature is a competitive equilibrium approach, in that testable implications are derived from models where the budget constraint of the economy is taken into consideration. Moreover, the testable implications are agnostic to the particular methods used to share risk and instead test the effectiveness of all employed methods without knowledge about the individual methods (Cochrane (1991), Mace (1991) and Townsend (1994)). The following subsection explores in detail the construction of the main tests and summarises the results in the literature.

1.3.1 How tests are constructed in the literature, Evidence and Further Refinements

Cochrane (1991), Mace (1991) and Townsend (1994) developed similar tests, which we outline below. The derivation here closely follows that by Townsend (1994) who obtains testable implications from the first order conditions of a dynamic programming problem in which a hypothetical social planner maximises the weighted sum of agents[22] expected utilities subject to village resource constraints. Townsend assumes a Constant Absolute Risk Aversion (CARA) form for the utility function representing individual preferences, while Mace also derives testable implications with a Constant Relative Risk Aversion (CRRA) utility function. The consumption process implied by full risk sharing with CARA preferences is as follows:

$$c_{ivt}^{j} = \alpha^{j} + \beta^{j} C_{vt} + \delta^{j} A_{ivt}^{j} + \gamma^{j} X_{ivt}^{j} + u_{ivt}^{j} \qquad (1)$$

where c_{ivt}^{j} is the consumption of household j in village v at time t, $\mathbf{C_{vt}}$ is average consumption in the community at time t, A_{ivt}^{j} are demographic variables for household j, X_{ivt}^{j} are other time varying household variables and u_{ivt}^{j} is a disturbance term. The household specific fixed term, α^{j}, is not observed and can be eliminated by differencing equation (1) over time, which yields the following equation:

$$\Delta c_{ivt}^{j} = \beta \Delta C_{vt} + \delta \Delta A_{ivt}^{j} + \gamma \Delta X_{ivt}^{j} + \Delta u_{ivt}^{j} \qquad (2)$$

In essence, under full risk sharing the consumption process is such that any changes in household consumption can be explained by changes (or shocks) to aggregate consumption and changes in household demographic variables. Therefore, one test for perfect risk sharing is to include in equation (2) a variable indicating a preference shock or an income shock (that we denote by Δy^{j}_{t}). The specification for this test is as below:

$$\Delta c_{ivt}^{j} = \beta \Delta C_{vt} + \vartheta \Delta y_{ivt}^{j} + \delta \Delta A_{ivt}^{j} + \gamma \Delta X_{ivt}^{j} + \Delta u_{ivt}^{j} \qquad (3)$$

[22] Cochrane (1990) and Mace (1991) both take the household to be the economic agent, while Townsend (1994) considers individuals as the relevant economic agents. Townsend then aggregates individuals to the household level. For simplicity, we will assume that the agent here is the household.

If there is perfect risk sharing, the coefficient θ should equal 0. Moreover, as done in Townsend (1994) θ can be interpreted as a measure of the effectiveness of risk sharing arrangements, with a value close to 0 indicating that consumption is almost fully protected from idiosyncratic shocks. Cochrane (1991) and Mace (1991) apply this test on US data, while Townsend (1994) applies it to data from 4 Indian villages. He obtains a value of 0.14 for θ, which, though significantly different from zero, suggests that there is a substantial amount of risk sharing taking place among these households. A key feature of this test (and a possible drawback) is that it identifies the efficiency of risk sharing for idiosyncratic shocks only and not for aggregate shocks, so that even if households are insured substantially against idiosyncratic shocks, they may not be insured against aggregate shocks, which may hamper consumption smoothing.

Two criticisms have been levelled against the above test specification. First, as mentioned by Chauduri and Ravallion (1998), consumption and income are measured with error in most datasets. This measurement error is of the classical form, which will attenuate regression coefficients. Therefore, coefficient estimates for θ may be close to 0 as a result of errors in measurement rather than households being fairly well insured. This problem can be overcome by employing the instrumental variables approach, using an instrument for income. A second, more fundamental problem with specification (3) is also highlighted by the same authors: This specification does not allow for a complete separation in the aggregate and idiosyncratic components of income changes. Δy^j_t therefore is a noisy measure of idiosyncratic income shocks, which can thereby lead to attenuation bias in θ when θ>0. Chauduri and Ravallion (1998) therefore suggest implementing the following test implemented by Cochrane (1991), which modifies specification (3) by including village-time dummies in place of C_t. The modified specification is as follows:

$$\Delta c^j_{ut} = v_t + \theta \Delta y^j_{ut} + \delta \Delta A^j_{ut} + \gamma \Delta X^j_{ut} + \Delta u^j_{ut} \qquad (4)$$

