From participation to repurchase: Low income households and micro-insurance

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Abstract

The paper asks what drives insurance coverage in low income households by analysing repurchase patterns of micro-insurance policies. We use data on customers of a financial services provider from three states in India and find that the probability of repurchase is highest in the first two months after the contract expires, and steadily declines after. This suggests a window of opportunity for financial firms and governments to target customers to ensure continuous insurance purchase. Non-membership of micro-finance groups and poor rainfall in the month of expiry affect the chance of repurchase adversely. Customers who take longer to repurchase tend to increase the amount of insurance cover.

JEL codes: G21; G22; D14
Keywords: micro-insurance; credit; repurchase; India

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1 Introduction

Despite the importance that policy has given micro-insurance in improving financial access for low income households, studies show that households are yet to sufficiently adopt these products (Eling, Pradhan, and Schmit, 2014; Bock and Gelade, 2012). In this paper, we address a natural follow-up question: when households do purchase insurance, do they return to renew it? Micro-insurance contracts are typically one year contracts, making renewal or repurchase a conscious decision. If micro-insurance is to play the role of hedging against shocks to consumption, then repurchase is as important as the first adoption. Only when households continue to renew their policies, does micro-insurance become truly effective. Thus, it is important to understand what drives repurchase.

There is some literature on the question of what drives micro-insurance adoption. Several factors are identified in randomised control trials that constrain larger participation by these households. The studies show that households that face higher liquidity constraints are less likely to purchase insurance. Features of the contract such as the limited salience of the product for the household requirements, insurance premium, low financial literacy and the lack of trust in the formal financial system are additional factors that are barriers preventing poor households from greater insurance adoption (Giné, Townsend, and Vickery, 2008; Cole, Giné, et al., 2013; Cole, 2015).

In contrast to this, research on the *repurchase* of micro-insurance contracts is relatively limited. Repurchase of contracts is an important part of how insurance can help low-income households to achieve consumption certainty. It is when insurance becomes a persistent element of the household financial portfolio, that it can become a channel through which the household can manage event risk such as poor health episodes or other shocks to earning revenues and consumption better.

In this paper, we analyse repurchase of life and accident insurance using administrative data from a financial services firm that provides micro-insurance products in three states of India. The firm (IFMR Rural Channels and Services Private Limited, or IRCS) both provides financial advice as well as financial products to low-income customers, in regions which otherwise have a lack of other financial service providers such as banks. Since the IRCS branches tend to be the only service providers in these regions, they tend to have customers who visit them repeatedly for varying financial needs.

Therefore, this data allows us to study the repurchase of micro-insurance by low-income customers. This is unlike most of the current literature where the focus of randomised control treatment analysis typically focuses on understanding household behaviour around a single experiment. The data allows us to study customers whose initial insurance policy purchased has expired, and now face the repurchase decision for the first time. We ask which of these customers choose to repurchase, and how long after the expiry of the policy does it take them to repurchase? We also ask if at the time of repurchase, they increase the amount of insurance cover.

We find that the probability of repurchase rises in the first two months after expiry, and steadily declines after. This implies that if a customer does not repurchase within the first twelve months of the expiry of the first policy, repurchase is unlikely. Interestingly, a small proportion of customers who come back after a longer time since expiry of the policy, seem to purchase a larger amount of cover. We also find that the rainfall conditions in the month the policy expired influence repurchases - if rainfall has been very poor, then repurchases are less likely. This is especially the case if the member is not a micro-finance customer i.e. a member of a joint-liability group (JLG) prior to the purchase of the policy.

Our results suggest that there is a window of opportunity for financial firms or the government to design interventions to bring customers back into the coverage pool. It may be economically beneficial to retain a customer instead of winning the customer back. Our results also suggest that membership of a JLG is a driver of the repurchase decision. We think there are two drivers of this relationship - first because JLG loans provide liquidity to pay the premium, and second, more importantly, the seem to enable information gathering and trust building opportunities with the financial intermediary.

In the class of low-income countries, India has the highest micro life and accidental death and disability insurance participation because of life insurance regulations that mandate the sale of insurance products to rural areas (Roth, McCord, and Liber, 2007). Indian policy makers have incorporated insurance products as an explicit element of their financial inclusion drive. For example, the Government of India launched the distribution of a life micro-insurance scheme in 2014, the *Suraksha Bima Yojna* (DFS, 2015a) and an accident insurance scheme *Jeeven Jyoti Bima Yojna* (DFS, 2015b). The life insurance product offers a sum of Rs.200,000 (USD 3000) at an annual of premium of Rs.12 (USD 0.18) upon accidental death, while the latter offers the same sum at an annual premium of Rs.330 (USD 5) upon the event of death or permanent disability. Thus, these explicitly target the poorer among the population. We expect that the market for micro-insurance products will mature once customers have consistently purchased these products, and they have observed actual claims to conclude if such products do provide the insurance cover that was promised. Understanding patterns in repurchases, as well as observing decisions on how much low-income households purchase of assured amounts, can be valuable input into the design of the program in the coming years.

The paper is organised as follows. Section 2 describes the research setting. Section 3 describes the data and methodology. The results are discussed in section 4. Section 5 concludes.

2 The research setting

The importance of insurance in poverty alleviation arises from the observation that low-income households are more vulnerable to shocks that adversely impact their ability to smooth consumption (Dercon, 2002). For example, such households take a larger hit on their consumption during an illness or a death, or natural calamities such as droughts or floods. These risks are pervasive, and yet there is a paucity of insurance contracts that are accessible to such households to protect against such shocks. This has led to a significant role of micro-insurance in the policy debates about the type of products to improve financial access of low income households (Morduch, 2004). Micro-insurance is defined as protection of low-income individuals against specific risks, such as those outlined above, in exchange for regular premium payments proportionate to the likelihood and cost of the risk involved (Churchill, 2006).

What early research on participation in micro-insurance shows is that households appear to not purchase enough of it (Eling, Pradhan, and Schmit, 2014; Bock and Gelade, 2012). The research, which is mostly in the form of randomised control trials, finds that insurance purchase is constrained by price, trust, liquidity constraints and limited salience (Giné, Townsend, and Vickery, 2008; Cole, Giné, et al., 2013). Education levels seems to matter to adoption (Bendig and T. Arun, 2011), as do awareness building and training (Gaurav, Cole, and Tobacman, 2011; Dercon et al., 2014). Cole, Stein, and Tobacman (2014) demonstrate that insurance payouts in a village have a significant impact on participation. This suggests that information generated by insurance payments has village wide effects.

A follow-up question that naturally arises is, whether households choose to repurchase micro-insurance once they have purchased it in a given year? Micro-insurance contracts are typically one year contracts, making repurchase a conscious decision. This is different from lapsation in normal insurance contracts, where the policy holder commits to paying regular premiums over a long horizon, and stops paying before the term is over. Repurchases, or renewals, is an area where research is limited. Fitzpatrick, Magnoni, and Thornton (2011) and Thornton et al. (2010) find low renewal rates of micro-insurance (health) in Nicaragua, while Dong et al. (2009) and Platteau and Ontiveros (2013) find similar results in Bukrina Faso and India respectively. Evaluating the drivers of repurchase is especially important, because it is only when households continuously renew their contracts, can micro-insurance truly become an effective means of smoothing consumption.

