Understanding micro-insurance renewals

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Abstract

In this paper, we study the renewal of micro-insurance policies by low income customers in India. The analysis is based on administrative data from a financial service provider located in three states of India. We ask which customers choose to renew, how long after the expiry of the policy does it take them to renew, and if at the time of renewal, they increase the amount of insurance cover purchased. The probability of renewal rises in the first two months after expiry, and plateaus after twelve months suggesting that there is a window of opportunity for financial firms and governments to focus on customers and bring them back into the coverage pool. Customers who come back after a longer time since expiry of the policy, seem to purchase a larger amount of cover. Rainfall conditions in the month the policy expired influence renewals - if rainfall has been very poor, then renewals are less likely. This is especially the case if the member is not a micro-finance customer prior to the expiry of the policy. This suggests that liquidity constraints matter for the renewal decision, and product design that can defray the premium payment over a period of time, may lead to continued participation.

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Contents

1 Introduction

Events such as a health shock, poor rainfall, or death can have adverse consequences for low-income households. The pervasiveness of such risks, and the paucity of instruments to protect against them, have led to an emerging literature on the importance of insurance in poverty alleviation (Dercon, 2002). As a consequence, microinsurance[1] has come to play a significant role in the suite of products designed to improve financial access of low income households (Morduch, 2004).

If insurance is beneficial, why do households not purchase enough of it? This puzzle has driven a lot of the early effort.[2] The research, mostly in the form of radomised control trials, finds that price, trust, liquidity constraints and limited salience constrain adoption (Giné, Townsend, and Vickery, 2008; Cole, Giné, et al., 2013). Education levels seems to matter (Bendig and T. Arun, 2011), as does training (Gaurav, Cole, and Tobacman, 2011; Dercon et al., 2014).

A natural follow-up question is, if households do purchase insurance in one year, do they come back for it again? Microinsurance contracts are typically one year contracts, making renewal a conscious decision. Only if households continuously renew their contracts, can microinsurance truly claim to have achieved a measure of acceptance. Research on the renewal of micro-insurance contracts is limited. Fitzpatrick, Magnoni, and Thornton (2011) and Thornton et al. (2010) find low renewal rates of micro-insurnace (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 renewals is especially important if take-up is measured in the context of field experiments as is the case in most current empirical research, where purchase at the time of the intervention may not translate to subsequent adoption.

In this paper, we study the renewal of micro-insurance policies by low income customers in India. We focus on life and accident insurance as death of a family member is one of the largest risk facing low income households (Clarke and Dercon, 2009). Life insurance has also been identified as the most widely demanded in low-income countries (Roth, McCord, and Liber, 2007). It is also less suscpetible to problems of moral hazard and basis risk which make pricing and sale of insurance difficult, and is therefore an important market to understand.

[1]Microinsurance is defined as protection of low-income people against specific perils in exchange for regular premium payments proportionate to the likelihood and cost of the risk involved (Churchill, 2006)

[2]Eling, Pradhan, and Schmit (2014) and Bock and Gelade, 2012 provide a detailed survey of studies on micro-insurance demand

The analysis is based on administrative data from a financial service provider located in three states of India. This allows us to study the actual re-purchase of micro-insurance. We study customers whose initial insurance policy purchased has expired, and now face the re-purchase decision for the first time. We ask which of these customers choose to renew, and how long after the expiry of the policy does it take them to renew? We also ask if at the time of renewal, they increase the amount of insurance cover purchased.

We find that the probability of renewal rises in the first two months after expiry, and plateaus after twelve months. This implies that if a customer does not renew within twelve months of the expiry of the first policy, renewal is unlikely. 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. It may be economically beneficial to retain a customer instead of winning the customer back. Interestingly, 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 renewals - if rainfall has been very poor, then renewals are less likely. This is especially the case if the member is not a micro-finance customer prior to the expiry of the policy. This suggests that liquidity constraints matter for the renewal decision, and product design that can defray the premium payment over a period of time, may lead to continued participation.