Where v_t are village-time dummies and θ is interpreted as before. The main test of the theory in this specification is that θ should equal zero in the presence of perfect risk sharing. Chauduri and Ravallion (1998) estimate (4) using the same data as Townsend and employing instrumental variables to correct for the endogeneity introduced by measurement error in income. Making these adjustments yields a higher coefficient for θ than that obtained by Townsend. The conclusion is still the same: consumption is not fully insured.

If one assumes that consumption preferences are better described by a constant relative risk aversion (CRRA) utility function, the test derived is still very similar, with the following resulting specification is:

$$\Delta \ln c^j_t = \beta v_t + \theta \Delta \ln y^j_t + \delta \Delta A^j_t + \gamma \Delta X^j_t + \Delta u^j_t \qquad (5)$$

As before, if there was perfect consumption smoothing, then the coefficient on log income would be 0. Conducting this test in levels or logs can generate substantially different predictions as shown by Mace (1991). With CARA utility, the evidence obtained is consistent with the perfect insurance hypothesis. However, the converse is true when preferences are of

the CRRA form. CARA utility, however, has the unappealing feature that the amount invested in a risky asset is constant across wealth levels, which means that the wealthy invest a lower proportion of their portfolios in risky assets. Therefore, specification (5) is the more appealing form for the test.

Similar tests, applied across different contexts, confirm this result. Attanasio and Szekely (2004) test for perfect risk sharing in Mexico. They use average village agricultural wages as an instrument for household income (which is endogenous due to measurement error) and reject the hypothesis of perfect risk sharing. Townsend (1995) implements this test on data from Thailand and soundly rejects the hypothesis of perfect risk sharing. Fafchamps and Lund (2003), similarly, find that consumption is not fully shared in rural Phillipines.

An underlying assumption in the tests described above is that agents have identical risk preferences. However, this is likely to be untrue in most environments. Mazzocco and Saini (2009) argue and show that the imposition of this assumption may drive the rejection of the perfect risk sharing hypothesis by the conventional general equilibrium tests. This is because efficient risk sharing in the presence of idiosyncratic shocks and aggregate shocks calls for two things: pooling income to share idiosyncratic risk (called income pooling) and insuring aggregate shocks by pooling income and sharing it according to individual risk preferences (called mutual insurance). The standard test assumes that there is no mutual insurance, and therefore rejects efficient risk sharing, even in instances where risk is perfectly shared. They then derive a sequence of tests that relax this rather strong assumption and test the perfect risk sharing hypothesis under heterogeneity in preferences. The authors apply their tests to data from India and strongly reject the assumption of identical risk preferences. Once they allow for heterogeneous risk preferences, they reject the hypothesis of perfect risk sharing at the village level, but cannot reject it when the test is applied at the level of the caste[23].

A number of papers have also studied the implications of shocks other than income shocks on consumption smoothing. Gertler and Gruber (2002) test for the effectiveness of risk sharing instruments in smoothing consumption following an idiosyncratic health shock to the head of the household in Indonesia. The specification they use is similar to (4), with Δy_{vt} indicating changes in the health status of the household head. They find evidence that disability shocks are imperfectly insured.

Mohanan (2008) exploits a quasi-experiment to identify the effects of exogenous health shocks on household consumption in India. The exogenous shock considered is being injured in a bus accident. He constructs a comparison group based on matching on gender, age, location of residence and bus routes used. To identify the effect of the health shock on consumption, he regresses household consumption on the shock and a set of household specific characteristics. He finds that households adjust to the shock by reducing educational and festival expenses and taking on debt. Food consumption is not affected. A drawback of his study is that he has data from a single cross-section only and so is unable to account for

[23] This result is consistent with findings by Morduch (1991) and are explored in more detail in section 1.5.

any unobserved differences between the households affected by the shock and the comparison households, which could affect consumption.