We focus on the repurchase of life and accident insurance. Clarke and Dercon (2009) show that death of a family member is one of the largest risk facing low income households. Life insurance has also been identified as the most widely demanded in low-income countries (Roth, McCord, and Liber, 2007). It is also less susceptible to the problems of moral hazard and basis risk that typically make pricing and sales of insurance difficult. Life insurance is therefore an important market to understand.

While life insurance demand has been a subject of much theoretical and empirical research (Browne and Kim, 1993; Li et al., 2007), evidence in the context of micro-insurance is limited (Giesbert, Steiner, and Bending, 2011; T. Arun, Bendig, and S. Arun, 2012; Bauchet, 2014). In most recent research on participation in life insurance, Bauchet (2014) finds that the information content of the message has a large influence, in particular conveying the financial and emotional toll of premature death. The consensus that emerges from the literature is that the better the understanding about the product and the greater the trust in the product as well as the service provider, the greater is the participation.

2.1 Our research questions

Since most of the research has focused on the question of micro-insurance participation, we focus on the decision to repurchase micro-insurance. Repurchase is the purchase of the product after expiry i.e. after the first one-year term has passed. We ask whether the same factors that are expected to influence participation also affect repurchase. We ask:

1. Does access to credit matter for repurchase?

   An element that may matter for repurchase is available liquidity, i.e. ready access to funds to pay for the insurance premium. Low liquidity constraints are likely to be correlated to higher demand for insurance. Giné, Townsend, and Vickery (2008) find that households who report themselves as credit rationed have a lower probability of insurance purchase. Cole, Sampson, and Zia (2011) give people an endowment of Rs.25 or Rs.100 and find higher insurance purchases by those with higher endowment. They conclude that liquidity constraints matter because the larger endowment has a larger effect on poorer individuals on whom liquidity constraints are more likely to be binding. Their surveys point to lack of sufficient funds as most common response to why insurance is not purchased. Liu, Chen, et al.

(2013) find a higher insurance participation when farmers are offered credit vouchers when buying insurance that allowed them to delay payment of the premium until the end of the insured period. Liu and Mayers (2014) finds that a binding liquidity constraint causes the demand for actuarially fair insurance to drop below full coverage. Thus, if liquidity constraints are severe enough, the optimal choice can be to forego buying insurance altogether.

Access to credit may also be important from the point of view of building familiarity with finance, and the financial service provider.

2. Does wealth influence the decision to repurchase insurance? If so, in which direction?

   There is no clear prediction from expected utility theory on whether wealthier individuals will continually purchase insurance. On one hand, Gollier (2003) argues that wealthy individuals will prefer to draw down their wealth in the event of an adverse shock, to purchasing insurance which involves paying a premium upfront for a conditional redemption. This suggests that only when the wealth is zero, would consumers purchase external insurance. On the other hand, there is the empirical evidence, which suggests otherwise. For example, in the case of insuring against poor rainfall outcomes, Giné, Townsend, and Vickery (2008) and Cole, Sampson, and Zia (2011) find that wealthier households are more likely to purchase rainfall insurance.

Thus, we expect that access to credit and wealth are common factors that influence participation as well as drive the repurchase, to the extent that these may constitute important reasons for consumers dropping out of insurance. If this is true, it can provide guidance on how to design measures to improve persistence. We now describe the products in our dataset, and the financial services provider of the products.

2.2 The financial services provider and products

Our data comes from the IFMR Rural Channels and Services Private Limited (IRCS) which implements the Kshetriya Gramin Financial Services (KGFS) branch-based model of distributing financial products across India.[1] As of March 2014, KGFS branches operated out of five geographical regions:[2]

[1] For more details, see `http://ruralchannels.ifmr.co.in/kgfs-model/about-kgfs`

[2] These regions are chosen by the service provider because of their inaccessibility to formal finance. In each village with a KGFS branch, the nearest bank branch is at least 2-5 kms away. This implies that most households in the KGFS villages will tend to have limited access to formal finance.

- Two districts in the South Indian state of Tamil Nadu. These are fertile agrarian economies.
- Two districts in the East Indian state of Orissa. These are characterised by subsistence agriculture supplemented by domestic migration.
- Five sparsely populated, hill districts in the North Indian state of Uttarakhand. These are dominated by trade and services and is least likely to be impacted by variation in rainfall.

The KGFS model has three distinctive features. First, each KGFS branch is designed to be a regional institution serving a specific territory with distinct geographic, economic, and linguistic characteristics. Second, KGFS follows a "wealth management approach", i.e. every enrolled client is provided with financial advice tailored to the client's socioeconomic profile. The advice is generated through a proprietary optimisation algorithm that aims at promoting the financial well-being of the client.[3] Third, KGFS distributes a wide variety of products that include micro-finance loans, long-term pension product, remittance products and micro-insurance products. In this set-up, the credit product is not officially tied to the insurance product.

In this paper, we study the experience of the two main insurance products. These are:

Term life insurance The Term life insurance (access to creditTLI) is a one year product that covers mortality risk of customers. The purpose of the product is to protect the financial well-being of a household from financial shocks arising due to loss of human capital as a result of death. The premium ranges from Rs.1.42 per Rs.1000 sum assured at age 18, to Rs. 14.17 per Rs.1000 sum assured at age 59.[4] The minimum sum assured is Rs.25,000 and the maximum is Rs.250,000 in multiples of 25,000. The median annual income of this group is around Rs.125,000, so a purchase price of about Rs.300 for a 35 year old is almost 3 percent of the monthly household income, and almost 12 percent of the monthly per capita income. The sum assured is paid to the nominee on death. The premium is a function of the age of the customer, and the sum assured desired. In case of suicides only 80% of premium amount is to be reimbursed.

Personal Accident Insurance The Personal Accident Insurance (PAI) is also a one year product that covers mortality risk or permanent disability risk of customers arising due to accident. The purpose of this product is to protect the financial well-being of a household from financial shocks arising due to loss of human capital

[3] We do not have access to this algorithm, or the advice that was actually provided to the client.
[4] The TLI is not sold to those above the age of 59.

i.e. death or extreme disability as a result of an accident. The premium for PAI is about Rs.0.5 per Rs.1000 sum assured. The minimum sum assured is Rs.100,000 and the maximum is Rs.1,000,000 in multiples of 100,000. The PAI is not sold to those above the age of 69.

The two contracts are similar in that they have a payout in the event of death. However, PAI is restricted to only death (or permanent disability) by accident. The differential in premium arises because TLI is a "life insurance" product, while PAI is a "general insurance" product. Under Indian regulations, a general insurance product is much cheaper than a life insurance product. Also, the TLI provides cover for death owing to any cause, as opposed to PAI which provides cover only owing to an accident. These reasons make the TLI more expensive than the PAI.

3 Data and methodology

3.1 Data

Our data consists of 144,370 customers whose policy expired between March 2011 and March 2014. We drop customers above the age of 60, as the term life insurance is not sold to those above 60. We also drop customers who report an annual household income of greater than Rs.2,000,000 based on feedback from the service provider that an income higher than this is likely to be a reporting error. This gives us a total sample of 132,008 customers. 85 percent of these customers belong to different households, while 15 percent (19186 customers) are from the same household. Of the total number of customers, 90567 (69 percent) customers have purchased only the accident insurance (PAI) policy, 33031 (25 percent) have purchased both the accident and life insurance policies, and 7931 (6 percent) have purchased only a life insurance (TLI) policy.

