FINANCIAL SERVICES ASSESSMENT

Impact of Micro-Savings on Shock Coping Strategies in Rural Malawi

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Financial Services Assessment project can be found on the web at http://www.fsassessment.umd.edu/

ABOUT THE PROJECT

The *Financial Services Assessment* project is designed to examine the impact of financial services on the lives of poor people across the developing world. This project is funded by the Bill & Melinda Gates Foundation, which is committed to building a deep base of knowledge in the microfinance field. The IRIS Center at the University of Maryland, College Park, together with its partner, Microfinance Opportunities, will assess a diverse range of innovations in financial services. The results of this project will shed light on the design and delivery of appropriate financial products and services for the poor and the potential to scale up successful innovations to reach larger numbers of low-income households.

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ABSTRACT

This study examines the impact of improving access to formal savings services on the ability of households to manage adverse economic shocks- which affect over 90% of the households in our sample. The study uses a Randomized Encouragement Trial (RET) design to gather panel data from 2,006 households in rural Malawi. The analysis focuses on improved access to formal savings services enabled by the introduction of mobile banking by the Opportunity International Bank of Malawi (OIBM) in the study area. Our results indicate no statistically significant impact of improved access to OIBM savings services on reduction in use of sub-optimal shock coping behaviors. But, differential levels of impacts were observed based on wealth levels and types of shocks that households experience. For households at the top of the wealth distribution, an increase in OIBM savings services was associated with less reliance on distressed asset depletion to cope with shocks. But, the effect was opposite for those at the bottom of the wealth distribution. Households above the median wealth level in areas with high uptake of OIBM services used less of distressed asset depletion to deal with two types of shocks that severely affected the majority of households in the area: increased input prices and crop diseases.

OTHER NOTES

The exchange rates used here were 140.6 Malawian Kwacha (MwK) = 1 US$ for 2008 and 148.9 Malawian Kwacha (MwK)= 1 US$ for 2010.

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ACRONYMS

BMGF   Bill & Melinda Gates Foundation

ITT   Intention to Treat

LATE   Local Average Treatment Effect

MFI   Microfinance Institution

OIBM   Opportunity International Bank of Malawi

RET   Randomized Encouragement Trial

STUDY DEFINITIONS

Cluster	A group of villages adjacent to each other that entails an enumeration area; smallest unit of aggregation by the national statistics office to conduct a census.
External Agent	A person or institution that does not reside in the household.
Shock	Uncommon and mostly unexpected adverse events that strike a household without much warning.
Income Reducing Shock	A shock reported to reduce the income expected to be received by the household.
Aggregate Shock	A shock affecting multiple households within a specific area.
Idiosyncratic Shock	A shock affecting some households and not others in a specific area.
Ex Ante Coping Mechanism	An action taken prior to experiencing a shock to be better able to cope with shocks when they occur.
Ex Post Coping Mechanism	A response taken after experiencing a shock to be better able to cope with shocks when they occur.
Externality/spillover effects	A positive or negative impact on a party not involved in a specified economic/social transaction or act; the effects that accrue to non-users of OIBM due to others' use of OIBM.

STUDY AREAS IN CENTRAL MALAWI

Road (marked in yellow) in rural central Malawi that OIBM mobile bank travels. Bank stops are denoted by stars.

EXECUTIVE SUMMARY

STUDY OBJECTIVE

The majority of rural Malawians depend on agriculture for their livelihoods and experience frequent droughts, floods, and other unexpected adverse events such as illness andprice fluctuations, referred to as shocks, that lead to income and asset loss. While there is an option of doing nothing in the wake of a shock, many also tend to use several coping strategies including informal insurance, savings, loans, receiving aid and remittances, reducing consumption, and liquidating assets to at least sustain their welfare levels prior to the shocks.

In this paper, we discuss the impact of improved access to micro-savings from formal financial institutions on the ability of rural households to manage shocks ex-post to their occurrence. We use a large panel data (interviewed in 2008 and again in 2010) gathered from 2,006 randomly selected households in Central Malawi on their use of financial services, shocks, and other household characteristics in an area that experienced the introduction of the Opportunity International Bank of Malawi (OIBM). OIBM is a savings- led bank that began its operation using a mobile bank – bank on wheels - in rural central Malawi in August of 2007 and in some respects tailored its savings products to households in rural areas.

We posit that improved access to formal savings services helps households cope with adverse shocks better, and by reducing their use of sub-optimal coping behaviors such as doing nothing, depleting productive assets, and reducing consumption levels. In other words, we expect that households with higher access to and use of formal micro-savings services would show higher ability to respond to adverse shocks, instead of doing nothing, and use better coping strategies than without it.

Specifically, we examine the following:

- Does improved access to and take- up of OIBM savings services help households reduce their use of sub-optimal coping behaviors?
- Do the impacts vary by the wealth status of the households and type of shocks experienced?

For this study, we define shocks as uncommon and mostly unexpected adverse events that strike a household without much warning. We consider common and fairly expected events such as births, weddings, school graduations, and events such as funerals, which are only unpredictable in terms of timing, to be life-cycle events and not shocks. Coping mechanisms are measures taken by households to help them restore their lives as best as possible to pre-shock welfare levels.

STUDY METHODOLOGY

The study was conducted between 2008 and 2010 in rural central Malawi, an area that experienced a considerable improvement in access to formal financial services and, more specifically, to deposit services. Data are gathered from 2,006 randomly selected households that were considered potential clients of formal financial service providers drawn from three districts in Central Malawi – Mchinji, Dedza and rural Lilongwe where the OIBM mobile

bank operates. The survey was conducted from January – April in both 2008 and 2010 to gather baseline and end line data, respectively.

In order to examine impacts of OIBM, the study applied Cluster based Pair Matched Randomized Encouragement Trial (RET) design to draw samples for the study. In our study, the RET design involved the use of intensive information campaigns as a means to encourage take- up of OIBM products. OIBM, in collaboration with the IRIS Center, offered encouragement that induces households in a randomly selected set of clusters and withheld it from a similar set of randomly selected clusters such that differences in outcomes could be attributed to the program. In this setting, difference in the level of encouragement defines a treatment and control group. The encouragement is expected to increase take- up and use of services resulting in impacts. With significantly higher uptake (and use of) financial services in encouraged areas compared to non-encouraged areas, any difference in impacts is attributable to services from the institution. Therefore, encouragement functions as an instrument to cause impacts.

In our study, encouragement was provided through intense information campaigns in 56 randomly selected clusters. The campaign was withheld in 56 similar sets of clusters to function as control areas. The information and non-information campaign clusters were matched by districts, population and distance from OIBM's service point. The information campaign lasted for 20 months (April 2008 to December 2009).

KEY FINDINGS

Adverse economic shocks are found to affect over 90% of the households in our large sample of 2,006 rural Malawian households. The most common adverse economic shocks were loss of livestock, increased food prices, falls in the sale prices of crops, and increased input prices. Before access to OIBM improved in the study area, nearly three fourths of households reported not responding to at least one adverse shock. When responding, three fourths of the households drew down on cash savings kept either at home or with an external agent. However, after the increase in access to OIBM savings services, a shift was noticed in the coping strategies used by households. Non- response to adverse shocks declined from 75% to 66%, use of cash savings declined from 74% to 50%. But, the use of coping mechanisms such as reduced consumption, and increased labor sales and distressed asset depletion increased.

A rigorous examination of panel data to address the questions below reveals the following:

Does improved access to and take- up of OIBM savings services help households reduce their use of sub-optimal coping behaviors?

Significantly more households in clusters with large number of OIBM savings accounts resort to no response and reduced consumption in the event of shocks relative to households in clusters with few OIBM accounts. The results indicate that improved access to and high levels of uptake of OIBM savings accounts alone is inadequate to deal with adverse shocks faced by the rural Malawian households.

Specifically, among the households that are highly likely to take- up OIBM savings, the non-response to adverse shocks increases with the increased probability of having an OIBM savings account. A savings account with OIBM does not appear to prompt client households to take any action to manage adverse shocks.

Are there differential impacts of the program by the household wealth status and type of shocks faced by the households?

By wealth type, households in the bottom quartile (Q1) living in areas with improved access to and take- up of OIBM savings, tend to reduce their non- response to shocks. But they increase the use of asset depletion to manage shocks. However, the effect for the top quartile (Q4) is the opposite. While the effect is statistically insignificant, it suggests that households at the extreme ends of the wealth distribution behave differently in coping with shocks as access to OIBM savings improves.

By shock and wealth types, we found that households above the median wealth level in areas with high uptake of OIBM services used less of all three sub-optimal coping strategies. Especially, to cope with higher input prices, a decreased reliance on decreasing consumption was more frequently used. They also used less of distressed asset depletion to deal with two types of shocks that severely affected the majority of households in the area--increased input prices and crop diseases.

To summarize, there is no statistically significant impact of improved access to OIBM's savings services in reducing the use of sub-optimal shock coping behaviors among the rural Malawians. In the event of an adverse shock, sub-optimal coping behaviors used include taking no action, reducing consumption and depleting productive assets. But, differential levels of impacts were observed based on wealth levels and types of shocks that households experience. For households at the top of the wealth distribution, increase in OIBM savings services was associated with less reliance on distressed asset depletion to cope with shocks. But, the effect was opposite for those at the bottom of the wealth distribution. Households above the median wealth level in areas with high uptake of OIBM services used less of all three sub-optimal coping strategies. Specifically, these median wealth households uses less of distressed asset depletion to deal with two types of shocks that severely affected the majority of households in the area --increased input prices and crop diseases.