Thus far, the literature summarised tests the perfect risk sharing hypothesis by considering consumption smoothing only. As mentioned in section 1.2, risk also has important consequences for investment decisions. A number of papers test for the implications of idiosyncratic shocks on household decisions related to investment in human capital and physical capital. We briefly summarise some recent results here. Jacoby and Skoufias (1997) study the effects of seasonal fluctuations on income on child school attendance among agrarian households in India and find evidence that households insure themselves against these fluctuations by taking children out of school, though this has little effect on long term human capital outcomes. Beegle et al (2006) find that child labour increases and school enrolment falls following an income shock among households in rural Tanzania. Duryea et al (2007) find that unemployment shocks increase the probability of children entering the labour force, of dropping out of school and also adversely affects the child's progression in school in Brazil.

1.3.2 Conclusions

One key conclusion emerges from this literature: Though households are able to smooth their consumption to a surprising extent when faced by idiosyncratic shocks, they do not achieve perfect smoothing. This result is supported by evidence from numerous settings across the world, suggesting that there exist barriers to perfect risk sharing. Numerous researchers have integrated some of these frictions into models of risk sharing and consumption smoothing (Kocherlakota (1996), Ligon, Thomas and Worrall (2002), Kinnan (2010)), which we discuss in more detail in the next sub-section.

1.4 Barriers to risk sharing

The literature has focused on 3 main frictions that limit the ability of households to share risk perfectly. These are:

1) Limited commitment
2) Hidden action
3) Hidden income

Limited commitment refers to the fact that in the absence of formal enforcement mechanisms (such as the courts of law), arrangements between households to share risk should be self-sustaining, that is, no household should want to walk away. To understand when this would happen, consider 2 households that have an informal arrangement to help each other. If one household receives a very high income and the other a low income, the household with high income would be tempted to keep this income and renege on informal arrangements with the other household. Therefore, not all risk sharing arrangements would be supported when there is limited commitment.

Coate and Ravallion (1993) show that limited commitment results in informal arrangements that are worse than the first-best outcome of perfect insurance. The intuition for this can be seen from the example above: since some risk sharing arrangements cannot be supported under limited commitment, there will be states of the world where households will have to bear some risk. Coate and Ravallion use results from the theory of repeated games to characterise constraints under which an informal arrangement between 2 households in this environment would be self-sustaining. The arrangement is sustained through the use of punishments: any household that deviates ends the informal arrangement between the households and there will be no trade between households in the future. The authors characterise the constraints under the assumption that consumption in any period depends on resources available in that period only. This assumption is rather restrictive as it rules out borrowing between the households. Numerous studies in developing countries show that informal borrowing is widely used to help smooth consumption (see for instance Udry (1994)).

Kocherlakota (1996) relaxes this assumption and characterises the properties of the optimal risk sharing contract under limited commitment. He shows that in the presence of limited commitment, the history of one's actions and shocks affects current consumption, and therefore, full risk sharing is not possible. The way in which the history of the interaction matters is as follows: if one household receives a high income in one period and the other household receives a low income, the high-income household may want to renege on the transfer he has to make to the low-income household under the informal arrangement they have. To prevent this from happening, the low-income household promises the high-income household higher transfers in the future, in exchange for help in this period. Therefore, future transfers will depend on the past and so perfect risk sharing may not be possible. A second feature of this contract is that of "amnesia": If a household is constrained by the lack of commitment in any period, then the future course of the contract depends only on that period and not on the history of the contract. That is, the contract "re-sets" once any agent becomes constrained. This property has also been called "forgiveness". While Kocherlakota (1996) characterises the properties of the optimal contract, he does not provide an explicit characterisation of the contract.

This is done by Ligon, Thomas and Worrall (2003) in an important paper in this now-extensive literature. They extend the work by Kocherlakota (1996) and show that the constrained efficient contract can be characterised by the ratio of marginal utilities of consumption of households. Under a first-best risk sharing contract, the ratio of marginal utilities of households should be constant across states and over time. Transfers between households are constructed to satisfy this condition. Under dynamic limited commitment, the constrained efficient contract follows the following rule: First, each state of nature is associated with an interval of ratios of marginal utilities. Current transfers can be computed from the observation that risk averse households will wish them to be such that the change in the ratio of the marginal utilities is minimised, given the current realised state and the ratio of marginal utilities from the previous period. That is, if the households are in a particular interval at the beginning of a period, then given the current realised state, transfers will be