The dataset includes information on customer demographics such as age, gender, marital status, education, occupation family size and annual household income. Other relevant information includes household information: does the household of the customer have a private toilet, have electricity, use wood, kerosene or gas as a cooking medium, whether the household owns a house, land, livestock, runs a shop or owns consumer durables[5]. These variables are then used to create an asset-index as a proxy for household wealth, and divide the index into four quartiles for further analysis.[6] We use a principal components

[5]In the dataset, consumer durables include jewellery, vehicle, agricultural equipment, computer, TV, refrigerator, mobile phone, grinder, mixer, washing machine, sewing machine.

[6]Details on the asset index are provided in the appendix.

procedure to determine the set of weights for each of these assets as described by (Filmer and Pritchett, 1998)[7]

The geographical variation in KGFS branches can cause interesting variation in insurance repurchases in that it is linked to variation in rainfall. There is high agrarian presence in the dataset, and since the agricultural economy is likely to be impacted by rainfall, household income is likely to be highly correlated with rainfall. A season with a normal level of rainfall will imply a constant level of income, while periods with floods or droughts are likely to be periods of constrained liquidity. A change in income is likely to significant impact the ability of households to renew their insurance contracts. In order to capture this, we categorise the month in which the policy expired according to the deviation of rainfall faced by the district in which the insured resides.[8] If the long term rainfall deviation in the district of the insured is greater than 19 percent in the month of expiry, then we categorise it as "excess". Similarly, deviation between -19 and 19 percent is classified as "normal", deviation between -59 percent and -20 percent is classified as "deficient", while deviation less than -60 percent is classified as "scanty". We create these categories for each observation of individuals insurance participation.

We measure access to credit by membership of a joint-liability group (JLG). In the geography that is considered in the paper, it is likely that those who are members of a JLG are the only ones with access to loans, as formal finance does not really have a presence. We expect that if access to credit matters, then JLG membership should be an important driver of insurance repurchase, especially in times of poor rainfall.

3.2 Methodology: Time to repurchase

Since repurchase is a binary event – either the individual purchases the insurance again or not – a static probit model can be used to study insurance policy repurchases. A probit model, however, fails to control for each individuals period at risk. When the time between expiry and repurchase is long, it is important to control for the fact that some individuals repurchase policies many months after the expiry of the first, while other do so immediately. We, therefore, estimate a reduced-form hazard function of the period of non-repurchase for a given customer, once the policy has expired, using the following

[7] Principal components analysis (PCA) extracts from a large number of variables those few orthogonal linear combinations of the variables that best capture the common information. The first principal component is the linear index of variables with the largest amount of information common to all of the variables.

[8] Source: Indian Meteorological Division. `http://www.imd.gov.in/section/nhac/dynamic/mid1.htm`

approach:

Let T represent the time to repurchase a micro-insurance policy. We are interested in the hazard of repurchase i.e., the instantaneous probability of repurchase of the insurance policy, conditional on it not having been repurchased until that time. We assume that T is a random variable with a cumulative distribution function $P(t) = Pr(T \leq t)$. The origin of T i.e. survival time, is the time at which the insurance policy expired. In our sample, T can be censored where the study period ends before we observe whether the customer repurchased the policy or not. What we do observe is $T = min(T, C)$ where C is an indication of whether the observation is censored.

Then, the hazard of repurchase is defined as

$$h(t) = \lim_{h->0} \frac{P(t \leq T < t + h | T \geq t)}{h}$$

$h(t, x)$ is the hazard function which mirrors the probability of renewing the policy, t months after expiry of the first. The hazard depends on the covariates x.

The covariates include measures of wealth and liquidity constraints. These include deviations in rainfall from the long-term average, the asset quartile the customer belongs to, and JLG membership. The rainfall variable is divided into four categories: excess, normal, deficient and scanty rainfall. We expect the coefficient to have a negative sign in times of deficient or scanty rainfall, indicating that bad external economic outcomes affect the ability of customers to pay for the insurance renewal. We expect the coefficient on the JLG membership to be positive. We also control for customer demographics including age, gender, education, and occupation, as well the income of the household the customer belongs to.

The model most frequently used for such analysis is the Cox-proportional hazard model. This model assumes proportional hazards i.e. there is an underlying hazard rate over time, and differences in the covariates simply lead to differences in the relative hazard rate at a point in time. The model assumes no interaction between time and covariates. We considered the model as well, but found that the tests for proportion hazards were not met with our data. Hence, we used a parametric survival model where the event time is explicitly modeled using a statistical distribution. More specifically, we used the Weibull model, which leads to a hazard rates which either increase or decrease monotonically over time.[9]

[9] We tested the model using other functional forms as well, and found the Weibull to be the best fit.

3.3 Methodology: Increases in coverage

The second aspect we wish to model is an increase in insurance coverage in subsequent repurchases, and what determines its magnitude. Of course, an increase in coverage is meaningful only for those who chose to repurchase their policy. This implies that the dependent variable is observed for a restricted, nonrandom sample, and that the error term in the selection equation, i.e. selecting to renew the policy, may be correlated with the error term in the outcome equation i.e. increasing insurance coverage.

This may lead to biased and inconsistent estimates, as was pointed out in (Heckman, 1976; Heckman, 1979). A 2-step solution of this problem requires us to estimate the selection equation (Pr(renew insurance) in our case), and use the results from this to predict the probability of increase in coverage for each respondent. The predicted individual probabilities are transformed into the inverse-mills-ratio i.e. $\frac{\phi(.)}{\Phi(.)}$, where $\phi(.)$ and $\Phi(.)$ are standard normal density and cumulative distribution functions. The inverse-mills-ratio is then used as an explanatory variable in the outcome equation.

4 Results

4.1 Who repurchases?

We find that 65 percent of the sample renewed their insurance policy, a repurchase rate that is much higher than what has been reported in the literature.[10] Life insurance contracts do not suffer from basis risk, and therefore individuals do not have to worry about not getting a payout. The proportion of repurchases have however, been falling over time. As shown in Figure 1 shows that those who had purchased insurance in early years have repurchased more than those who purchased the insurance later. We return to this question in Section 4.2.