IMPLICATIONS FOR OIBM

In the wake of adverse shocks in rural Malawi, the current savings services of OIBM are conceivably inadequate to reduce the use of sub-optimal coping strategies, especially for the poor households. It is likely that the current terms and conditions of OIBM savings products suit the wealthier households, relative to poorer households, for accumulating adequate volumes of savings with OIBM. These accumulated savings could potentially be withdrawn in order to cope with large shocks. These better off households could also use the accumulated savings as leverage or their assets as collateral to access loans from formal institutions, including OIBM. Therefore, it is feasible for these non poor households to limit their reliance on distressed asset depletion. In addition, the low frequency of visits by the OIBM mobile bank (once or twice a week) and short service period of three to four hours per visit combined with a withdrawal fee could limit easy and quick access to small amounts of savings at times of emergency. This is reflected in the high prevalence of cash kept at home and its use for emergency purposes in the area.

Our research also shows that OIBM has a highly untapped clientele among the poor and women headed households. OIBM, with its worldwide experience in serving such clientele is better placed than its competitors to provide them with valuable services. The value creation could entail an increase in their ability to cope with adverse shocks without resorting to sub-optimal coping behaviors. The current expansion of OIBM through multiple delivery outlets such as satellite branch in Mchinji, cell phone banking, use of points of service devices at shops, and automated teller machines, along with new products such as bundled savings with funeral insurance, and crop insurance, are in the right direction and could compliment the current services provided by the mobile bank. Services provided through various delivery outlets that could quickly and easily be accessed, combined with other suitable products and services, have a high potential to protect the poor households in the wake of shocks and thus help reduce the use of sub-optimal coping mechanisms.

AREAS FOR FUTURE INQUIRY

The current study only addressed the final outcome of access to and uptake of savings. A further inquiry into the data is nonetheless required. Specifically, more analysis is needed to examine the effects of access to savings services on intermediate outputs such as economic activities pursued by the households and on the types of shocks households face for explaining the process to draw more implications. For example, households could reduce consumption more often because they have a better level of nutrition and would be able to afford to lower it. Also, an examination of use of other financial services such as loans and remittance services from OIBM and other formal and informal institutions in combination with savings would further strengthen the results presented here. These lines of inquiry could provide a causal link and better explain the evidence reported in this paper. Finally, an explicit analysis of the effects of formal savings on shock coping behaviors by gender, geographic remoteness, and the social relationships of clients would add additional dimensions to the results and help to fully understand the differential impacts of formal savings on the shock coping ability of its clients.

STUDY BACKGROUND

The *Financial Services Assessment* project, undertaken by the IRIS Center at the University of Maryland and Microfinance Opportunities, is assessing the impact of grants provided by the Bill & Melinda Gates Foundation to microfinance organizations for the design and development of innovations in providing financial services in developing countries. The research will assess the impact of new financial products, services and delivery systems on outreach and client welfare.

The *Financial Services Assessment* project addresses issues such as access to financial services and the role of the enabling environment. Through the use of quantitative surveys and qualitative studies, the research examines if and how the financial innovations affect access and use of financial services by the poor and impact client and community welfare. In this way, the research helps reveal the value proposition of innovations: the unique added value of the innovations to the poor through the financial service providers.

Impact of Micro-Savings on Shock Coping Strategies in Rural Malawi

I. INTRODUCTION

Malawi ranks among the lowest in the world in terms of income per capita[1]. The majority of rural Malawians depend on agriculture for their livelihoods and experience frequent droughts, floods and other unexpected adverse events such as illness and price fluctuations (referred to as "shocks") that lead to income and asset loss. For example, the average expenses in rural central Malawi towards hospitalization amounted to US$10 and the average expenses of out of town funerals was about US$27; meanwhile weekly household incomes averaged US$55 (Stuart et al., 2011). Adverse shocks such as these can be extremely difficult to overcome, since they can have a long-term effect on household well-being (Newhouse, 2005; Mendoza, 2009). It becomes difficult to manage shocks when they can, as noted, result in losses almost equivalent to a household's income.

Many rural households in developing countries, however, use several ex-ante mitigation strategies such as strengthening informal insurance through social capital and commitment savings to use in the event of a shock. In addition, ex-post coping mechanisms such as drawing down on savings, taking loans and aid, receiving remittances, reducing consumption, and liquidating assets are also used to cope with shocks (Sebsted and Cohen, 2001; Collins et al., 2009). Coping with direct income and asset losses are, nonetheless, found to be influenced by the types of institutions to which households have access (Carter and Little, 2005). In many economic environments, such as Malawi, where formal insurance[2] services are still absent, the financial sector fills the void and helps households cope with shocks (Dercon 2007; Burritt 2006; Karlan and Morduch, 2009). For example, microcredit has been found to help cope with shocks by reducing use of sub-optimal coping strategies such as reliance on distressed sales of labor, reducing food consumption, and short-term migration for wage work in Bangladesh (Berg and Emran, 2011). In accord, Burritt (2006) showed the significant role for microcredit in Malawi for coping with shocks. When credit markets are thin, studies show that strategies such as the depletion of productive assets and the reduction in permanent consumption tend to be used to cope with shocks and result in reduced future incomes (Fafchamps, 1999).

While the focus has largely been on the ex-post shock-coping benefits of microcredit, micro-savings (which can function as self-insurance) are now being considered as important a mechanism to help mitigate shocks, both ex-ante and ex-post. For example, several studies find that households save as an ex-ante coping strategy when income reductions due to shocks are expected in the near future (Deaton, 1992; Alderman, 1996; Kazianga et al, 2006). Research also shows that savings can play an especially important role in managing shocks ex-post when commitment to risk-sharing networks within villages is difficult to enforce (Chandrasekhar et al, 2010). Recent studies in Malawi have shown that households often face multiple shocks and rely on a variety of shock-coping mechanisms, but rely most on informal insurance such as social capital and self-insurance such as savings kept at home (Flory and Nagarajan, 2010; Makoka, 2008; Yamauchi et al., 2009; Stuart et al., 2011).[3]

In this paper, we discuss the impact of improved access to micro-savings from formal financial institutions on the ability of rural households to manage shocks ex-post to their occurrence. We have a special vantage point for analyzing this issue - we have information

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[1] CIA Fact book (2011) ranks Malawi 218th out of 228 countries with a GPD per capita of $900.

[2] We observed no presence of formal insurance when conducting research on the survey instrument and virtually no households reported the use of insurance to cope with a shock.

[3] Stuart et al (2011) show that formal sources were used much less than cash kept at home for managing lump sum expenditures by rural Malawian households. But, when formal sources were used, households often preferred using savings over loans due to the cumbersome operational procedures that make loans unsuitable to quickly manage unforeseen lump sum expenses.

from a survey of 2,006 randomly selected households in Central Malawi on their use of financial services, shocks, and other household characteristics in an area that was introduced in 2007 to the Opportunity International Bank of Malawi (OIBM). OIBM is a savings-led bank that began its operation using a mobile bank (bank on wheels) in rural central Malawi in August of 2007 and in some respects tailored its savings products to households in rural areas (see Box 1 for details on OIBM). Specifically, the focus is on the impact of OIBM on the ability of its clients to effectively manage adverse shocks ex-post to their occurrence and sustain their welfare levels prior to the shocks.

We posit that improved access to formal savings services helps households cope with adverse shocks better, by reducing their use of sub-optimal coping behaviors such as doing nothing, depleting productive assets, and reducing consumption levels. In other words, we expect that households with higher access to and take up formal micro-savings services would show a higher ability to respond to adverse shocks, instead of doing nothing, and use better coping strategies than without it.

Specifically, we examine the following:

- Does improved access to and take up of OIBM savings services help households reduce their use of sub-optimal coping behaviors?
- Do the impacts vary by the wealth status of the households and type of shocks experienced?

For this study, we define shocks as uncommon and mostly unexpected adverse events that strike a household without much warning. We consider common and fairly expected events such as births, weddings, school graduations, and events such as funerals (which are only unpredictable in terms of timing) to be life-cycle events and not shocks. Coping mechanisms are measures taken by households to help them restore their lives as best as possible to pre-shock welfare levels.

Box 1: Opportunity International Bank of Malawi (OIBM)

Opportunity International Bank of Malawi (OIBM) is a commercial bank aiming to provide high value financial services to meet the needs of economically disadvantaged Malawians. OIBM received a full commercial banking license on March 21, 2002, and opened its first branch in Lilongwe on May 23, 2003. It is a savings-led institution with more depositors than borrowers, a 6:1 depositor to borrower ratio as of December, 2010.

OIBM also offers loans, insurance, payment services, and foreign exchange products. Savings products include ordinary savings accounts, business savings accounts, and *Kasupe* accounts designed for those who do not regularly transact with their account. Other options include accounts tailored for parents paying their children's school fees, exporters, short-term savers, and those who want funeral insurance. OIBM's loan products include options for business owners in groups, individual business owners, small and medium enterprises (SMEs), agricultural clients, private schools, employees needing advances, and corporations. They also offer *Mphamvu* loans for life cycle needs such as births, school fees, weddings, and funerals. Lastly, their insurance products cover marine, burglary, fire, goods in transit, householders, house owners, and travel insurance. Some of the program characteristics, aimed at improving access for poor rural households, included less rigid identification card requirements, lower minimum balances, and increased information exposure via village-level marketing campaigns, among others.

OIBM is headquartered in Lilongwe, the capital and largest urban area of Malawi, located in its Central Region. The growth in clients at OIBM is phenomenal. The number of depositors has increased from 55,769 in December 2006 to 323,206 in December 2010. Over that same time span, the number of borrowers from OIBM has risen from 9,279 with a gross loan portfolio of $4,910,557 to 51,152 with a gross loan portfolio of $31,343,731. Additionally, although the average loan of an urban borrower is $728 compared to rural borrower's mere $208, OIBM was able to make 31,692 loans in rural Malawi in 2009 compared to 13,583 in urban areas.