constructed such that the ratio of marginal utilities remains in this same interval. However, the transfers required to do this could be such that one household becomes constrained (for instance, it could be asked to make a very large transfer, which it may not be able to). In this case, the ratio of marginal utilities would be at the boundary of any interval, and thus the ratio of marginal utilities would have to change, meaning that perfect risk sharing is not achieved. Ligon, Thomas and Worrall (2003) also find that the amnesia property derived by Kocherlakota (1996) holds, though they call it "forgiveness". They then structurally estimate this model and compare the performance of the dynamic limited commitment model with the perfect risk sharing model and the "static" limited commitment model of Coate and Ravallion (1993). The authors find that the model does better in predicting the average response of household consumption to idiosyncratic income shocks than either of the alternative models considered. In particular, this response is in line with that observed in the data. However, they are unable to explain the distribution of consumption observed in the data: they predict more consumption inequality than is actually observed.

The second barrier considered in this literature is that of hidden action, which is one important type of asymmetric information. Hidden action limits the amount of risk that is shared when an agent's actions influence the realisation of the state of the world. The intuition for this is as follows: if households know that others will fully insure them in case of an adverse shock, and actions that reduce the probability of an adverse shock occurring, households will shirk. To incentivise the household to apply high enough efforts, the other households will limit the amount of risk they absorb, which means that households will face some risk. Ligon (1998) models this formally by allowing a household's own actions to affect the distribution of states of the world (and hence output). He shows that in the presence of hidden information, agents' inter-temporal marginal rates of substitution vary, whereas this parameter would be constant across agents in the perfect risk sharing model. He uses this observation to construct a test which compares the model with private information with the permanent income hypothesis (where only the credit and savings markets are available), and finds that in the 3 Indian villages he studies, the private information model performs much better than the permanent income hypothesis. One criticism of his test is that he is unable to distinguish between the hidden information model and the perfect risk sharing model. This particular barrier has not been studied much in this literature, partly because it is widely believed that since everyone knows each other and information is widely shared in villages, asymmetric information is not a very problematic barrier in rural contexts. This belief was strengthened by evidence from Udry (1994) which suggests that hidden information is not much of a problem in rural Nigeria. The results from Ligon (1998), however, suggest that this may not be the case in rural areas everywhere. This barrier certainly needs to be further explored in future work.

The third barrier to attain full risk sharing is hidden income. Hidden income arises when income is observed imperfectly or even when income cannot be perfectly verified by a third party, and hence economic agents cannot write contracts contingents on income. Consequently, only low transfers will be made to agents claiming to have low income due to a shock, because if the transfers were large everyone would have an incentive to lie about

their income levels. This barrier has not been studied much in the literature. Kinnan (2010) models this barrier, along with the other two barriers considered here – hidden action and limited commitment- and sets out to derive a test that can distinguish between these 3 barriers to risk sharing. To this end, she shows that a household's lagged inverse marginal utility is a sufficient statistic for lagged current marginal utility when limited commitment and hidden action are the barriers constraining perfect risk sharing, but is not a sufficient statistic when the relevant barrier is hidden income. Therefore, if one regresses a household's current inverse marginal utility (which can be replaced by log consumption when utility is of CRRA form) on the lagged inverse marginal utility and lagged income, we would expect lagged income to have a coefficient of 0 if the relevant barrier preventing full risk sharing is either limited commitment or hidden action. A non-zero coefficient implies that hidden income is the relevant barrier. Kinnan implements this test on 7 years of monthly data from Thailand and finds that lagged income has predictive power in forecasting a household's current inverse marginal utility. An advantage of this test is there is no need for structural estimation, which is often required to solve dynamic contracts. More work needs to be done to see if this result generalises to other settings, though one drawback in applying this same test is the need for a long time series of data, which is rarely available for village economies in developing countries.

The presence of these barriers and frictions suggests that interventions from outside parties could be welfare-enhancing. Moreover, the evidence from the literature gives suggestions on the form of interventions and policies that would be most effective in improving consumption smoothing and hence welfare.

1.5 Risk is shared in Networks

A reason for the rejection of the perfect risk sharing test outlined in section 1.2 is that the community or village is not the relevant institution in which households share risk. Indeed, a number of papers in the literature have found that in rural communities, risk is not shared at the level of the community, but rather, within social networks.