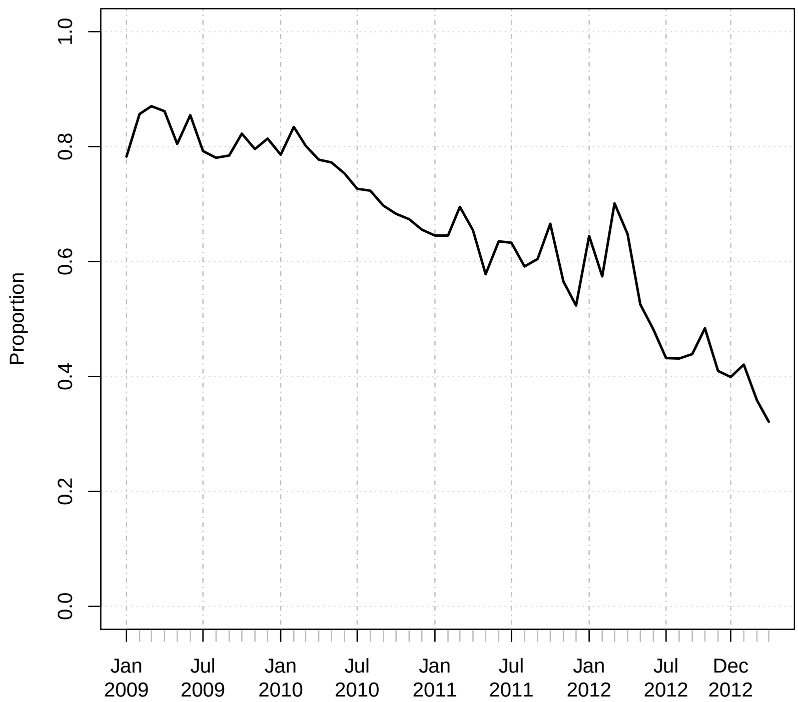
Table 1 describes the sample characteristics that renewed insurance.

There are three characteristics that stand out. First, there is a large difference in repurchases between the group with a micro-finance (JLG) loan before the purchase of the insurance policy (74 percent repurchases) compared to those without a JLG loan (59 percent repurchases). Second, the maximum repurchases (73 percent) can be seen for those whose policy expired in the month with "normal" rainfall, while the lowest repurchases (66 percent) are for those whose policy expired in the month with "scanty" rainfall. If

[10]Fitzpatrick, Magnoni, and Thornton (2011) and Thornton et al. (2010)

Figure 1 Repurchase by date of purchase of policy

This figure presents the proportion of people who repurchased their policy by the year of the first purchase. That is, almost 80 percent of those who had first purchased the policy in 2011, also repurchased again.



variations in rainfall lead to financial difficulties, then it is possible that customers postpone the repurchase of insurance. Third, repurchase is highest (67 percent) for those with the most assets.

Figure 2 shows the repurchase rate for combination of the rainfall, JLG and asset index variables. The repurchases are highest (80 percent) for those whose policy expired in times of normal rainfall, who are in the second quartile of the asset index, and have accessed JLG loans. In fact, the differential between good and bad rainfall times is not high for all asset groups in the presence of the JLG. The differential in all asset groups is higher when the customer is not a JLG customer, and it is most stark when rainfall is scanty.

This suggests that across wealth groups, bad rainfall outcomes impair the ability of the individual to renew insurance contracts. In contrast, the presence of micro-credit, which reduces the liquidity constraints on the individual, appears to mitigate the impact somewhat.

Table 1 Characteristics by repurchase

This table presents characteristics of the sample that renewed their insurance. The N indicates the number of observations in each category. The number in the square brackets shows average or proportion of observations in each category. For example, of those 74% of those who had a micro-finance (Joint Liability Group or JLG) loan at the time of taking the insurance renew their insurance. This is opposed to 59% of those who did not have a JLG loan at the time of insurance purchase. The dataset contains 74,659 customers who were not members of a JLG group, and this constitutes 57% of the data-set, while JLG customers constitute 43% of the data-set. Repurchases by each component of the asset index is provided in the Appendix.

Proportion renewed insurance: 0.65
Number of observations: 132,000

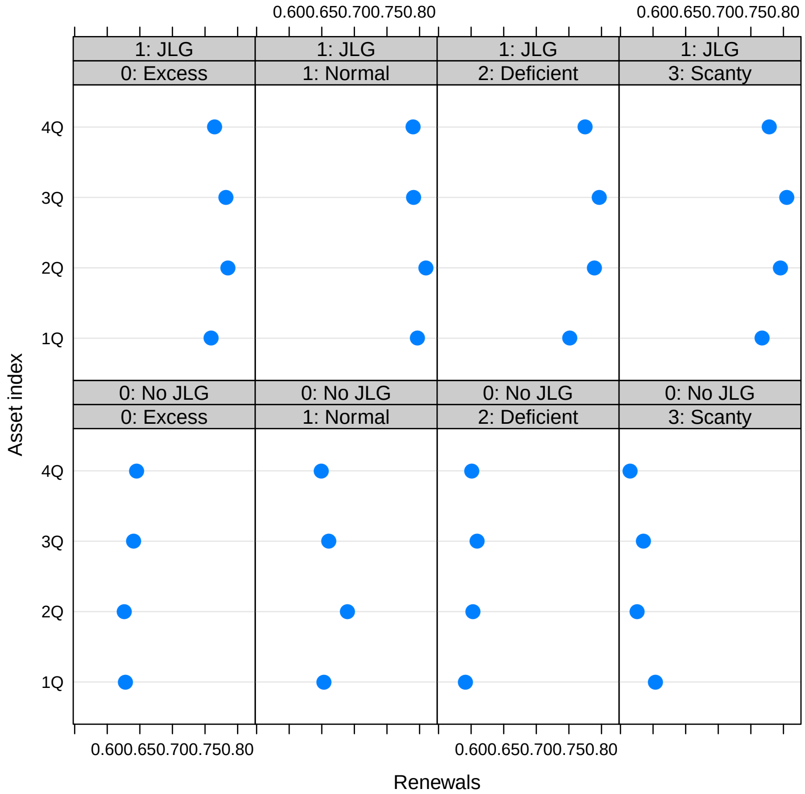
	Mean (renewed)	SD	N [Overall Mean]
JLG: No	0.59	0.49	74,659 [0.57]
JLG: Yes	0.74	0.44	56,870 [0.43]
Rainfall: Normal	0.73	0.44	19,250 [0.17]
Rainfall: Excess	0.69	0.46	45,648 [0.40]
Rainfall: Deficient	0.67	0.47	21,753 [0.19]
Rainfall: Scanty	0.66	0.47	27,492 [0.24]
Asset index: 1Q	0.62	0.48	35,039 [0.26]
Asset index: 2Q	0.65	0.48	34,945 [0.26]
Asset index: 3Q	0.66	0.47	34,917 [0.26]
Asset index: 4Q	0.67	0.47	26,628 [0.20]
Household income '000'	124.52	230.25	132,000 [127.1]
Age	38.78	9.04	132,000 [39]
HH size	4.45	1.40	132,000 [4.4]
Gender: Female	0.70	0.46	76,564 [0.58]
Gender: Male	0.58	0.49	54,965 [0.42]
Married	0.67	0.47	122,767 [0.93]
Single	0.39	0.49	8,762 [0.07]
Caste: General	0.48	0.50	16,419 [0.87]
Caste: SC/ST/OBC	0.67	0.47	115,110 [0.12]
Hindu	0.65	0.48	124,803 [0.95]
Non-Hindu	0.66	0.47	6,724 [0.05]
Education: Illiterate	0.61	0.48	20,958 [0.15]
Education: Primary	0.68	0.47	50,942 [0.39]
Education: Secondary	0.64	0.47	55,419 [0.42]
Education: Graduate	0.53	0.50	4,210 [0.03]
Occ: Agri-allied	0.59	0.49	21,193 [0.17]
Occ: Business	0.58	0.49	13,990 [0.11]
Occ: House-wife	0.68	0.46	15,977 [0.13]
Occ: Labour	0.67	0.47	61,493 [0.49]
Occ: Not working	0.64	0.48	5,249 [0.04]
Occ: Others	0.55	0.50	1,872 [0.01]
Occ: Salary	0.56	0.50	5,788 [0.05]

4.2 How long to repurchase?

The first step we use to understand whether there are patterns in how much time customers take to repurchase their policies after it has expired is a graphical analysis of how repurchase hazards vary over the expiry spell. Figure 3 presents the Kaplan-Meier survival curves where the event is a repurchase. The survival probabilities reflect the probability of not purchasing the policies. These are computed as the number of failures (i.e. repurchases) in month t divided by the size of the risk set at the beginning of the month.