Currently, there are four full-service OIBM branches in Lilongwe, two full-service branches in other regional towns and 16 satellite centers that are simply "kiosks" that offer a limited range of OIBM's financial services. In addition, there is a mobile bank that services several villages in Central Malawi. The purchase of the van that functions as a mobile bank was funded by the Bill and Melinda Gates Foundation (BMGF) to provide financial services in rural areas. While OIBM's operations focused on urban centers until mid-2007, the grant from the Gates Foundation allowed outreach to rural Malawians by bringing the bank closer to the clients. The van, unlike the kiosks set up in various villages, offers full financial services. Transactions are carried out in real time using the built-in ATM machine. OIBM has set up two routes for the van, with the route starting from Lilongwe and going to Dedza (on the border of Mozambique) and to Mchinji (on the border of Zambia). Each route is serviced one to two times per week, and makes two stops at six trading centers along the way before arriving at their destination. Four of the six trading centers are un-banked by any formal institution while the other two are serviced by more than three different bank branches. The mobile bank is accessible to rural residents and brings it closer to their home and businesses to open and operate their savings accounts. Loan approvals, however, can only be done in Lilongwe where the head office of OIBM is located.

Sources: Stuart et al (2011) and Meagher (2010).

II. STUDY METHODLOGY

The study was conducted between 2008 and 2010 in rural central Malawi, an area that experienced a considerable improvement in access to formal financial services and, more specifically, to deposit services (McGuinness, 2009; Ferguson, 2011). But, the region also experienced exogenous shocks such as increasing food prices and the rise and fall in the prices of its main export – tobacco. The study is based on a survey of 2,006 randomly selected households that were considered potential clients of formal financial service providers drawn from three districts in Central Malawi – Mchinji, Dedza and rural Lilongwe, where the OIBM mobile bank operates. The survey was conducted from January – April in both 2008 and 2010 to gather baseline and end line data.

A. EXPERIMENTAL DESIGN: MATCHED-PAIR CLUSTER-RANDOMIZED ENCOURAGEMENT DESIGN

A rigorous research design is required in order to isolate the impact of OIBM on the strategies households use to cope with shocks to restore their welfare to levels prior to experiencing shocks. While a randomized control trial (RCT)—which assigns a randomly selected part of the population to a savings product and withholds that product from the rest—provides an ideal strategy for identifying the causal impacts of a program, it is not always logistically feasible or ethically desirable in practice. It may not be possible, for example, to physically exclude portions of the population from a product that serves a geographic area, or ethical to bar potential clients from taking a product that could help them. Such was the case for this study - we discussed the possibility of randomization (along the lines of RCTs) with OIBM and concluded that, for business and ethical purposes, it was unreasonable to deny services to a significant portion of households.

Box. 2: The Design and Implementation of Intensive Information Campaigns

By December 31, 2007, the OIBM mobile van serviced 490 clients and was low for acquiring a competitive edge for OIBM. Focus group discussions conducted in early February 2008 by the IRIS center among villagers in the areas serviced by the mobile van found that there was a good demand for improved access to accurate and specific information on financial services. Many suggested that easy and continuous access to information on terms and conditions of the products and methods to access them would improve take up of financial services. Information was largely spread through word of mouth followed by limited exposure to mass media such as radio.

McGuinness (2008) also found that information flows in rural Malawi were not consistent, resulting in out dated and uneven knowledge of the details of financial products and providers. There was misinformation and misunderstanding about financial services due to the low education level of rural residents. It was not uncommon to hear reports that "banks have enough customers and do not want any more" or "the bank's computer system is full and they cannot take any new customers" even from community leaders (McGuinness, 2008). A recent study by Bertrand et al., (2010) indicates that well tailored advertising of attributes of financial products increases loan demand as much as a 25% reduction in the interest rate would. Therefore, the IRIS team discussed with the OIBM marketing team about an intense information campaign to improve outreach. The two teams then designed an intense information campaign to provide information on OIBM products at the door steps of potential clients and also post OIBM information in crucial public places.

Source: Nagarajan and Adelman, 2010.

As a result, in a joint effort with OIBM, IRIS creatively developed a strategy through the use of intensive information campaigns that permitted the use of the randomized encouragement trial (RET) design. The RET methodology entails randomly selecting a part of the study

population and offering 'encouragement' that induces[4] households in this subpopulation into taking up the program and withholding 'encouragement' from a similar set of randomly selected part of the study population such that differences in outcomes could be attributed to the program.

In our study, applying the RET framework, information about the OIBM savings product was provided by OIBM over a period of 18months to all households in randomly selected clusters(i.e. groups of villages) via intensive information marketing campaigns. Meanwhile, intense information campaigns were withheld from a set of similar clusters. The choice of selecting to randomize information was premised on our earlier research that showed that lack of accurate information on formal financial services limited the take up and use of formal financial services in central rural Malawi (Nagarajan and Adelman, 2010). Therefore, we designed an information campaign that simply explained the terms, conditions, and the application process for a savings account with OIBM. The information campaign was implemented in 56 randomly chosen clusters, and withheld from another 56 similar clusters matched by population and distance from the trading centers where the OIBM mobile bank made a stop every week. (see Box 2). Therefore, the design used in this study is essentially referred as "Matched-Pair Cluster-Randomized Encouragement Design".

The intense information campaign serves as an instrument to provide counterfactual evidence. As discussed in the empirical strategy section (below), under certain general assumptions the RET design permits us to attribute differences in outcomes between areas with and without the intense information campaign to the improved access to formal savings services from OIBM.

B. SURVEY INSTRUMENT

The survey instrument used to gather data for the study was a 31-page structured questionnaire with eleven sections, including household demographics, economic activities, poverty status, food security, physical assets, income, use of financial services, shocks experienced and mechanisms used to cope with shocks, and social capital. The instrument was thoroughly pre-tested in the field prior to conducting the survey.

The section on shocks included queries to capture all household shocks, the timing of the shocks over the last year, and whether they led to a reduction in income. For the most recent adverse shocks during the prior 12 months, data were gathered on ways households coped with the shocks, such as whether they used cash savings kept at home, financial services with formal and informal sources, informal insurance, whether they liquidated assets (including estimated values, reduced consumption, or used some other coping strategy. Data on the use of social networks to help manage shocks was collected as well. Other infrequent events, and their associated expenditures, were also documented such as births, funerals, educational expenditures, and weddings.

The survey design used for this study has four unique features worth noting:

First, the survey design provides balance by forming 56 pairs of clusters that were matched (within each pair) on observable characteristics such as population and distance from major trading centers. Subsequently, one cluster in each pair was randomly selected to receive intensive information campaigns. This ensured comparability between clusters with and without intensive information campaigns in terms of physical access to financial services (see table 1).

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[4] A key design component is that the information used to induce program uptake does so in a manner which does not affect outcomes of interest (shock coping ability in our case).

Second, clusters included in the study were geographically distributed across OIBM's service area. In particular, a balanced number of clusters with and without intensive information campaigns within 0-5 kilometers, 5-7 kilometers, and 7-15 kilometers were selected from each of the trading centers where OIBM van makes a stop every week. In this way, the study incorporates the importance of distance as a factor that affects access to financial services (see table 1)

Third, the survey data were collected from late January until the end of April, during the hungry and rainy season that spans from December to March every year, and therefore is robust to potential seasonality effects. Further, this captures the time of year in which most households are in their most vulnerable state and when the effects of access to formal savings services would presumably be most salient.

Fourth, the survey's sampling frame was based on a random sample of households that were considered, in 2008, as potential clients of microfinance institutions such as OIBM. The randomly chosen households were screened based on three simple queries: age, residency status and economic activity before inclusion in the study. Most microfinance institutions (MFIs) in Malawi only include adults above 18 years of age that are engaged in some economic activity, and also require proof of residency of over a year and Malawian citizenship. However, no enquiry was made on use of financial services for deciding on inclusion in the study.

C. EMPIRICAL STRATEGY FOR IMPACT ANALYSIS

SHOCK COPING STRATEGY METRICS

We use three metrics of shock coping ability to gauge the impact of increased access to savings:

 (i) Whether a household took any action in order to cope with an adverse shock,
 (ii) Whether an adverse shock led to use of distressed asset depletion, and
 (iii) Whether the household could insulate its consumption level from adverse shocks

These variables were constructed based on the information gathered in the shocks module of the survey. These measures, in combination, capture changes in use of sub-optimal coping mechanisms due to participation in OIBM.

The 2008 (base line) data from the study sample revealed that most households face multiple shocks (Flory and Nagarajan, 2010). Therefore, we modeled the proportion of shock responses that fit into the three coping categories: decreasing consumption, not responding to shock, or responding via distressed asset depletion. For example, if a household reported two different shocks, and coped with one of these by decreasing consumption, then the proportion of shocks coped with by reducing consumption would be 0.50. In accord, the outcome of interest is the proportion of shock coping behaviors that falls into each of the coping categories. We used the panel data to test whether there was a decrease on the reliance for each of the three sub-optimal shock coping mechanisms when access to formal savings improves.

Table 1. Sample Household Characteristics at Baseline in 2008

	Intensive Information Areas (Treatment) (N = 1,011)	Non-intensive Information Areas (Control) (N = 995)
Number of Households, by Distance to OIBM mobile bank stop (km)		
Less than 5	195	203
5 - 7	217	173
7 - 12	454	501
More than 12	145	118
Savings Accounts		
Households with Formal Savings Accounts	102	78
Households with OIBM Savings Accounts	18	7
Demographic Characteristics		
% that are female headed	13.75	15.88
Age of household head (years)	41.63	41.66
Household size (number)	5.3	5.07
Number of dependents	2.85	2.76
Income Generating Activity		
Agriculture		
% of households that grow crops	98.91	98.49
Number of total crops grown	2.29	2.97
Number of consumption crops grown	2.58	2.57
Number of cash crops grown	0.34	0.41
Agricultural land (Acres)	2.56	2.46
Non-agricultural business		
% of households that operate a business	26.01	25.03
Number of businesses operated	0.32	0.28
Number of households	1,011	995
Shocks		
Avg. Number of Shocks	3.32	3.06
Avg. Expenditures Per Shock (US$)	13.1	11.6

Note: Count of households at each distance range from centers where the mobile bank stopped at weekly frequency. Dependents are members of the household ages 0 – 17. Sample characteristics are based on information in 2008 (baseline) before the implementation of intense information campaigns. Expenditures per shock is the total of all expenditure reported (cash savings used + the value of any assets sold) divided by the total number of shocks the households experienced for all households that reported at least one shock. Expenditures per shock in current PPP converted US$.