In an early paper in this literature, Morduch (1991) applied a test similar to (5) to a measure of a social network in rural Indian villages: the caste. He fails to reject the hypothesis of perfect risk sharing of food consumption within the caste network. In further work, though, Morduch (2004) finds that there is substantial variation across castes in the degree of risk shared, with some castes being relatively better insured than others. All the same, the former conclusion is supported by work by Munshi and Rosenzweig (2009) who document that caste networks are an important source of mutual insurance in rural India.

An important paper in this literature uses data that was specifically collected to study how consumption is smoothed in rice-farming villages in rural Phillipines. Fafchamps and Lund (2003) use a unique dataset on rural Filipino households, and find that households receive help following an adverse shock in the form of gifts and informal loans primarily from

networks of friends and relatives rather than from the community at wide. Moreover, these networks are not limited to a village, but are across villages. This evidence has led to a growing theoretical literature (which is summarised below) that develops models of risk sharing and insurance, based on bilateral arrangements between households embedded in a social network.

Another institution that has been found to be important for risk sharing is the extended family and kinship network. Angelucci et al (2010) identify extended family networks in rural Mexican villages from the naming convention in use in Mexico, which includes the surname of one's father and mother in one's own surname. Using this data, they document that following a positive exogenous shock from the introduction of a Conditional Cash Transfer programme (CCT) programme, there is better risk sharing among households with relatives in the village compared to those without relatives. They also find that connected households are less likely to withdraw children from school or send them to work in the case of a health shock in the household. Kinnan and Townsend (2010) study how kinship networks and connections to financial institutions aid households in smoothing consumption and investment in villages in Thailand. They find that households that are connected directly or indirectly (via people they transact with, who may or may not be kin) to financial institutions are able to smooth their consumption better, while those with more kin are able to smooth investment better.

Bloch et al (2007) develop a model of risk sharing between households in a social network, where risk is shared via bilateral transfers. They show that a self-sustaining risk sharing arrangement in a network setting can only be sustained in low or high density networks, where density is defined to be the proportion of possible network connections that exist. This result is intuitive: in sparsely connected networks, where almost no one shares risk with one another, a person who deviates from the insurance arrangement would not be an important source of insurance anyways. Conversely, networks that are densely connected are better able to punish deviators (a deviator is excluded from the network completely and so deviation is very costly when the network is very dense), and hence are stable.

Ambrus et al (2010) study the efficiency of risk sharing in networks of different structures. They show that the amount of risk shared within a network depends on the structure of the network, particularly, to a feature of the network called the expansiveness. Expansiveness is defined to be the ratio of the perimeter of the network to the area of the network, that is, the number of links that agents on the edges of the network have going out of the network relative to the number of agents in the network. Networks that are highly expansive allow for more risk sharing by allowing for more channels through which shocks can be propagated in a network.

This strand of the literature is currently very active, with lots of on-going work.

1.6 Policy Interventions and Consumption Smoothing

The presence of barriers to risk sharing suggests a role for intervention from outside parties. A growing literature has considered the effects of policy interventions on households' ability to smooth consumption. This sub-section examines some of these studies:

1.6.1 Conditional Cash Transfer Programmes

Conditional Cash Transfer (CCT) programmes have become immensely popular over the past decade as a tool for improving investments in human capital in poor communities of many developing countries and now even some developed countries. Interventions of this kind generally provide a cash transfer to mothers on the fulfilment of certain conditions such as taking children under 5 for regular vaccination and health checks and sending children to school. The cash transfer can aid households in better smoothing their consumption by providing relatively stable source of income to households.

However, as Albarran and Attanasio (2003) point out, there could be no increase in household welfare or households could even be left worse off if the public cash transfer displaces informal transfers the household would have otherwise received. They test this crowding our hypothesis in a model with limited commitment, using data from a randomised evaluation of a CCT programme in Mexico, called Progresa (now *Oportunidades*) and find that CCTs are limited in improving consumption smoothing as they crowd out private transfers.

CCT programmes can improve outcomes including consumption for households other than direct beneficiaries of the programme as documented by Angelucci & De Giorgi (2009). In further work, Angelucci et al (2010) show that the positive income shock brought by the CCT transfer is shared within the extended family network of the beneficiary households. This network is also the relevant institution via which risk is shared: Consumption of relatives of households who are eligible for the cash transfer increases once the transfer is implemented, but that for households that are not related to eligible households does not. Further, households embedded in an extended family network are less likely to withdraw children from school or send them to work following a health shock within the household.