Figure 2 Repurchase by wealth, rainfall and micro-credit (JLG) participation

This figure presents the proportion of people who renewed their policy depending on wealth, rainfall and micro-credit (JLG) participation.



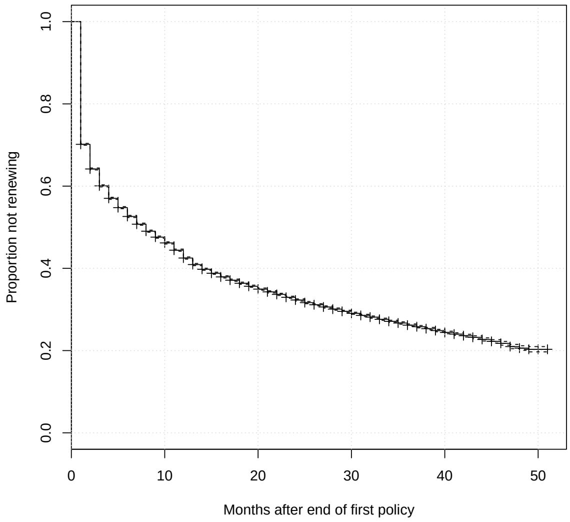
The sharpest single drop in survival probabilities is within the first 1-2 months of the expiry of the policy. After that, the survival probabilities continue to decrease but at a more gradual rate. This continues over the period of twelve months and is irrespective of when the initial policy was taken. This implies that if an individual does not repurchase her policy within twelve to fifteen months of its expiry, she is unlikely to do so after. This might also reconcile the low proportion of repurchases in later years see in Figure 1. It is possible that several of the customers may come back in 12 months time.

What is interesting about the time to repurchase is that repurchase continues for almost twelve months after expiry of the policy. This raises the following question: if individuals do ultimately repurchase their policy, what causes them makes to wait so long?

We use the observations from the previous Section 4.1, and plot the survival curves by rainfall and JLG status. The top panel in Figure 4 shows the survival curve of those whose policy expired in months of normal and scanty rainfall. The bottom panel shows the survival curve of those with and without JLG.

Figure 3 Kaplan-Meier estimates for repurchase of insurance

This figure presents the Kaplan-Meier survival curves for the event of repurchase of policies.



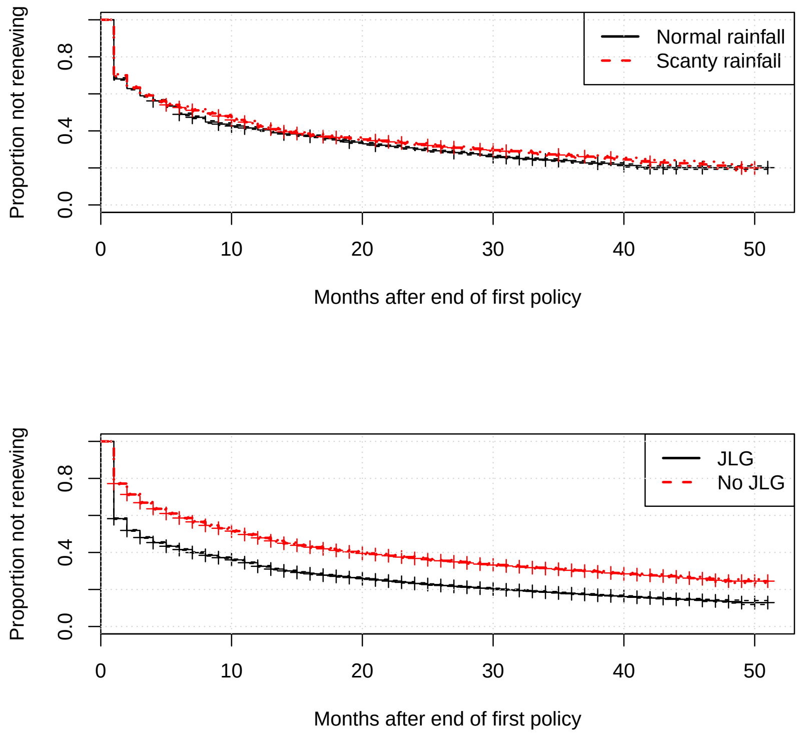
We find that there is a slight difference in the survival probability of individuals whose policies expired during periods of different rainfall, when rainfall is scanty and when rainfall is normal. The survival probability is a bit higher in the first month if rainfall is normal. This suggests that, when expiry of the policy occurs in the month with scanty rainfall, the proportion of individuals who repurchase is slightly lower than when expiry of the policy occurs in the month with normal rainfall. But the survival curves largely overlap. The difference in survival probabilities is visibly large when it comes to individuals with and without JLG membership. Those without JLG loans before the purchase of the first policy have a much higher survival probability i.e. they are less likely to repurchase their insurance than those who were on a JLG loan.

4.3 Does more time to renew imply greater coverage?

From the previous two sections, we observe that individuals chose to repurchase their policies if they are facing less adversity (normal rainfall, micro-credit loan) than if they are more constrained (poor rainfall, no micro-credit loan) at the time that the contract expired. But some of these individuals in the sample do repurchase their policies, albeit after a longer period compared to other individuals who did not face similarly adverse conditions. We next ask the question of whether these individuals, who chose to repurchase their policies at a later date, renew for the same amount or for a higher amount.

Figure 4 Kaplan-Meier estimates for repurchase of insurance by rainfall and JLG

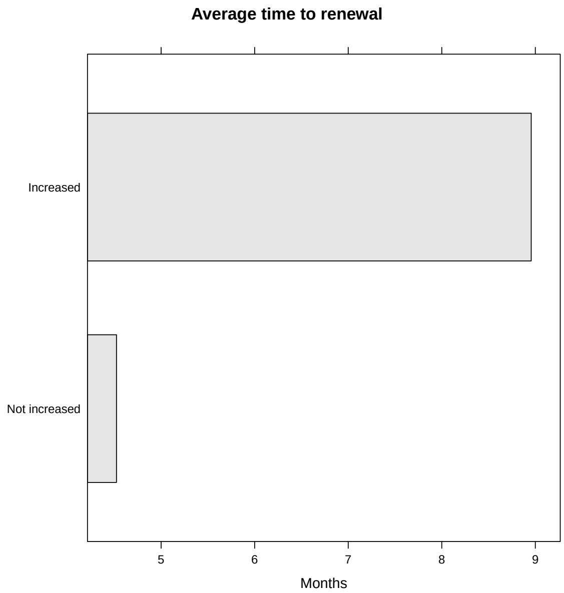
The graph presents the Kaplan-Meier survival curves where the event is defined as repurchase of life insurance policies.
In the top panel, there are two plots where one plot is the survival curves for those individuals whose policies expired in months with "normal" rainfall and those whose policies expired in months with scanty rainfall.
In the bottom panel, there are two plots where one plot shows the survival curves for those individuals who were also borrowers compared to the survival curves for those who were not.
The graph shows that there is a distinct difference between the survival curves of individuals with micro-finance loans. However, there is less difference for those whose policies expired during periods of normal and scanty rainfall.