Impact of Micro-Savings on Shock Coping Strategies in Rural Malawi

IMPACT ESTIMATION METHODS

As mentioned above, this study uses a randomized encouragement trial (RET) design. The validity of the RET estimates of the effects of access to OIBM savings services on shock coping requires two properties.

Property 1: The intensive information campaign (the 'encouragement' in our framework) is randomly assigned, resulting in households with and without intensive information campaigns that are, on average, comparable in all observable and unobservable characteristics. This property is satisfied by this study's experimental design. Intensive information campaigns were randomized at the cluster level within each 56 matched pairs, which result in two comparable populations (see Table 1 for comparable 2008 data in both sets of clusters).

Property 2: Compliance among households exposed to intensive information campaigns — that is, take-up of new OIBM savings accounts—is significantly higher relative to households that were not exposed to the intense information campaigns. We find that intensive information campaigns, indeed, were successful in inducing households into adopting OIBM savings accounts. While there is up-take in areas that did not receive intensive information campaigns, the number of new OIBM savers is at least twice as high in areas with intensive information campaigns. This can be seen from two complementary data sources: OIBM's administrative data on new account openings and this study's survey (Table 2).

Table 2. Number of OIBM Savings Accounts Opened between April 2008 to December 2009

	Intensive information areas	Non-intensive information areas	Total
OIBM administrative data	933	489	1,422
IRIS study sample	60	23	83

Note: The first row shows all of the households with accounts in the clusters based on OIBM's MIS system. The second row shows the number of households within our panel data that had OIBM accounts.

Given that our study design meets the two essential properties of RET, we could apply two different, and complementary, estimation methods to measure the impact of increased access to formal savings through OIBM on shock coping ability.

Intention to Treat (ITT) estimate: Here, we compare shock coping strategies between households exposed to intense information campaigns and those that were not. It assumes that the inducement has resulted in significantly higher uptake in areas 'encouraged' to save in formal institutions more frequently. Therefore, with significantly higher uptake of OIBM's product in 'encouraged' areas relative to control areas, this captures the average impact of savings on shock coping strategies that is due to those households that took up OIBM savings accounts because of the intensive information campaigns. This average impact includes the outcomes of households that actually adopted OIBM accounts due to the intensive information campaigns as well as other households in those clusters that may have also felt an effect (e.g. spillover effect) although they did not open accounts. In accord, for the ITT effect of access to formal savings services on changes in the shock coping strategies of household *i* we estimate the following equation:

$$\Delta(\%Sub\_Optimal\ Shock\ Responses\ _i) = \beta(Controls_i) + \delta(IntenseInformation_i) + \varepsilon_i \qquad (1)$$

In this model the estimate for parameter δ captures the ITT effect. Because intense information campaigns were randomly assigned, estimation by ordinary least squares (OLS) should provide unbiased estimates.

Local Average Treatment Effect (LATE) estimate: Here, we focus our analysis only on those households whose savings behavior could be changed by the intense information campaign, yielding the local average treatment effect (LATE). In other words, , we examine the average treatment effect for those households whose take up of OIBM savings is predicted to be caused by the intensive information campaign, and who would not have opened an OIBM savings account otherwise. The analysis focuses on households that comply with intense information campaigns for the following reasons: first, by concentrating on households whose behavior can be influenced by 'encouragement', we eliminate any bias from unobservable characteristics that may contaminate causal estimates. We do this, in essence, by eliminating from causal consideration those types of households that would have selected to adopt OIBM services even without encouragement--that is, we eliminate selection bias by limiting the scope of study to compliers. Second, estimates based on complier households are potentially the most policy relevant. Policymakers are found to care about the impacts of programs they might promote- and specifically about the impact of such programs on households whose behavior may change as a program is promoted. Policy will not change the behavior of never takers or always takers. Therefore, policymakers are most interested in the impact on compliers.

LATE involves two steps in computation. In the first, we compute the probability of OIBM take-up based on whether or not the household received an informational encouragement to do so. In the second, we estimate the shock coping effect of savings for those households whose probability of OIBM take-up was affected by the information campaign. In other words, we model the effects of OIBM's program on those households induced by intense information campaigns, the LATE, by the following system of equations:

$$\Delta(\%\ Sub\_Optimal\ Shock\ Responses\ _i) = \beta(Controls_i) + \lambda(New\ OIBM_i) + \varepsilon_i \qquad (2)$$

$$New\ OIBM_i = \mu(Controls_i) + \gamma(Intense\ Information_i) + v_i \qquad (3)$$

The randomization of intense information campaigns (property 1) warrants that the probability distributions of error terms ε_i and v_i are orthogonal. If the campaigns indeed induced households to adopt OIBM accounts (property 2) then the parameter γ should not be equal to zero. In combination the two properties discussed above validate the use of an indicator of exposure to intense information campaigns as an instrumental variable. Therefore, applying two staged least squares (2SLS) provides an unbiased estimate of the parameter λ, which captures the LATE.

PROFILE OF AN OIBM CLIENT FAMILY IN THE SAMPLE

A male-headed household of five, three of which are children, live in the village of Mchiliko, which is located in Lilongwe, Malawi. Their home is a one hour walk to the nearest trading center. This family received the information campaign. The husband and wife are farmers and all of the children attend school. They grow groundnuts, hybrid maize, and tobacco on their two acres of land, which they own. The parents also earn less than US$1 as *ganyu* laborers (day laborers) and the family has a business in petty trading; the father is the primary owner.

No one in the family has taken any loans from formal financial institutions in the past three years. Although members of the family have savings accounts with OIBM, Care Malawi, and a cooperative bank, they continued to keep cash savings at home. The mother opened the account with the cooperative bank in January of 2009; the balance is $3. The father opened the Care Malawi account in June 2006 and the OIBM account in September 2009. As of 2010, the balance of the OIBM account is $98.

This family has experienced a notable amount of shocks, which they responded to with a variety of coping methods. While the average amount of shocks at baseline is 3.16 and at end line is 2.70, this family experienced six shocks in 2008 and four shocks in 2010. In 2008, the family suffered from a decline in sale price crops, which forced the family to stop selling the crops; crop disease, which they coped with through a spiritual response; business failure, which forced them to close the business; and an unexpected increase in input prices, so they had to spend $117 in savings. Additionally, the family was unable to cope with the theft or death of livestock.

Over the course of two years, the family became able to cope with shocks in a more effective manner. At the time of the baseline survey in 2008, the family was not able to respond to some of the shocks that they experienced, but at the end line in 2010, the family was able to spend their savings that they kept at home as one of the coping mechanisms for all of the shocks that they experienced.

In 2010, the household experienced business failure, there was a large fall in the sales price for crops, they had dead and/or stolen livestock, and there was a lower crop yield due to a drought or flood. In response to the business failure, the family spent $5 from their savings and reduced non-food expenditures. In response to the significant fall in sale prices, the family spent $85 from their savings, reduced food consumption, and reduced non-food expenditures. To cope with the dead and/or stolen livestock, the family spent $22 from their savings, and in response to the lower crop yield, the family spent $13 from their cash savings, and reduced their food consumption.

Source: IRIS Center Malawi Impact Survey.

III. SHOCKS AND COPING STRATEGIES

In this section, we discuss the types of shocks experienced by the sampled households and the coping mechanisms used to restore their lives as best as possible to pre-shock welfare levels. We describe the resulting change in coping behaviors after the introduction of the mobile bank.

A. SHOCK PREVALENCE IN STUDY AREA

Percent of Households Experiencing Shocks by Type
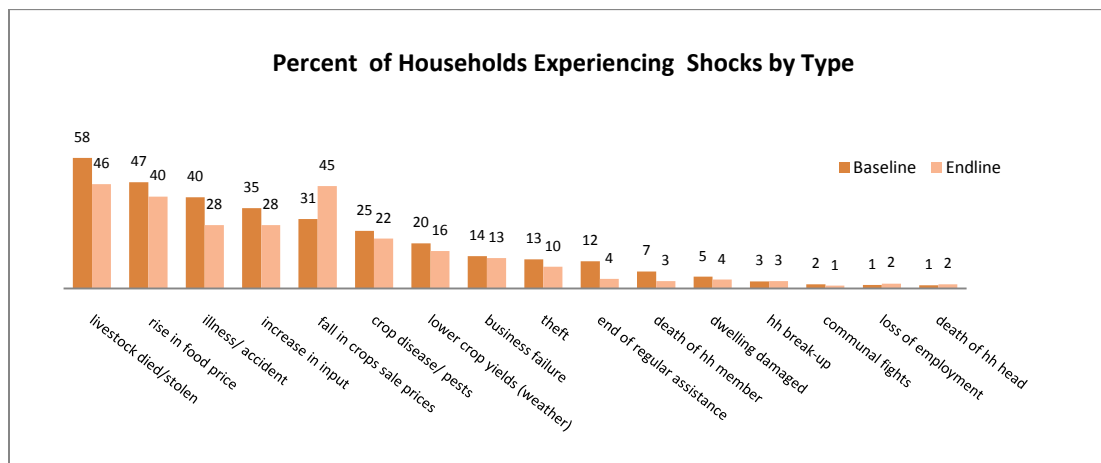
Households in our study areas of rural central Malawi have a high-level of exposure to shocks; over 90% of the households in our sample reported shocks both in 2008 and 2010.