1.6.2 Banking and financial markets

Another policy that can expand risk sharing opportunities for households in this context is the expansion of banking and financial markets. In particular, the introduction of a bank or microfinance institution can introduce more efficient savings instruments and expand credit provision, and hence provide households with more effective methods of smoothing their consumption.

A handful of studies have investigated the effects of microcredit, which provides credit often without collateral[24], on risk sharing. Morduch (1998) finds evidence, using a quasi-experimental design using data from Bangladesh, that access to microfinance reduces

[24] Microcredit was initially provided to groups of individuals under joint liability arrangements, that is, the group would be responsible for repayment of the loan on any group member that defaults. Recently, however, microcredit providers have provided small loans based on individual liability

variability of household consumption across seasons. Kaboski and Townsend (2006) find, using quasi-experimental variation, that households in villages with well-run village-level microfinance institutions achieved improved consumption smoothing.

1.6.3 Community Based Interventions

Community-based interventions are interventions that involve the local community (most usually, a village) at some step of the intervention, be it in targeting, volunteering, or more extensive participation at every step of the way. Participatory community interventions are a subset of community based interventions which involve beneficiaries at numerous points of the intervention, from the design and management or the intervention to group meetings to choosing local public goods and implementing the chosen goods. In some cases, communities even have direct control of project resources. Such interventions have become immensely popular, with funding by the World Bank for such projects standing at $7 billion in 2006. Section 2 of this literature review summarises some of the more recent work on this subject. In this sub-section, we focus on the work on community based interventions and risk sharing.

Community based interventions and groups offer two possible channels through which they may improve consumption smoothing. First, these groups allow for the pooling of income risk, and hence for group-based risk sharing schemes. Fafchamps and La Ferrara (forthcoming) study income pooling within self help groups, a type of community based intervention in which individuals pool capital to form a group that functions much like a production co-operative. They find that such incomes are highly correlated among group members, but that this correlation does not arise from the self-selection of similar individuals into a group. The authors interpret this as evidence that these self help groups serve a mutual assistance role.

Second, they can help reduce barriers to risk sharing: for instance, community based interventions may increase social interactions and thereby enable improved enforcement of informal arrangements and improved information transmission within a community, hence easing barriers to risk sharing.

The intuition for how increased information can improve enforcement of is as follows: Agents who interact once only will choose the action that benefits them the most, which may not be one that maximises social welfare. If, however, they were to interact more than once, they could choose actions that deliver outcomes that are pareto optimal, because with many interactions agents have opportunities to punish those that deviate from an agreed action. That is, more frequent interaction reduces the enforcement constraint to informal risk sharing arrangements. This is an important result from the theory of repeated games which shows that societies can sustain actions that cannot be sustained in a one-shot interaction if the interaction is repeated infinitely often.

Moreover, when information is not public, increased interactions provide individuals with more opportunities to learn about other members of the community and hence reduce

asymmetric information, which has been shown to be an important barrier to informal insurance arrangements (Kinnan (2010)).

A number of policy interventions call for social interactions between community members. For instance, CCT programmes usually have regular meetings for mothers where they work on social issues, microfinance providers give loans to groups of women who meet regularly to re-pay loans, community driven development calls for community groups to manage resources and so on. However, very little work has studied the effects of such interaction on other economic outcomes.

To our knowledge, Feigenberg et al (2010) is the only paper that considers the effects of exogenous increases in social interactions on risk sharing. The authors vary exogenously the social distance between clients of a microfinance institution in India by randomly choosing clients in certain communities to meet either once a week or once a month to make repayments on the microloans borrowed[25]. The authors find that clients in groups mandated to meet more frequently increased their social contact outside the microfinance group, with substantially increasing the probability of them visiting each others' homes, and attend social events together. They further find that clients in groups meeting weekly received higher transfers following a health shock, which is taken as evidence of improved risk sharing. One major drawback of their study is that they do not have the data to directly test for improvements in risk sharing.