We use the value of the premium that a household pays to determine if the cover purchased by the customer has increased, decreased or stayed the same. We also use the price of insurance at each age to calculate the premium value. For example, since PAI only covers death or disability by accident while TLI covers both, the value of a Rs.100,000 cover for both cannot be treated as the same. We therefore use a factor of 0.5 to calculate the total cover. For example, if an individual has paid Rs.100,000 TLI cover and Rs.100,000 PAI cover implies a total cover of Rs.150,000. We define an increase in cover only if the difference between the coverage purchased at repurchase is at least Rs.50,000 more than the coverage purchased for the first policy.

Figure 5 Coverage increases and time to repurchase

The graph below presents the fraction of customers who renewed their policies, and how much premium was paid. The graph shows that only those who tend to renew soon after their policies expired, did not increase their cover. All those who took more than a month or two to renew their policies paid a higher premium.



We find that in our sample, only 28 percent of those who repurchased also increased the cover purchased. In Figure 5 we examine the average time to repurchase of those who had increased their insurance coverage. We see that those who took a longer time to repurchase their policies tend to also increase their insurance cover.

We also examine whether the increase in cover is occurring because customers are purchasing more of the same type of policy, or diversifying by purchasing two different types of policies. We find that the 47 percent of those who increased their cover had gone from having one policy (accident cover, for example) to purchasing both policies (accident and term life cover). A move from a PAI only policy to both policies will imply a jump in premium, as the life insurance policy is more expensive than just the accident insurance policy. This might explain the longer time between expiry and repurchase of those who increase their cover.

Table 2 shows the summary statistics of the sample that increased their insurance coverage on repurchase.

Unlike the repurchase decision, where JLG membership seemed to matter, the coverage decision is not influenced by JLG membership. A greater proportion of those whose policy expired in months of deficient rainfall seem to increase cover, even though from Table 1 we know that the proportion of repurchases is lower. A possible explanation for

Table 2 Characteristics of households who increased insurance cover

This table presents characteristics of the sample that increased their insurance cover. The number in the square brackets shows the overall mean. For example, of those in the first quartile of the asset index, 31% increased their insurance cover on repurchase. The first quartile of the asset index included a total of 21,829 observations, and made up 26% of the data-set. Increases by each component of the asset index is provided in the Appendix.

Proportion increased cover: 0.28
Number of observations: 85,494

	Mean	SD	N
Household income in Rs. ('000)	126.92	124.14	85,494 [119]
Age	36.98	8.79	85,494 [39]
HH size	4.46	1.41	85,494 [4.4]
JLG: No	0.28	0.45	43,688 [0.51]
JLG: Yes	0.28	0.45	41,806 [0.49]
Rainfall: Normal	0.27	0.44	14,055 [0.18]
Rainfall: Excess	0.25	0.43	31,610 [0.40]
Rainfall: Deficient	0.29	0.45	14,600 [0.18]
Rainfall: Scanty	0.27	0.45	18,278 [0.23]
Asset index: 1Q	0.31	0.46	21,829[0.25]
Asset index: 2Q	0.28	0.45	22,684 [0.26]
Asset index: 3Q	0.27	0.44	23,109 [0.27]
Asset index: 4Q	0.26	0.44	17,872 [0.21]
Gender: Female	0.28	0.45	53,415 [0.62]
Gender: Male	0.27	0.45	32,079 [0.37]
Married	0.28	0.45	82,049 [0.96]
Single	0.35	0.48	3,445 [0.04]
Caste: General	0.31	0.46	7,859 [0.09]
Caste: SC/ST/OBC	0.28	0.45	77,635 [0.91]
Hindu	0.28	0.45	81,035 [0.95]
Non-Hindu	0.28	0.45	4,457 [0.05]
Education: Illiterate	0.26	0.44	12,897 [0.15]
Education: Primary	0.26	0.44	34,577 [0.40]
Education: Secondary	0.30	0.45	35790 [0.42]
Education: Graduate	0.32	0.46	2230 [0.03]
Occ: Agri-allied	0.26	0.44	12,508 [0.15]
Occ: Business	0.31	0.46	8,171 [0.10]
Occ: House-wife	0.28	0.45	10,931 [0.13]
Occ: Labour	0.28	0.45	41,321 [0.51]
Occ: Not working	0.27	0.44	3,355 [0.04]
Occ: Others	0.33	0.47	1,024 [0.01]
Occ: Salary	0.29	0.46	3,264 [0.04]

this is that in times of deficient rainfall, repurchases fall, but when this group comes back again, it purchases more cover. A larger proportion of those in the lowest asset quartile seem to increase their insurance cover, as do those involved in business.

4.4 Hazard model estimates

Table 3 presents the results from the hazard model. Column (1) shows the results when only the JLG membership variable is used in the estimation. Column (2) and (3) show the results with the asset and rainfall variables added to the specification. Column (4) describes the results of the full model i.e. one where we include all demographic and income controls. In these estimations, the base for the different discrete variables are as follows. The base for JLG is non-membership of a JLG. The base for the asset index is the first quartile. The base rainfall variable is excess rainfall. For the variable gender, the base is female, for education is graduate and above, for occupation is agriculture, for caste is the general category of caste (i.e. not low caste), and for religion is Hindu. We find that as we increase more covariates to the models, the estimates on rainfall, assets and JLG membership do not change significantly. Hence we focus the discussion on the results in Column (4).

JLG membership
We find that having taken a micro-credit loan increases the repurchase hazard by 34 percent, statistically significant at the 1 percent level. If credit were a substitute for insurance, then JLG membership should have crowded out the repurchase of insurance. But this does not seem to be the case. This result is consistent with evidence reported from other parts of the world which shows that 36 percent of covered lives and 60 percent of life products are directly linked to credit schemes (Roth, McCord, and Liber, 2007).

What could be the drivers for this result? There could be four possible explanations. First, members may be taking an insurance cover to be able to use the sum assured to pay off the loan in the event of death. However, in the case studied in this paper, repayment of loans is waived off in the event of death of the debtor. This implies that the customer does not need to purchase insurance to ensure repayment. The financial services provider also has nothing to gain from the point of view of repayment, and has little incentive to push the insurance product.

A second explanation could be that access to credit may provide the liquidity to pay the insurance premium. We looked at the date of insurance repurchase and the take-up of a JLG loan. We find that 17 percent of those who renew insurance have taken a new JLG loan within 7 days of the insurance purchase, and another 18 percent have taken a new loan within 14 days of the insurance purchase. But this leaves out almost 65 percent of customers who do not enter a new JLG contract around the same time as the insurance repurchase. These numbers suggest that some part of the loan amount may be used in the payment of the insurance premium, but it does not appear to be an over-whelming reason. This also shows that insurance products are not pushed or forcibly sold along with credit.