Among the 2,006 sampled households, there was a decrease in the proportion of households reporting to have experienced shocks over the study period; from 1,921 households in 2008 (95.3% of sample) to 1,869 in 2010 (93.2% of sample).[5] Yet households that experienced shocks faced an increased number of shocks: on average, from 2.51 shocks in 2008 to 3.17 in 2010. The degree of reliance on agriculture in the area highlights the high degree of exposure to risk, much of which is associated with agriculture. Most households participate in agriculture: 94% owned land that they used in agriculture and 83% claim farming as their primary occupation[6].

The most prominent shocks were livestock loss, illness, and price shocks to inputs (Figure 1).

But, over the period of two years (2008 to 2010), the proportion of households experiencing shocks decreased for all the types of shocks reported with the exception of those related to decrease in crop sale prices. The percent of households experiencing shocks due to decline in crop sales rose from 31% of households at baseline to 45% at end line, due in part to the severe drop in tobacco prices that took place during our study period[7]. Note that the change

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[5] For an extended detailed review of the different specific types of shocks faced by the households please see the IRIS Center's earlier report (Flory and Nagarajan, 2009).

[6] Meanwhile the other three most common occupations are being a salaried professional (8%), running a household business (5%), and being a wage worker (4%). In addition, only 25% of households had a business that was not agricultural.

[7] For more information on the tobacco price volatility during the period see the Economist "Economic Policy: The impact could be costly" from the Malawi Country Report 2009 (Oct.1).

in the number of households that reported experiencing a food price shock, which decreased despite the overall rise in food prices rose during the study period.

There was no significant difference in change in average number of shocks per household between intense information campaign areas and the non campaign areas.

The average of the change in number of shocks across all households in information campaign areas was 0.474, while it was 0.396 in non-campaign areas. The difference in the change was not significant[8].

Exposure to income- reducing shocks was high.

Not all shocks were considered to have reduced household incomes. But, of the 1,869 households that reported experiencing shocks at end line, 1,796 reported that at least one of those shocks reduced their incomes (89% of 2,006 sampled households). There was not much difference between baseline and end line for the whole sample– it was 86% at base line and 89% in end line - or within any wealth quartile.

Table 3. Number of Households with Income Reducing Shocks

Wealth Group	Households in Group	Year	Number of Income Reducing Shocks		
			At least 1	*1-4*	*5-8*
Whole Sample	2,006	*2008*	1,729 (86%)	1,505 (75%)	224 (11%)
		2010	1,796 (89%)	1,605 (80%)	191 (9%)
Q1 (bottom)	502	*2008*	414 (82%)	368 (73%)	46 (9%)
		2010	450 (89%)	409 (81%)	41 (8%)
Q2	497	*2008*	432 (86%)	377 (75%)	55 (11%)
		2010	445 (89%)	396 (79%)	49 (9.%)
Q3	505	*2008*	445 (88%)	389 (77%)	56 (11%)
		2010	443 (87%)	403 (79%)	40 (7%)
Q4 (Top)	502	*2008*	438 (87%)	371 (73%)	67 (13%)
		2010	458 (91%)	397 (79%)	61 (12%)

Note: Number of households with at least one shock which the household claimed to directly reduce their expected income; Wealth Quartiles based on household assets holdings-for details on the construction of quartiles see appendix. Q1 represents households who are in the bottom 25% of the wealth distribution within their cluster.

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[8] Wilcoxon ranksum test, p=.291

B. SHOCK COPING STRATEGIES

Most households hit with shocks did not do anything to cope with them.

In 2008 and 2010, of households that reported to have experienced shocks, 45% and 41%, respectively, did not do anything in response to some or all of the shocks they faced.

Cash savings was the main tool households relied on when coping with shocks.

Interestingly, only 17% of the households that reported using cash savings in 2008 for coping with shocks either had an active or recently closed bank account; this proportion climbs to 30% in 2010. Given the low prevalence of informal deposit services such as Rotating Savings and Credit Associations (ROSCAs), money keepers, and savings with friends and relatives in our study area of rural central Malawi, this indicates that the cash savings were primarily kept at home.

Even those with formal savings accounts use cash kept at home to cope with shocks.

While 66% of shock-experiencing households in 2010 with formal savings accounts used at-home cash to respond to one or more shocks, only 60% of shock-experiencing households without formal savings accounts ever responded with use of at-home cash. It is plausible that households with formal savings accounts had more cash on hand, perhaps as part of a self-imposed commitment savings mechanism, to accrue lump-sums of money before making deposits. Anecdotal evidence gathered by IRIS during field visits showed that many households that saved with formal institutions still kept cash at home – they were storing the cash at home in order to take it to the OIBM truck that came once a week or the bank branch in the trading centers that they visit on weekly market days.

However, households with external savings account with formal institutions spent more cash savings to cope with shocks than those without an external savings account.

In 2010, the median of total cash savings used in coping with shocks was $21 for households that did not report external savings with formal institutions while it was US$29 for households reporting to have external savings. Formal savings were primarily used to address the most frequent shocks experienced by the sampled households –drop in the sale price of crops and rise in the price of food. The median expenditure amount used to cope with shocks from bank withdrawals was $67.15.

Table 4. Use of Shock Coping Strategies by households that Experience Shocks

	Whole Sample		Intensive information areas		Non- intensive Information areas	
No. of Households with Shocks	1,921	1,869	962	943	959	926
Year	2008	2010	2008	2010	2008	2010
Did not do anything	45.0%	40.8%	45.0%	43.3%	45.0%	38.2%
Increased Labor / migrated	4.4%	16.5%	4.3%	15.3%	4.5%	17.7%
Reduced consumption	0.9%	4.5%	0.6%	4.8%	1.3%	4.2%
Sold / rent assets	4.0%	6.6%	4.6%	7.6%	3.4%	5.5%
Use cash savings	46.4%	32.5%	46.3%	31.4%	46.6%	33.7%
Gifts, aid, & remittances	0.5%	0.8%	0.5%	0.6%	0.5%	1.0%
Use loans	0.9%	3.3%	0.9%	3.7%	0.9%	2.9%
Other	7.0%	22.6%	8.4%	21.7%	5.6%	23.5%

Note: Percent of households, out of those reporting to experience at least one shock, that reported using the mechanism listed as one of the top three most important things they did in response to at least one shock.

But, there was a shift away from the most common shock coping strategy- spending cash savings.

There was a *decrease* in using cash, from 47% of households in 2008 to 33% in 2010. Meanwhile, there was *an increase* in most other types of shock coping strategies with increased labor supply seeing the largest shift, from 4.4% to 17% during the same period.

Nearly 6% of households coped with shocks by liquidating assets.

The types of shocks that households most frequently coped with by selling assets were livestock loss and unexpected increases in food prices. Such cases mostly involved selling livestock. Median livestock sales were $12 which coincides with the costs imposed by shocks which, on average, was around $13. Land rentals were common—about 22% of households grew crops in land they had rented.

C. SHOCKS FACED BY NEW OIBM SAVERS AND THEIR COPING STRATEGIES

Note that a greater amount of households had access to and became members of formal financial institutions in 2010 relative to 2008, especially with OIBM. The number of OIBM savers increased from 25 households in 2008 to 103 households in 2010, with 83 as new OIBM savers since the end of base line survey in 2008.

New OIBM savers, on average, faced more shocks in 2008, but reported reduction in the average number of shocks they faced which reflects the trend among all sampled households.

New OIBM savers saw a decrease from 3.36 to 3.08 shocks whereas other households experienced a decrease from 3.16 to 2.70 shocks from 2008 to 2010.

But, there were differences in the trends between new OIBM savers and the rest of the sample among the types of shocks (see annex table 4).

- New OIBM savers experienced similar frequencies of lower crop yields and crop disease whereas the rest of the sample saw decreases; for example, the proportion of OIBM savers reporting low crop yields increased from 14% to 20% whereas this proportion decreased from 20% to 16% for other households. It is to be noted that these OIBM households also reported to have received more formal loans and rented more land for agriculture[9].
- But, new OIBM savers experienced a greater reduction in theft relative to the rest of the sample. While the rest of the sample went from 12% of households reporting theft to 10%, new OIBM savers went from 25% to 13%.
- The proportion of households with illness remained the same for new OIBM savers between baseline and end line while it dropped from 40% to 28% for other households.
- Other shocks experienced did not have differences in trends that stood out between new OIBM savers and the rest of the households.

Interestingly, households who opened OIBM savings accounts after 2008 actually increased their reliance on cash savings-- opposite of the aggregate trend. The proportion of new OIBM savers that relied on cash savings (either kept at home or with an external agent) increased slightly, from 27% to 31%, whereas the rest of the sample saw a decrease from 33% to 27%. The rest of the trends in the use of coping mechanisms remained relatively the same between new OIBM savers and other households.

In the next section, we conduct econometric analysis to pinpoint the effects that are attributable to the introduction of OIBM's program in terms of shock coping strategies adopted by households.

SUB-OPTIMAL MEASURES FOR COPING WITH SHOCKS

Taking no action to adverse shocks: Households were explicitly asked to report shocks which had severely and negatively impacted them. Therefore, not doing anything in response indicates that any adverse effects of the shock on a household's welfare were not mitigated.

Asset depletion: This takes the form of sales of productive assets or a decrease in accumulation of human capital. For example, selling farmland or removing children from school reduces long-term earning potential, lowers long-term household welfare, and significantly heightens household vulnerability. We include selling assets (tools, furniture, etc.), selling or renting out farmland, selling livestock, and removing kids from school to work under this category.

Reduced consumption: This captures instances where households were not able sustain their consumption level and therefore report to have to reduce food consumption, consume lower cost/less preferred foods, or reduce non-food expenditures. This is in line with Townsend's (1994) concept of testing for full-insurance by examining the correlation between income and consumption.

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[9] The amount of land rented for cultivation increased by .21 acres for new OIBM savers in comparison to .01 acres for other households. The difference between these trends is statistically significant at the .05% level (based on a t-test for difference of means). In terms of loans, the percent of new OIBM savers that had loans increased from 36% to 48% whereas the rest of the households saw an increase from 31% to 35%.