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). In 2014, the Government of India launched the distribution of a life insurance scheme, the *Suraksha Bima* (DFS, 2015a) and an accident insurance scheme *Jeeven Jyoti Bima* (DFS, 2015b) through the banking channel.[3] The market for microinsurance products will mature once people continuously purchase these products, and also make decisions on the sum assured purchased. Understanding renewals may feed 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. The methodology is discussed in section 4, and the results in section 5. Section **??** concludes.

[3]It will take another few years to see the claims history to conclude if these have actually provided the insurance cover that was promised.

2 The research setting

Overall, resarch on microinsurance has shown that price, trust, liquidity constraints and limited salience constrain adoption (Giné, Townsend, and Vickery, 2008; Cole, Giné, et al., 2013). Education levels seems to matter (Bendig and T. Arun, 2011), as does training (Gaurav, Cole, and Tobacman, 2011; Dercon et al., 2014). Insurance payouts in a village have a significant impact on participation suggesting that information generated by insurance payments has village wide effects (Cole, Stein, and Tobacman, 2014).

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 take up, Bauchet (2014) finds that the information content of the message, in particular conveying the financial and emotional toll of premature death has a large influence. What seems to emerge is a consensus that the more the understanding of the product and trust of the product as well as the service provider, the greater is the participation.

What remain inconclusive is the role of wealth. There is no clear prediction from expected utility theory on whether the demand for insurance is higher by wealthier individuals. On one hand, Gollier (2003) argues that wealthy individuals will prefer the draw down of their wealth in the event of a bad shock to purchasing insurance. It is only when the wealth is zero, would consumers purchase external insurance. The empirical evidence suggests otherwise. For example, Giné, Townsend, and Vickery (2008) and Cole, Sampson, and Zia (2011) find that wealthier households are more likely to purchase rainfall insurance.

Another element closely linked with that of wealth is that of liquidity constraints i.e. access to cash to pay for the insurance. This is seen to be influential in increasing demand. Giné, Townsend, and Vickery (2008) find that households who report themselves as credit rationed have a lower probability of insurance take-up. 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 argue that liquidity constraints matter because the big endowment has a larger effect on poorer individuals on whom liquidity constraints are more likely to be binding. In fact, their surveys point to not enough funds to purchase insurance has the most common response.

Similar results were reported by Liu, Chen, et al. (2013) who find that offering credit vouchers which allow farmers to enter an insurance contract while delaying payment of the premium until the end of the insured period increased take up. In more recent research, Liu and Mayers (2014) finds that a binding liquidity constraint reduces the demand for actuarially fair insurance below full coverage. If the liquidity constraint is severe enough the optimal choice can be to forego buying insurance altogether.

If wealth and liquidity constraints matter for the participation decision, then they should particularly matter for the renewal decision. In fact, these may constitute important reasons for consumers dropping out of insurance. This can provide guidance on the design of measures that can improve persistency.

We turn next to describing the products and the financial services provider distributing the products.

2.1 The financial services provider and products

Our study revolves around two main insurance products:

Term life insurance The Term life insurance (TLI) 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 minimum sum assured is Rs.25,000 and the maximum is Rs.250,000 in multiples of 25,000. 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. The TLI is not sold to those above the age of 59.

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 i.e. death or extreme disability as a result of an accident. 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 PAI is similar to the TLI in that it is also paid out in the event of death. However, it is restricted to only death by accident. The differential arises because the TLI is a "life insurance" product, while the PAI is a "general insurance" product. Under Indian regulations, a general insurance product is much cheaper than a life insurance product, making the PAI less expensive than the TLI.