A third reason could be that there are complementarities between credit and insurance participation. Since credit and insurance are offered in the same branch, a higher demand for credit may translate into higher repurchase of insurance, as customers visit the branch more frequently, and get more exposed to other financial products, and are perhaps

Table 3 Hazard model: Repurchases

	(1)	(2)	(3)	(4)
Has JLG	0.47***	0.41***	0.39***	0.34***
	(0.006)	(0.007)	(0.007)	(0.001)
Assets: 2Q		0.028***	0.03***	0.021**
		(0.009)	(0.010)	(0.01)
Assets: 3Q		0.022**	0.028***	0.013
		(0.009)	(0.010)	(0.1)
Assets: 4Q		−0.124***	-0.120***	-0.121***
		(0.011)	(0.011)	(0.012)
Rain: Normal			-0.011	-0.015
			(0.015)	(0.016)
Rain: Deficient			-0.018	-0.017
			(0.014)	(0.014)
Rain: Scanty			-0.065***	-0.067***
			(0.013)	(0.014)
Log(hh income 000)				-0.064***
				(0.014)
Log(hh income square)				0.003**
				(0.002)
Age				0.100***
				(0.003)
Age square				-0.001***
				(0.00004)
Gender: male				-0.056***
				(0.01)
Education: Illiterate				0.011
				(0.026)
Education: Primary				0.169***
				(0.025)
Education: Secondary				0.120***
				(0.025)
Occ: Business				0.260***
				(0.015)
Occ: Labour				0.204***
				(0.011)
Occ: Not-Working				0.079***
				(0.013)
Occ: Others				0.088***
				(0.034)
Occ: Salary				0.097***
				(0.021)
Caste: Not general				0.046***
				(0.018)
Religion: Non-Hindu				-0.036**
				(0.017)
HH size				0.042***
				(0.003)
Observations	131,529	129,273	111,929	106,155
Log Likelihood	−-303,678	−-294,767.5	-276,433.6	-258,677.4

Controls for month and year of policy expiry
Controls for region
Note: *p<0.1; **p<0.05; ***p<0.01

able to build trust about the financial service provider. For example, Giesbert, Steiner, and Bending (2011) show a mutually reinforcing relationship between the use of micro-insurance and the use of other financial services.

Finally, it is possible that there are unobserved differences between those who have chosen to take a JLG and those who have not, and it is these differences that are driving the result. Given this dataset, we are unable to statistically pinpoint the exact mechanism that drives credit and insurance purchase. However, the high correlation between a JLG and an insurance purchase does suggest that there are complementarities between the products, other than just providing ready access to funds, which need to be explored.

Asset ownership
Wealth is the second most significant variable. We find that individuals in the second quartile of assets have a higher repurchase hazard than those in the first quartile. The repurchase hazard decreases when moving up the asset index: those in the last quartile of assets are 12 percent less likely to repurchase insurance relative to those in the first quartile of assets. This is consistent with the perspective that individuals only consider the purchase of insurance when they do not have enough buffer stock wealth (Gollier, 2003). This is also consistent with empirical evidence which shows that households primarily demand life insurance when they lack accumulated reserves, or wealth, for self-insurance (Matteo and Emery, 2002).

Rainfall
We find that large deviations from long-term rainfall reduce the hazard of repurchase. When the policy expires in months with scanty rainfall, the repurchase hazard reduces by almost 7 percent, which is statistically significant at 1 percent. There is no difference in the repurchase hazard when rainfall is normal or deficient, relative to when there is excess rainfall. This suggests that collecting premiums during a lean period resulting from poor rainfall outcomes restrict the ability to pay premiums.

Other socio-demographic variables
We find that repurchase hazard decreases with income and increases with the square of income. The repurchase probability first increases with age, but declines after. This is contrary to T. Arun, Bendig, and S. Arun (2012) who find that insurance demands decreases with age, but increases after. They attribute it to the older people having a higher incentive to protect family in the case of death. Our results may be driven by the fact that the service provider does not sell insurance to those above a certain specified age.

On individual characteristics, we find that men are less likely to renew their policy than women. Relative to those with a graduate degree, those with a primary and secondary schooling are more likely to renew their policies. We find that a non-Hindu is less likely to renew than Hindus. Agriculture seems to have the lowest repurchase probability. This is consistent with other work that shows that religion can play a role on insurance decisions (Browne and Kim, 1993).[11]

4.5 Increases in coverage

We turn next to understanding what drives increases in coverage. Table 4 shows the results from a Heckman selection model on the determinants of increase in coverage.[12] We use JLG participation to account for exclusion restrictions, since this participation is seen to have an impact on the probability of repurchase. However, conditional on repurchase, we find that it is less likely to have an impact on the amount of insurance purchased. In the table, Column (1) presents the coefficients from the selection equation, while Column (2) presents the results from the outcome equation.

As is expected, JLG membership is hugely significant in explaining repurchase. Those who were members of a JLG at the time of the purchase of the insurance policy are 33 percent more likely to repurchase their insurance than those who were not members of a JLG. Men are less likely to repurchase their insurance than women, as are the illiterate relative to those with a graduate degree. Those with a primary schooling are more likely to repurchase. Individuals in agriculture are the least likely to repurchase their policies on expiry. Businessmen and women are 24 percent more likely to repurchase, while labourers are 19 percent more likely to repurchase relative to those in agriculture. Repurchase probability decreases with household income and then increases. Thus, we find that those in the highest asset quartile are the least likely to repurchase. This appears to be consistent with the premise that households who have assets prefer to draw upon their assets to smooth consumption in response to a shock. These results are similar to the results on repurchase hazards described earlier.

Turning our attention to increases in coverage, we find that the most significant variable is the time taken to repurchase. The longer a customer takes to repurchase, the more likely she is to increase her cover (Column (2)). Why does more time lead to higher

[11]This model specification accommodates individuals from the same households as well, and it is likely that the decisions of individuals in the same households are correlated. We conducted the same analysis using only one member per household. Once again, we find that our results do not change. These results are not included in the paper, but are available on request.

[12]We estimate the same model for different definitions of an increase in coverage, and find that our results do not change. The results are available on request.

Table 4 Heckman selection model: Probability increase coverage

	selection (1)	*outcome* (2)
JLG: Yes	0.330***	
	(0.010)	
Time to repurchase		0.018***
		(0.0002)
Age	0.107***	0.0025
	(0.003)	(0.002)
Age-squared	−0.001***	−0.0001***
	(0.00004)	(0.00002)
Gender: MALE	−0.042***	−0.036***
	(0.010)	(0.004)
Education: Illiterate	−0.062**	−-0.009
	(0.025)	(0.011)
Education: Primary	0.068***	−0.011
	(0.024)	(0.010)
Education: Secondary	0.040*	−0.001
	(0.023)	(0.009)
Caste: Not general	0.041**	0.02***
	(0.016)	(0.007)
Religion: Non-hindu	−0.038**	0.008
	(0.018)	(0.007)
Occ: Business	0.239***	0.030***
	(0.016)	(0.007)
Occ: Labour	0.191***	0.021***
	(0.011)	(0.005)
Occ: Not-Working	0.056***	0.013**
	(0.014)	(0.005)
Occ: Others	0.076**	0.013
	(0.032)	(0.01)
Occ: Salary	0.085***	0.014
	(0.020)	(0.008)
HH size	0.035***	−0.00002
	(0.003)	(0.002)
HH income (Rs.000)	−0.112***	−0.004
	(0.017)	(0.006)
HH income squared (Rs.000)	0.011***	0.0009
	(0.002)	(0.0007)
Assets: 2Q	0.015	−0.008**
	(0.011)	(0.004)
Assets: 3Q	0.003	−0.013***
	(0.011)	(0.004)
Assets: 4Q	−0.121***	−0.009*
	(0.013)	(0.005)
Intercept	−1.169***	0.015***
	(0.080)	(0.004)
Observations	125,560	69,953
Log Likelihood	−71,756.790	
Multiple R-square		0.16
ρ		0.221
Inverse Mills Ratio		0.092*** (0.022)