To strengthen the evidence for improved risk sharing, the authors implemented a laboratory experiment in the field, whereby clients were each entered in a separate lottery in which the client had a 1/11 chance of winning a Rs. 200 ($5) promotional coupon. The client also had the opportunity to enter other group members in the lottery, which would reduce her direct probability of winning the coupon, but would increase the probability that someone in the group won. This part of the lottery experiment was designed to measure changes in cooperation due to increased interactions. To measure the effects of the increased social interactions on risk sharing, a subset of clients played a variant of the lottery experiment. In this variant, the client was given his winnings as 4 Rs.50 coupons rather than a single Rs. 200 coupon. To interpret the results of this latter lottery experiment as a change in risk sharing, one needs to assume that a more divisible prize eases risk sharing. While their results from this experiment support their hypotheses that increased social interactions improved cooperation and resource sharing, it is not clear whether actual risk sharing changed. The lottery was a modest positive shock to the participants in the experiment, and social norms for sharing a positive shock may be very different from informal arrangements and norms for the sharing of adverse shocks or for shocks of larger magnitudes. Second, this paper is unable to say anything about the magnitude of any effect of increased social interactions on consumption smoothing.

Further research is needed to investigate whether policy interventions that reduce barriers to risk sharing do result in improved risk sharing.

[25] The clients in this microfinance group all had individual liability loans, but met regularly to make repayments to the staff from the microfinance institution.

2 Community Based Interventions and Other Economic Outcomes

Our work also contributes to another strand of literature, which considers the effects of community based interventions, including participatory interventions. As mentioned before, such interventions have been increasing in popularity, and have been employed in a number of contexts. A growing literature has considered the usefulness of such interventions on monitoring of public services, provision of local public goods, in post-conflict settings, in building social capital and in its vulnerability to elite capture. Here, we provide a brief summary of this literature.

Mansuri and Rao (2004) provide an excellent critical review of the potential benefits and drawbacks of community based interventions and summarises some early studies in this area. Their review also highlights the wide range of projects that fall under the umbrella of community based interventions and community driven development and also the dearth of well-designed impact evaluations investigating the effects of such interventions on socio-economic outcomes. In this review, we focus on results from some recent studies. Note though that this is not a comprehensive review of this literature.

a. Community Based Interventions and Monitoring of Public Services

Olken (2007) tested the effectiveness of community participation in reducing corruption related to building roads in Indonesia. He contrasts the effectiveness of grass roots participation through community meetings with project staff with top-down government audits in reducing corruption, through a randomised trial. He finds that community monitoring fails to reduce corruption on average, even though actual community participation in the meetings increased. Though there was no reduction in average total missing expenditures (his measure of corruption), he finds a significant reduction in corruption on a measure that could be easily monitored by community members – missing labour expenditures, but not on missing materials expenditures which accounted for a large proportion of the corruption.

Bjorkman and Svensson (2009) investigate the effects of a participatory, community based monitoring intervention in Uganda. The intervention was randomly allocated and focused on public primary health care providers. Community members in randomly selected communities were invited to two meetings where staff from local community based organisations provided them with information on the state of their local public health care provider and encouraged them to hold the provider to account for their performance. This intervention generated large increases in the usage of health care services. Further, the authors also find large improvements in health, particularly child health as measured by the under-5 mortality rate and the weight of infants and young children.

Banerjee et al (2010) conducted a randomised experiment to assess the effectiveness of three ways of increasing community participation – providing information on the role and structure

of village education committees, providing this information along with tools to gather information on local educational performance, and proving the information and tools and training local volunteers on a pedagogical technique for reading, on improving education outcomes in poor, rural villages in India. They find that none of the interventions improved community participation in schools or child performance in school, even though participation in meetings organised by the implementing NGO was high. The third intervention, though, generated significant improvements in reading skills among children who attended reading camps organised by the trained volunteers; that is, outcomes improved for learning *outside* schools. These results suggest that in some contexts, increasing community participation alone is not sufficient to improve outcomes.

2.2 *Community Based Interventions in Post-Conflict Settings*

Community driven development (CDD) projects have been widely used in post-conflict settings, and are seen as a way of re-building institutions while providing communities with public goods. Experimental studies of these interventions have investigated impacts of the increased social interaction and participation on social cohesion. Fearon et al (2009) report the results of a randomised field experiment evaluating a community driven reconstruction intervention implemented in post-conflict Liberia. The intervention implementer oversaw the formation of community development communities (CDC) which were tasked with managing a community-wide process to select and implement 2 public goods projects, which were to be implemented sequentially, with a small project implemented initially followed by a larger project. The authors first investigate the impact of this intervention on social cohesion, which is measured by a community-wide public goods game. They find that the intervention improved cohesion and co-operation by this measure.