The insurance products are distributed by 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.[4] Through this, IRCS also provides micro-finance loans, and is a distributor for a long-term pension product. As of March 2014, KGFS branches operated out of five geographical regions:

- Two districts in the state of Tamil Nadu in South India, which are fertile agrarian economies.
- Two districts in the Eastern Indian state of Orissa, which are characterised by subsistence agriculture supplemented by domestic migration.
- Five hill districts in the state of Uttarakhand in North India that are sparsely populated and are dominated by trade and services.

These regions are particularly chosen because of their inaccessibility to formal finance. In each village that KGFS operates, a bank branch is at least 2-5 kms away. This implies that most individuals in KGFS villages have had limited access to formal finance.

3 Data and methodology

Our data consists of 252,514 insurance customers of KGFS. This includes 103,778 (41 percent) customers who purchased both policies BOTH 132,600 (53 percent) who purchased only a PAI policy and 16,138 (6 percent) who purchased only a TLI policy.

We exclude those whose first policy has still not expired, i.e. they took a policy after April 2013, and the date of expiry falls after our data-set which ends on March 2014. This leaves us with a total of 158,931 customers. We further remove those who renewed their policy before the expiry of the first. We also drop customers who report an annual household income of greater than Rs.2,000,000 i.e. as an income higher than this is likely to be a reporting error. This gives us a total sample of 132,008 customers.

We have data on household demographics such as age, gender, marital status, education and occupation. We know if the household of the customer has a private toilet, has electricity, and uses wood, kerosene or gas as a cooking medium. We also know family size and annual household income. We have data on whether the customer owns a house, owns land, livestock, and a shop. In addition we know if the customer owns consumer durables (jewellery, vehicle, agricultura equipment, computer, TV, refrigerator, mobile phone, grinder, mixer, washing machine, sewing machine). We use these variables to create an asset-index that proxies for household wealth. We use the principal components

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

procedure[5] to determine the set of weights for each of these assets as described by (Filmer and Pritchett, 1998).[6] We divide the index into four quartiles for further analysis.

We categorise the month in which the policy expired according to the deviation of rainfall in the district the insured resides in. If the long term rainfall deviation in the district of the insured was greater than 19 percent in the month of expiry, then we categorise it as "excess", 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".[7]

3.1 Who renews?

We find that 65 percent of our sample renewed their insurance policy. This renewal rate is much higher than what has been reported in the literature.[8] Life insurance contracts do not suffer from basis risk, and therefore individuals do not have to worry about not getting a payout. This eliminates one reason for low take-up, and the higher renewal rate. Table 1 describes the sample that renewed its insurance.

There are three characteristics that stand out. First, there is a big difference in the group that had taken a microfinance (JLG) loan (74 percent renewals) vs. that had not taken a JLG loan (59 percent renewals). Second, we see the maxium renewals (73 percent) for the group whose policy expired in the month with "normal" rainfall, and the lowest (66 percent) for the group whose policy expired in the month with "scanty" rainfall. IF variations in rainfall lead to financial difficulties, then it is possible that customers postpone the renewal of insurance. Third, renewal is highest (67 percent) for those with the most assets. This suggest that wealth and liquidity are important variables influencing the renewal decision.

Figure 1 shows the renewal rate for combination of the rainfall, JLG and asset index variables. The renewals 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

[5]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.

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

[7]Source: Indian Meterogical Division. http://www.imd.gov.in/section/nhac/dynamic/mid1.htm

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

Table 1 Characteristics by renewal

This table presents characteristics of the sample that renewed their insurance. For example, of those 74% of those who had a microfinance (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. Renewals by each component of the asset index is provided in the Appendix.