Controls for month, year and district
Note: *p<0.1; **p<0.05; ***p<0.01

purchase of cover? As most of the increases are driven by the move towards the purchase of both policies (TLI and PAI) from a PAI or TLI only policy, it could be that people appear to postpone decisions on how much insurance cover to take till they have adequate resources to purchase the amount of insurance they truly desire. However, it is important to remember that the proportion of those who have increased the cover is really low in the overall dataset.

Conditional on repurchase, age is negatively correlated with an increase in coverage: older individuals are less likely to increase the cover they purchase compared with younger individuals. Men are less likely to increase coverage than women. While those with lower education, and higher income seem to have a higher probability of repurchase, this does not translate into increase in coverage. This could be because those with low education and income find it difficult to pay higher premiums.

Labourers are more likely than those in agriculture to increase coverage, as are those who are salaried as well as those who are currently working. Partly, this result can be a manifestation of the dataset: in the sample, a large number of house-wives have been classified as not working. Also, those individuals who are higher on the asset index (with greater wealth) are less likely to increase coverage. The highest wealth quartile is also less likely to repurchase insurance – this suggests that the more wealthy do not find it in their interest to purchase higher cover, probably because they have the assets to provide for the family in the event of death. This result is also consistent with those in the lower castes purchasing a greater amount of cover.

Overall, our results seem to suggest that increases in coverage are rare, and when they do occur, they seem to be driven by the time between expiry and repurchase, and by low wealth status.

5 Conclusion

Improving insurance participation of low-income households has become an important objective in the access to finance movement. An example of this push is the 2014 Government of India initiative to distribute a life insurance scheme, the *Suraksha Bima Yojana* (DFS, 2015a) and an accident insurance scheme *Jeeven Jyoti Bima Yojana* (DFS, 2015b) through the banking channel in 2014. By 2016, almost 100 million of policies had been sold. A true measure of success for such schemes will only emerge over time, when the same people continue to renew these policies, without a push from the government. The efficacy of the claims settlement process will undoubtedly play a large part in the perceived usefulness and consequently the participation in the policy. In addition, it may be useful for governments to understand what drives repurchases and design policy to make such repurchases easier. Our paper seeks to answer this question.

In this paper, we study the actual repurchase of micro-insurance, unlike most current studies which measure participation in the context of field experiments, where purchase at the time of the intervention may not translate to subsequent adoption We ask which customers choose to repurchase, how long after the expiry of the policy does it take them to repurchase, and if at the time of repurchase, they increase the amount of insurance cover purchased.

We find that the probability of repurchase is the highest in the first two months after expiry, and plateaus after twelve months. Thus, if an intervention needs to be applied to ensure that individuals and their households have a continuous benefit of insurance, then it would be ideal to carry out the intervention in the time just around or after contract expiry. However, since the cover purchased is higher when the individual does repurchase after a longer time, the implication for the policy maker is to continuously apply the intervention to increase repurchases, whether it is immediately after contract expiry or after.

Rainfall conditions in the month the policy expired influence repurchase - if rainfall has been very poor, then repurchases are less likely. This is especially the case if the member is not a micro-finance customer prior to the expiry of the policy. Access to credit thus matters for the repurchase decision, and product design that can defray the premium payment over a period of time, may lead to continued participation. Access to credit, or JLG membership also seems to matter to build awareness and trust.

Our results suggest that there is a window of opportunity for financial firms and governments to focus on customers and bring them back into the coverage pool. The market for micro-insurance products will mature once people continuously purchase these products, and also make decisions on the sum assured purchased. This research on understanding repurchases can be used to re-design various government programs as well as private sector initiatives on how to improve the probability that the individual continues to renew their insurance policy after the first purchase.

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6 Appendix

Asset index

The asset index is based on the following formula

$$A_j = f_1(a_{j1} - a_i)/s_i + ...f_N(a_{jN} - a_N)/s_N$$

, where f_i is the scoring factor from the principal components analysis, a_{ji} is the value of the asset i in household j and a_i and s_i are the mean and standard deviation of asset i over all households. A move from 0 to 1 changes the asset index by $\frac{f_i}{s_i}$.

6.1 Tables

Table 5 Characteristics by repurchase

This table presents characteristics of the sample that renewed their insurance. For example, of those 74% of those who had JLG loan at the time of taking the insurance renew their insurance, as opposed to 59% of those who did not have a JLG at the time of insurance purchase. Repurchases by each component of the asset index is provided in the Appendix.

Proportion renewed insurance: 0.65 Number of observations: 132,000		
	Mean	SD
Cooking: Gas	0.60	0.49
Cooking: Kerosene	0.68	0.47
Cooking: Wood	0.66	0.47
Electricity: No	0.66	0.48
Electricity: Yes	0.65	0.48
House: No	0.66	0.48
House: Yes	0.65	0.48
Land: No	0.70	0.46
Land: Yes	0.59	0.49
Jewellery: No	0.59	0.49
Jewellery: Yes	0.66	0.48
Livestock: No	0.65	0.48
Livestock: Yes	0.65	0.48
Shop: No	0.65	0.48
Shop: Yes	0.61	0.49
Computer: No	0.65	0.48
Computer: Yes	0.53	0.50
TV: No	0.64	0.48
TV: Yes	0.65	0.48
Mobile: No	0.69	0.46
Mobile: Yes	0.63	0.48

Table 6 Characteristics by increase in insurance cover

This table presents characteristics of the sample that renewed their insurance. For example, of those 74% of those who had JLG loan at the time of taking the insurance renew their insurance, as opposed to 59% of those who did not have a JLG at the time of insurance purchase. Repurchases by each component of the asset index is provided in the Appendix.

Proportion increased insurance cover: 0.65
Number of observations: 85,494

	Mean	SD
Cooking: Gas	0.30	0.46
Cooking: Kerosene	0.30	0.46
Cooking: Wood	0.27	0.45
Electricity: No	0.32	0.47
Electricity: Yes	0.28	0.45
House: No	0.29	0.45
House: Yes	0.28	0.45
Land: No	0.27	0.44
Land: Yes	0.30	0.46
Jewellery: No	0.30	0.46
Jewellery: Yes	0.28	0.45
Livestock: No	0.29	0.46
Livestock: Yes	0.27	0.44
Shop: No	0.28	0.45
Shop: Yes	0.30	0.46
Computer: No	0.28	0.45
Computer: Yes	0.38	0.49
TV: No	0.26	0.44
TV: Yes	0.28	0.45
Mobile: No	0.25	0.43
Mobile: Yes	0.30	0.46