Table 5. Shock Trends of New OIBM Households and Others

| | Number of Households Reporting Shock | | | |
| | New OIBM Savers | | Rest of Sample | |
	2008	2010	2008	2010
Number of households	83	80	1,923	1,918
Average number of shocks	3.36	3.08	3.16	2.70
Type of Shock				
Lower crop yields due to drought/flood	14 (16.9%)	16 (20.0%)	385 (20.0%)	314 (16.4%)
Crop disease/pests	20 (24.1%)	21 (26.3%)	488 (25.4%)	419 (21.9%)
Livestock died/stolen	50 (60.2%)	42 (52.5%)	1104 (57.4%)	880 (45.9%)
Household business failure	14 (16.9%)	13 (16.3%)	272 (14.1%)	256 (13.4%)
End of assistance/aid/remittances	11 (13.3%)	3 (3.8%)	230 (12.0%)	81 (4.2%)
Unexpected increase in input prices	32 (38.6%)	29 (36.3%)	676 (35.2%)	530 (27.6%)
Large fall in sale price of crops	33 (39.8%)	46 (57.5%)	579 (30.1%)	857 (44.7%)
Large rise in price of food	34 (41.0%)	27 (33.8%)	904 (47.0%)	785 (40.9%)
Illness/accident of household member	29 (34.9%)	28 (35.0%)	777 (40.4%)	531 (27.7%)
Death of other household member	7 (8.4%)	5 (6.3%)	143 (7.4%)	60 (3.1%)
Break-up of household	4 (4.8%)	2 (2.5%)	58 (3.0%)	63 (3.3%)
Theft	21 (25.3%)	10 (12.5%)	235 (12.2%)	182 (9.5%)
Dwelling damaged by fire/flood/vandalism	3 (3.6%)	0	102 (5.3%)	78 (4.1%)

Note: Shocks that were reported by less than 3% of households in both groups were omitted. These shocks were death of a household head, death of working member of household, loss of salaried employment, communal fights, and 'other'. Percent of households within group shown in parenthesis.

Impact of Micro-Savings on Shock Coping Strategies in Rural Malawi

IV. IMPACT OF OIBM ON SHOCK COPING STRATEGIES

In this section, we present results based on econometric analysis to address the following questions:

- In *clusters* with *high* access to and take up of OIBM savings services, do households reduce their use of sub-optimal coping behaviors? This can be inferred by comparing areas with high uptake due to the intense information campaign and areas with low uptake due to no campaign. Results are obtained using Intention to Treat (ITT) estimates.

- Specifically, do households who take up OIBM savings reduce their use of sub-optimal coping strategies? This can be examined by analyzing households whose take up of OIBM savings is predicted to be due to the intensive information campaign (and would not have opened an OIBM savings account otherwise). Results are obtained using Local Average Treatment Effects (LATE) estimates.

- Are there differential impacts by the wealth status of the households? This is shown by the ITT and LATE estimates for each wealth quartile.

- Are there differential impacts by shock types and the wealth status of the households? This is shown by the ITT estimates for each of the two wealth status: below and above the median levels of wealth.

A. IMPACT OF OIBM IN HIGH UPTAKE AREAS RELATIVE TO LOW UPTAKE AREAS (ITT ESTIMATES)

ESTIMATING IMPACT		
ACRONYM	**NAME**	**INTERPRETATION**
ITT	Intention-to-Treat Estimate	The average impact of savings on shock coping for areas encouraged to save, whether or not households in those areas saved. This approach assumes that any association between information campaigns and shock management outcomes occurs exclusively through the channel of formal savings.
LATE	Local Average Treatment Effect Estimate	The average treatment effect for those households that take up OIBM savings only because of randomly applied inducement – information campaigns - to do so. These households are referred as "compliers".

Result 1: In the event of shocks, significantly more households in clusters with a large number of OIBM savings accounts resort to use of sub-optimal coping behaviors of no response and reduced consumption relative to households in clusters with few OIBM accounts.

ITT estimates presented in Table 6 show that being in a cluster where more households have OIBM accounts, induced by an intensive information campaign, is significantly associated with an increase in the proportion of shocks that are not coped with by any response, and an increase in the proportion of shocks that are coped with by reducing consumption. These results are robust to the inclusion of several control variables. Also, no strong association is found between households in a cluster with a larger number of OIBM accounts and reduction in reliance on distressed asset depletion. The full set of regression results is available in Appendix A4.

The results indicate that improved access to and high levels of uptake of OIBM savings accounts has not resulted in reduction of use of sub-optimal coping behaviors such as no response and reduced consumption. In other words, improved access to and high uptake of OIBM savings appears to be inadequate to shift rural Malawians away from using inferior coping strategies to deal with adverse shocks.

Table 6. Impact of OIBM on Coping with Shocks of Households in High Uptake Areas (ITT Results: OLS estimates)

Shock Coping Strategies (Outcome Variable)	Estimate $(\widehat{\delta})$	P-Value (H_0: $\delta = 0$)	Obs.	Control Variables
Δ in % shocks not coped with	0.049***	0.008	1,790	Y
	0.040**	0.019	1,718	N
Δ in reliance on reducing consumption to cope	0.024*	0.061	1,251	Y
	0.027**	0.038	1,240	N
Δ in reliance on distressed asset depletion to cope	0.004	0.835	1,251	Y
	0.009	0.653	1,240	N

*Note: Regression of changes of shock coping strategies on indicator of exposure to intense information campaigns; *, **, and *** represent significance at the 10%, 5%, and 1% level. P-values associated with heteroskedastically robust standard errors; Control variables are head of household age, head of household age squared, distance to call center, and number of shocks experienced. All regressions included cluster-pair fixed effects. Full regression results in Appendix A4.*

B. IMPACT ON HOUSEHOLDS THAT TAKE UP OIBM (LATE ESTIMATES)

Result 2*: Non response to adverse shocks increases with the increased probability of having an OIBM savings account. A savings account with OIBM does not appear to exclusively prompt client households to take any action to manage adverse shocks.*

The LATE estimates[10] are shown in Table 7. The results are consistent with the ITT estimates above and indicate that having OIBM savings accounts increase the proportion of shocks that are not coped with by any response, and the proportion of shocks that are coped with by reducing consumption (when coping). Similar to above, no strong association is found

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[10] Results presented here are the second stage estimates based on equations 2 and 3 presented in the Methodology section. The full set of regression with both first and second stage results with all covariates is available in Appendix A4.

between having OIBM accounts and reliance on distressed asset depletion to cope with shocks.

Table 7. Impact of OIBM on Coping with Shocks by Households that Take Up OIBM Savings (LATE Results: 2SLS estimates)

Shock Coping Strategies (Outcome Variable)	Estimate ($\hat{\lambda}$)	P-Value (H_0: $\lambda = 0$)	Obs.	Control Variables
Δ in % shocks not coped with	1.343*	0.094	1,789	Y
	1.115	0.143	1,730	N
Δ in reliance on reducing consumption to cope	0.496	0.154	1,251	Y
	0.595	0.109	1,214	N
Δ in reliance on distressed asset depletion to cope	0.022	0.961	1,251	Y
	0.046	0.923	1,214	N

*Note: Instrumental variable regression of change of shock coping strategies on being a new OIBM saver. New OIBM saver instrumented by indicator of exposure to intense information campaigns. *, **, and *** represent significance at the 10%, 5%, and 1% level. P-values associated with Heteroskedasticity Robust Standard Errors; Control variables are household age, household age squared, distance to call center, and number of shocks experienced. All regressions included cluster-pair fixed effects. Full regression and first-stage results available in Appendix A4.*

C. IMPACT OF OIBM, BY HOUSEHOLD WEALTH STATUS (ITT AND LATE ESTIMATES)

Result 3: *Households in clusters with high access and uptake of OIBM savings (ITT), and also the households that are likely takers of OIBM savings (LATE) show similar results in the following:*

(i) *Households in the bottom quartile (Q1) tend to reduce their non response to shocks but increase the use of asset depletion to manage shocks.*
(ii) *But, the effect on households in the top quartile (Q4) is the opposite. While the effect is statistically insignificant, it suggests that households at the extreme ends of the wealth distribution behave differently in coping with shocks as access to OIBM savings improves.*

It has been shown that households with less resources in developing countries are often less well-insured and have few options to cope with shocks compared to better off households that rely on different shock coping mechanisms (Jalan and Ravallion, 1999). Among the Honduran households that were hit by adverse shocks, Carter and Little (2005) found that relatively wealthy households protected their assets while poorer households depleted them to cope with shocks. In consideration of these findings, we recalculate the ITT and LATE estimates for each wealth quartile separately.

Tables 8 and 9 show the result from ITT and LATE, respectively, for each wealth quartile. The results do not provide any clear indication of the association between access to OIBM savings and shock coping for any of the four wealth quartiles.[11] However, there were differences in

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[11] The results could have been influenced by small sample size in each quartile. Deaton, 1997 showed that in such cases the point estimates would still remain unbiased while their standard errors would increase. As a result estimates may carry information, although they may not appear to be statistically significant.

results for households in the top (Q4) and bottom (Q1) wealth quartiles in terms of the proportion of shocks not coped with and the proportion of shocks coped with via distressed asset depletion: the estimates show opposite effects for these groups. Both ITT and LATE estimates, respectively, for the bottom quartile (Q1) show a reduction in the proportion of shocks not coped with and an increase in use of distressed asset depletion. But, both ITT and LATE estimates show the opposite direction for those households in the top quartile (Q4) for the same two sub-optimal coping mechanisms. While the effect is insignificant, the results are suggestive that households at the ends of the wealth distribution are affected differently by OIBM savings.