Proportion renewed insurance: 0.65 Number of observations: 132,000		
	Mean	SD
Houshold income '000'	124.52	230.25
Age	38.78	9.04
HH size	4.45	1.40
JLG: No	0.59	0.49
JLG: Yes	0.74	0.44
Rainfall: Excess	0.69	0.46
Rainfall: Normal	0.73	0.44
Rainfall: Deficient	0.67	0.47
Rainfall: Scanty	0.66	0.47
Asset index: 1Q	0.62	0.48
Asset index: 2Q	0.65	0.48
Asset index: 3Q	0.66	0.47
Asset index: 4Q	0.67	0.47
Gender: Female	0.70	0.46
Gender: Male	0.58	0.49
Married	0.67	0.47
Single	0.39	0.49
Caste: General	0.48	0.50
Caste: SC/ST/OBC	0.67	0.47
Hindu	0.65	0.48
Non-hindu	0.66	0.47
Occ: Agri-allied	0.59	0.49
Occ: Business	0.58	0.49
Occ: House-wife	0.68	0.46
Occ: Labour	0.67	0.47
Occ: Not working	0.64	0.48
Occ: Others	0.55	0.50
Occ: Salary	0.56	0.50

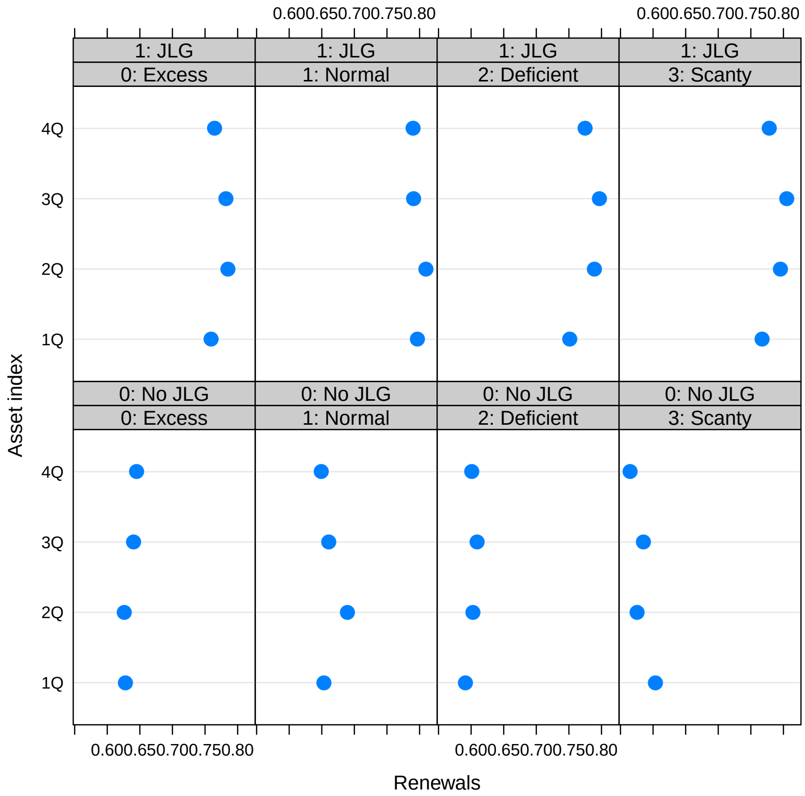
when the customer is not a JLG customer. This is most stark when rainfall is scanty. This suggests that across wealth groups, bad outcomes (proxied by rainfall), impair the ability to renew insurance contracts. However, the presence of micro-finance seems to mitigate the impact somewhat.

3.2 Time to renewal

An aspect of renewal that is of interest is how much time after the expiry of the policy do customers take to renew their policies? We begin with a simple graphical analysis to show how renewal hazards vary over the expiry spell. Figure 2 presents the Kaplan-Meier survival curves. The event is renewal, and the survival probabilities reflect the probability of not renewing the policies. These are computed as the number of failures (i.e. renewals) in month t divided by the size of the risk set at the beginning of the month.

Figure 1 Renewal by wealth, rainfall and JLG participation

This figure presents the proportion of people who renewed their policy depeding on wealth, rainfall and JLG participation



The survival probability falls the most within the first 1-2 months, and then over the first twelve months regardless of the initial policy taken, and then pleateaus after 12 months. This implies that if a member does not renew within twelve to fifteen months of the expiry of the first policy, she is unlikely to do so after.