Another study by Casey et al (2010) in post-conflict Sierra Leone studies the impacts of a CDD programme that provided rural villages with funds for local public goods, skills training along with assistance establishing village management communities and encouraging participation of socially disadvantaged groups such as women. They report the results of a randomised evaluation of this intervention. They find that the intervention improved local public good provision, more equal public good access and increased household assets and market activity within communities that received the intervention, but find no evidence of spill-over effects to wider social norms related to collective action. These interventions have some features that are similar to the intervention we are evaluating: they encourage community participation in improving community outcomes, they provide training and guidance on leadership and organisational structures. However, two dimensions on which the intervention we evaluate varies from these ones are:

1) Women are at the core of the intervention: the intervention relates to reproductive health outcomes and involved men were not involved until a much more advanced stage of the intervention
2) No funds were disbursed by the implementing organisation to the communities (though about 4 years after the start of the intervention, the NGO provided some modest funds ($5,000 across over 500 community groups) to be disbursed as micro-

credit loans). The community groups started by this intervention identified and implemented resource mobilisation strategies.

2.3 Social Capital

Another outcome considered in the literature, though not very widely, is social capital.

Labonne and Chase (2011) investigate the effects of a large CDD programme in rural Phillipines. The programme encouraged village members to participate and put together proposals for small scale infrastructure investments, which are subsequently submitted to municipalities and of which a subsample are funded. The programme involved villager participation at specific points and could have potentially improved social capital. The authors test whether this is the case using propensity score matching techniques. They find evidence of increased villager participation in village meetings and some limited evidence of improvements in generalised trust. However, villager participation in groups fell in communities that received the CDD intervention.

2.4 Elite Capture

A growing literature has also investigated concerns of elite capture, which are considered to be particularly likely in participatory community interventions. Elite capture refers to the fact that wealthy and well connected community members – the "elite" - are able to appropriate resources and benefits from the intervention for themselves, at the expense of more disadvantaged and marginalised community members (see Platteau and Gaspart (2003)).

Gugerty and Kremer (2008) study the effects of a randomly allocated intervention that provided outside funds and support to existing women's groups in rural Kenya. The funds and support intended to expand organisational strength. However, they found no improvements in organisational strength. Rather, group participation changed substantially, with local elites joining the groups and taking leadership positions, while marginalised groups within the community were pushed out of the group.

Labonne and Chase (2009) study a large community driven development (CDD) project in the Phillipines. Using data on successful and unsuccessful funding proposals put forward by villages, along with detailed household data covering over 1000 villages, they find little evidence of elite capture: both the community and elected leader's opinions are equally reflected in the community proposal. Further, poor and politically active communities were more likely to receive funds. More unequal villages were more likely to receive funds (for any given level of poverty), though in these communities, the village leaders were more able to override community members' wishes when selecting the proposal to put forward.

2.5 Self Help Groups and Economic Outcomes

Deininger and Lu (2010) study the impacts of a community based organisation - self-help groups - in India. In this setting, self-help groups (SHGs) consist primarily of women who come together to mobilize savings and obtain credit (for which they are eligible once a certain amount of savings have been gathered). The authors use a propensity score matching technique, and exploit the staggered introduction of an intervention encouraging the formation of self help groups in one state of India to identify its impacts on female empowerment, nutrition and other household socio-economic outcomes. They find that SHGs improve female empowerment (even for women who didn't attend the SHGs), nutritional status and consumption.

In this literature review, we summarise a few recent papers investigating the socio-economic impacts of CDDs. However, our investigation of the literature revealed a lack of rigorous well-defined evaluations of such interventions, particularly studies investigating impacts on socio-economic outcomes.

3 Conclusions

This literature review has summarized the methodology used to assess how well households smooth their consumption in developing countries. Though households are not able to smooth their consumption fully, they manage to attain a substantial amount of smoothness in their consumption. Limited commitment, hidden action and hidden income are the main hypothesis that explain why consumption is not fully insured. Depending on the particular setting, individuals might share consumption risk among others in the village or mostly with individuals belonging to their same group (kinship, caste, religious group, family, etc). We have also analyzed the effect of different interventions that might help households to smooth their consumption. We have paid particular attention to participatory community interventions because they share some features with the Women Group intervention that will be the object of our research.