Table 8. Impact of OIBM Savings on Coping with Shocks by Households in High Uptake Areas, by Wealth Status (ITT Results)

Shock Coping Strategies (Outcome Variable)	Wealth Quartile	Estimate ($\widehat{\delta}$)	*P*-Value (H_0: $\delta = 0$)	Obs.
Δ in % shocks not coped with	Q1	-0.014	0.762	439
	Q2	0.087*	0.058	448
	Q3	0.059	0.149	448
	Q4	0.032	0.448	454
Δ in reliance on reducing consumption to cope	Q1	0.027	0.33	296
	Q2	0.019	0.539	298
	Q3	0.012	0.644	335
	Q4	0.027	0.279	322
Δ in reliance on distressed asset depletion to cope	Q1	0.06	0.114	296
	Q2	-0.019	0.628	298
	Q3	0.02	0.607	335
	Q4	-0.055	0.19	322

*Note: Q1 represents households who are in the bottom 25% of the wealth distribution within their cluster. Regression of changes of shock coping strategies on indicator of exposure to intense information campaigns; *, **, and *** represent significance at the 10%, 5%, and 1% level. P-values associated with heteroskedasticity robust standard errors; Full regression results in Appendix*

Table 9. Impact of OIBM Savings on Coping with Shocks by Households that Take Up OIBM, by Wealth Status (LATE Results)

Shock Coping Strategies (Outcome Variable)	Wealth Quartile	Estimate ($\hat{\lambda}$)	P-Value ($H_0: \lambda = 0$)	Obs.
Δ *in % shocks not coped with*	Q1	-0.437	0.763	439
	Q2	2.908	0.162	448
	Q3	1.222	0.211	448
	Q4	2.284	0.631	454
Δ *in reliance on reducing consumption to cope*	Q1	0.581	0.368	296
	Q2	0.923	0.604	298
	Q3	0.171	0.645	335
	Q4	0.877	0.448	322
Δ *in reliance on distressed asset depletion to cope*	Q1	1.271	0.184	296
	Q2	-0.903	0.664	298
	Q3	0.284	0.612	335
	Q4	-1.782	0.42	322

Note: Q1 represents households who are in the bottom 25% of the wealth distribution within their cluster; Instrumental variable regressions of change of shock coping strategies on being a new OIBM saver. New OIBM saver instrumented by indicator of exposure to intense information campaigns. *, **, and *** represent significance at the 10%, 5%, and 1% level. P-values associated with heteroskedasticity robust standard errors; Full regression and first-stage results in Appendix A4.

D. IMPACT OF OIBM BY HOUSEHOLD WEALTH STATUS AND SHOCK TYPES (ITT ESTIMATES)

The results thus far indicate a low impact of OIBM on reduction in use of sub-optimal shock coping mechanisms. None the less, there appears some indication that OIBM is likely to have a differential impact on households based on their wealth levels. To clarify the picture further, we analyze below how households of each wealth status responded to the most common shocks reported – increases in food prices, increases in input prices, drops in crop sale prices, crop diseases, and livestock loss. Furthermore, we analyze whether the responses to each of these specific shocks were impacted by improved access to OIBM services. Note that these five major shocks are also reported to have affected most households in the study area and are referred to as aggregate shocks. Since they affect a large portion of households in an area they leave less potential for solidarity networks to play a shock coping role. In such cases, self-insurance such as household savings may play a more important role compared to informal risk sharing mechanisms. We consider two wealth groups for the analysis - above and below the median.

Result 4: *Households in clusters with large number of OIBM accounts are associated with:*
(i) *a reduction in use of decreased consumption to cope with higher input prices, especially by households above the median wealth level;*
(ii) *a reduction in the behavior of "no response" to deal with crop diseases, especially by households above the median wealth level;*
(iii) *no significant change in coping behavior of any type to deal with food prices, drop in crop sale prices, and livestock loss by households of both wealth groups;*

To conduct the analysis at the shock-level, we modify our econometric model accordingly (for each shock reported in 2010, the end line) and test whether living in a cluster that received an intensive information campaign had an effect on how the reporting households coped with it. Accordingly, we model the probability that the shock is coped with using a sub-optimal measure by the following equation:

$$\mathcal{P}(Response = Sub\_Optimal\ Response_i)$$
$$= \beta(Controls_i) + \varphi(IntenseInformation_i) + \varepsilon_i \qquad (4)$$

The parameter φ, in equation 4 above, captures the ITT estimate of OIBM savings services on the use of sub-optimal strategies for specific shock types[12]. The estimation results, presented in Table 10, show the following different degrees of impact for different shock type.

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[12] The LATE was not estimated for the shock-level analysis due to the small number of observations.

Table 10. Impact of OIBM Savings on Coping with Shocks by Households in High Uptake Areas, by Shock Types and Wealth Status (ITT Results)

		Results for specific shock types									
		Increased Food Prices		Increased Input Prices		Drop in Sale Prices		Crop Disease		Livestock Loss	
		Estimate ($\hat{\varphi}$)	P-Value ($H_0: \varphi = 0$)	Estimate ($\hat{\varphi}$)	P-Value ($H_0: \varphi = 0$)	Estimate ($\hat{\varphi}$)	P-Value ($H_0: \varphi = 0$)	Estimate ($\hat{\varphi}$)	P-Value ($H_0: \varphi = 0$)	Estimate ($\hat{\varphi}$)	P-Value ($H_0: \varphi = 0$)
Coping Category	Group	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Shock not coped with	All	0.032	0.182	0.027	0.466	-0.008	0.799	*-0.09**	*0.071*	-0.02	0.51
	Top	0.025	0.481	0.048	0.314	-0.039	0.416	*-0.15***	*0.036*	-0.00	0.91
	Bottom	0.039	0.246	-0.006	0.912	0.016	0.714	*-0.03*	*0.655*	-0.04	0.31
Reduced consumption to cope	All	-0.002	0.944	*-0.023***	*0.026*	0.039	0.512	-0.024	0.558	I.O.	-
	Top	-0.008	0.867	*-0.029***	*0.048*	0.08	0.122	-0.03	0.554	I.O.	-
	Bottom	0.006	0.874	*-0.011*	*0.319*	-0.002	0.944	-0.02	0.772	I.O.	-
Relied on asset depletion to cope	All	0.032	0.176	0.022	0.553	0.009	0.777	-0.029	0.487	I.O.	-
	Top	0.008	0.839	0.014	0.793	0	0.996	0.003	0.958	I.O.	-
	Bottom	0.046	0.129	0.032	0.515	0.021	0.691	-0.054	0.426	I.O.	-

Note: Results are for regressions at the shock level for different types of shocks in 2010. Outcome is binary variable indicating whether coping mechanism used to cope with shock fell into coping category. "All" indicates all households included in regression and "Top" and "Bottom" indicate only households above and below the median wealth level within their cluster were included; "I.O" indicates there were insufficient observations; *, **, and *** represent significance at the 10%, 5%, and 1% level; P-values associated with heteroskedasticity robust standard errors; Estimation via least squares (LS); Full regression results in Appendix 4.

The strongest association we observe is that households are better able to cope with increased input prices (column 3), households above the median wealth levels. We observe that for the entire sample, and for both wealth groups, adopting formal savings by most households, on average, is associated with a decreased reliance on reduced consumption to cope with higher input prices. For shocks related to crop disease, the most pronounced effects of formal savings come through taking an action to cope: having formal savings is found to be associated with an increased likelihood of taking an action in response, especially for households above the median wealth levels. The effects on lowering consumption and asset depletion when facing crop diseases are not statistically significant, they have negative signs. This may indicate that it is unlikely that savings with OIBM could induce households to respond using the inferior coping mechanisms that may potentially harm the welfare of the households.

For increased food prices and drops in crop sale prices, access to OIBM savings does not appear to play a large role in reducing the use of any of the three sub-optimal coping strategies by households of any type of wealth status.

Finally, there is little evidence that OIBM savings had an effect on how livestock loss is coped with for households of various wealth levels. Since the most frequent coping strategy for livestock loss was taking no action, there was not enough observation suitable for testing the effects of OIBM savings accounts on the other two measures (i.e. reduction consumption and depleting assets). It is to be noted that this shock elicited the lowest expenditures in response.

V. CONCLUSION AND IMPLICATIONS FOR OIBM

Adverse economic shocks are found to affect over 90% of the households in our large sample of 2,006 rural Malawian households. The most common adverse economic shocks were loss of livestock, increased food prices, falls in the sale prices of crops, and increased input prices. Before access to OIBM improved in the study area, nearly three fourths of households reported not responding to at least one adverse shock. When responding, three fourths of the households drew down on cash savings kept either at home or with an external agent. However, after the increase in access to OIBM savings services, a shift was noticed in the coping strategies used by households. Non response to adverse shocks declined from 75% to 66%, use of cash savings declined from 74% to 50%. But, the use of coping mechanisms such as reduced consumption, and increased labor sales and distressed asset depletion increased.

A rigorous analysis of a panel of 2,006 rural Malawian households indicate no statistically significant impact of improved access to OIBM's savings services in reducing the use of sub-optimal shock coping behaviors among the rural Malawians. In the event of an adverse shock, sub-optimal coping behaviors include taking no action, reducing consumption and depleting productive assets. But, differential levels of impacts were observed based on wealth levels and types of shocks that households experience. For households at the top of the wealth distribution, increase in OIBM savings services was associated with less reliance on distressed asset depletion to cope with shocks. But, the effect was opposite for those at the bottom of the wealth distribution. Households above the median wealth level in areas with high uptake of OIBM services used less of all three sub-optimal coping strategies. Specifically, these median wealth households used less of distressed asset depletion to deal with two types of shocks that severely affected the majority of households in the area: increased input prices and crop diseases.

IMPLICATIONS FOR OIBM

In the wake of adverse shocks in rural Malawi, the current savings services of OIBM are conceivably inadequate to reduce the use of sub-optimal coping strategies, especially for the poor households. It is likely that the current terms and conditions of OIBM savings products suit the wealthier households, relative to poorer households, for accumulating adequate volumes of savings with OIBM. These accumulated savings could potentially be withdrawn in order to cope with large shocks. These better off households could also use the accumulated savings as leverage or their assets as collateral to access loans from formal institutions, including OIBM. Therefore, it is feasible for these non poor households to limit their reliance on distressed asset depletion. In addition, the low frequency of visits by the OIBM mobile bank (once or twice a week) and short service period of three to four hours per visit combined with a withdrawal fee could limit easy and quick access to small amounts of savings at times of emergency. This is reflected in the high prevalence of cash kept at home and its use for emergency purposes in the area.

Our research also shows that OIBM has a highly untapped clientele among the poor and female-headed households. OIBM, with its worldwide experience in serving such clientele is better placed than its competitors to provide them with valuable services. The value creation could entail an increase in their ability to cope with adverse shocks without resorting to sub-optimal coping behaviors. The current expansion of OIBM through multiple delivery outlets such as a satellite branch in Mchinji; cell phone banking; use of points of service devices at shops; and automated teller machines (along with new products such as bundled savings with funeral insurance) and crop insurance, are in the right direction and could compliment the current services provided by the mobile bank. Services provided through various delivery outlets that could quickly and easily be accessed, combined with other suitable products and services, have a high potential to protect the poor households in the wake of shocks and thus help reduce the use of sub-optimal coping mechanisms.

AREAS FOR FUTURE INQUIRY

The current study only addressed the final outcome of access to and uptake of savings. A further inquiry into the data is nonetheless required. Specifically, more analysis is needed to examine the effects of access to savings services on intermediate outputs such as economic activities pursued by the households and on the types of shocks households face for explaining the process to draw more implications. For example, households could reduce consumption more often because they have a better level of nutrition and could afford to lower it. Also, an examination of use of other financial services such as loans and remittance services from OIBM and other formal and informal institutions in combination with savings would further strengthen the results presented here. These lines of inquiry could provide a causal link and better explain the evidence reported in this paper. Finally, an explicit analysis of the effects of formal savings on shock coping behaviors by gender, geographic remoteness, and the social relationships of clients would add additional dimensions to the results and help to fully understand the differential impacts of formal savings on shock coping ability of its clients.

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APPENDIX

A.1: CONSTRUCTION OF WEALTH QUARTILE INDICATORS

Wealth is measured by the self-reported value of the household consumer and productive assets. The survey includes a module that was tailored for Malawi and covers nearly 50 types of assets with a 'catch all' other category. This list includes assets probes such as ownership of a bed, televisions, vehicles, and generator among others. First, we take the sum of the self-reported values for all assets the household reports they own. Next, the total asset value for the household is placed within the distribution of values for households within the same cluster to determine wealth strata. Therefore, the wealth quartiles presented here reflect wealth relative to other households within each cluster. Note that the assets here do not include land or buildings.

A.2: SHOCK RESPONSES IN EACH CATEGORY

Out of all possible shocks responses the following were considered distressed asset depletion and reducing consumption:

Distressed Asset Depletion	Reducing Consumption
Sold assets (tools, furniture, etc.)	Reduced Food Consumption
Sold farmland	Consumed Lower Cost, Less Preferred Food
Rented out farmland	Reduced Non-Food Expenditures
Sold animals	
Removed children from school to work	

A.3: COPING STRATEGIES OF NEW OIBM SAVERS AND THE REST OF THE SAMPLE

Coping Strategies Used by New OIBM Savers vis-à-vis Others

Coping Response	New OIBM Savers				Rest of Sample			
	2008		2010		2008		2010	
	Number of Households	Percent of Households	Number of Households	Percent of Households	Number of Households	Percent of Households	Number of Households	Percent of Households
Spent cash savings	22	26.5%	26	31.3%	631	32.9%	512	26.7%
Sold animals	9	10.8%	12	14.5%	155	8.1%	179	9.3%
Sold more crops	7	8.4%	11	13.3%	105	5.5%	258	13.5%
Worked longer hours, worked more	5	6.0%	12	14.5%	151	7.9%	319	16.6%
HH members who weren't working worked	1	1.2%	3	3.6%	6	0.3%	112	5.8%
Borrowed money from relatives	0	0.0%	1	1.2%	47	2.5%	97	5.1%
Reduced food consumption	0	0.0%	5	6.0%	9	0.5%	97	5.1%
Consumed lower cost, less preferred food	1	1.2%	2	2.4%	22	1.1%	77	4.0%
Reduced non-food expenditures	1	1.2%	3	3.6%	18	0.9%	59	3.1%
Spiritual effort	4	4.8%	3	3.6%	43	2.2%	87	4.5%
Did not do anything	24	28.9%	28	33.7%	680	35.5%	702	36.6%
Other specify	8	9.6%	13	15.7%	165	8.6%	298	15.5%
Gifts (Friends/Relatives)	0	0.0%	4	4.8%	0	0.0%	60	3.1%

Note: Number of Households that reported using coping strategy for at least one shock they faced. Coping strategies reported by less than 3% of households reporting shocks omitted. Coping strategies omitted were: sent children to live with relatives, selling assets, selling farmland, renting out farmland, starting new business, removing children from school to work, going elsewhere to find job, borrowing money from money lender, borrowing money from bank, receiving help from NGO, receiving help from religious organization, and receiving help from government.

A.4: FULL REGRESSION RESULTS

Detailed Regression Results For Whole Sample: Effects of Access to Formal Savings on Coping with Shocks

Outcome:	Δ in % shocks not coped with						Δ in reliance on reducing consumption						Δ in reliance on distressed asset depletion					
Estimate:	ITT			LATE			ITT			LATE			ITT			LATE		
Information campaign	0.042*	0.049***	0.040**				0.021	0.024*	0.027**				0.00	0.00	0.01			
	(0.095)	(0.008)	(0.019)				(0.233)	(0.06)	(0.038)				(0.96)	(0.84)	(0.653)			
New OIBM Saver				1.37*	1.97*	1.668				0.49	0.62	0.72*				0.02	0.10	0.24
				(0.09)	(0.08)	(0.12)				(0.15)	(.12)	(0.09)				(0.96)	(0.84)	(0.66)
Age			0.003			-0.002			-0.002			-0.01*			-0.00			-0.00
			(0.42)			(0.73)			(0.29)			(0.07)			(0.73)			(0.59)
Age^2			0			0			0			0.00*			0.00			0.00
			(0.53)			(0.598)			(0.336)			(0.09)			(0.46)			(0.41)
Distance			-0.014*			0.017			-0.003			0.01			-0.01			-0.00
			(0.088)			(0.514)			(0.626)			(0.50)			(0.64)			(0.91)
Number Shocks			0.023**			0.008			-0.009			-0.01*			0.00			-0.00
			(0.025)			(0.554)			(0.17)			(0.06)			(0.99)			(0.90)
Δ Number Shocks			-0.021***			-0.015*			-0.001			0			0.004			0.01
			(0.003)			(0.076)			(0.859)			(0.98)			(0.52)			(0.46)
Constant	-0.05**	-0.05**	-0.088	-0.084**	-0.277	-0.426	0.046***	0.019	0.143	0.03**	-0.10	-0.02	0.03**	0.13	0.19	0.03	0.11	0.13
	(0.01)	(0.021)	(0.551)	(0.013)	(0.157)	(0.183)	(0)	(0.11)	(0.11)	(0.04)	(.34)	(0.92)	(0.04)	(0.36)	(0.39)	(0.15)	(0.49)	(0.56)
Cluster-Pair Fixed Effects	N	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y
Obs.	1,790	1,790	1,771	1,790	1,790	1,771	1,251	1,251	1,240	1,251	1,251	1,240	1,251	1,251	1,240	1,251	1,251	1,240

*Note: ***, ** and * represent significance at 1, 5 and 10%, respectively. ITT: Intension to Treat; LATE: Local Average Treatment Effect. Clustered standard errors are given in parentheses.*

First Stage Regression for Whole Sample and Wealth Quartiles

Group	Whole Sample			Q1			Q2			Q3			Q4		
Information campaign	0.04***	0.033***	0.024***	0.035**	0.031**	0.014	0.037**	0.034**	0.027*	0.022	0.02	0.026	0.052**	0.051**	0.037
	(0.00)	(0.00)	(0.007)	(0.012)	(0.026)	(0.295)	(0.012)	(0.015)	(0.061)	(0.173)	(0.264)	(0.15)	(0.028)	(0.037)	(0.168)
Age			0.003***			0.003			0.001			0.007**			0.002
			(0.005)			(0.173)			(0.545)			(0.019)			(0.664)
Age^2			-0.00***			0.00			0.00			-0.00**			0.00
			(0.001)			(0.167)			(0.312)			(0.039)			(0.488)
Distance			-0.018***			-0.003			-0.009			-0.03**			-0.031*
			(0.005)			(0.833)			(0.399)			(0.029)			(0.075)
Number Shocks			0.008**			0.005			0.003			0.011			0.015
			(0.045)			(0.449)			(0.726)			(0.197)			(0.243)
Δ Number Shocks			-0.004			0.001			-0.001			0.004			-0.012
			(0.15)			(0.736)			(0.889)			(0.412)			(0.156)
Constant	0.02***	0.094	0.203**	0.008	-0.03**	-0.081	0.008	0.118	0.259	0.024**	-0.02	0.132	0.051***	0.249	0.483*
	(0.00)	(0.153)	(0.049	(0.157)	(0.042)	(0.546)	(0.157	(0.392)	(0.248)	(0.014	(0.264)	(0.397)	(0.00)	(0.16)	(0.079)
Cluster-Pair Fixed Effects	N	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y
Obs.	2,006	2,006	1,771	503	503	432	486	486	430	510	510	457	507	507	452
F-Statistic	16.832	1.587	1.273	6.311	0.256	0.1382	6.419	.	0.2121	1.858	.	0.3307	4.872	.	0.6681

Note: ***, ** and * represent significance at 1, 5 and 10%, respectively. ITT: Intension to Treat; LATE: Local Average Treatment Effect. Clustered standard errors are given in parentheses.