What is interesting about the time to renewal is that the renewals actually continue for almost twelve months post expiry of the policy. This raises the question - if ultimately individuals do renew their policy, what makes them wait so long? In Figure 3 we plot the survival curves by rainfall and JLG status. The top panel 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.

We find that there is a slight difference in the survivial probability when rainfall is scanty and when rainfall is normal. The survival probability is a bit higher in the first month, and then higher between months five and ten. That is, when expiry of the policy occurs in the month with scanty rainfall, the proportion of individuals who renew is slightly

Figure 2 Kaplan-Meier estimates for renewal of insurance

This figure presents the Kaplan-Meier survival curves. The event is defined as renewal.

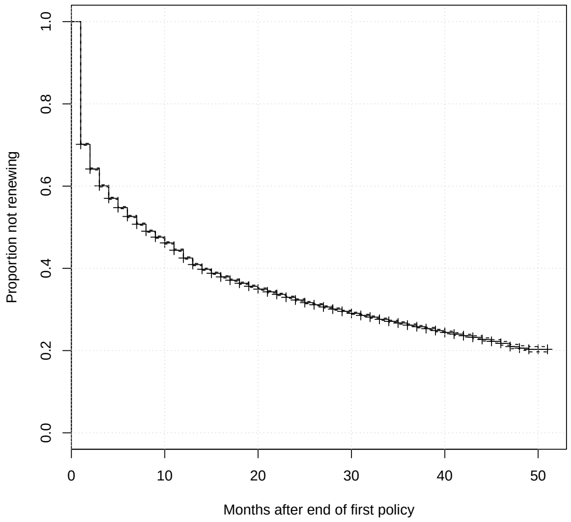


Figure 3 Kaplan-Meier estimates for renewal of insurance by rainfall and JLG

This figure presents the Kaplan-Meier survival curves. The event is defined as renewal.

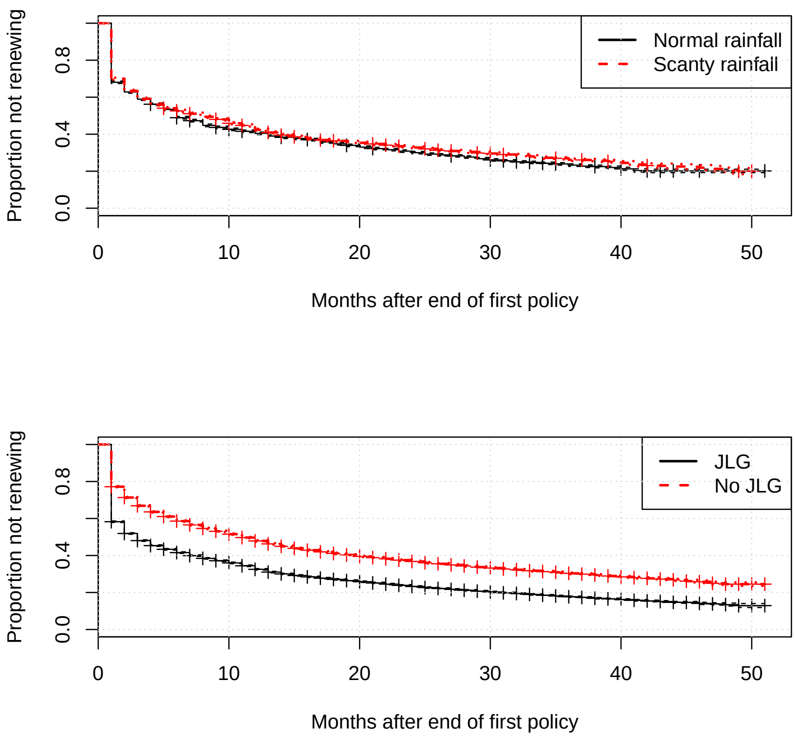
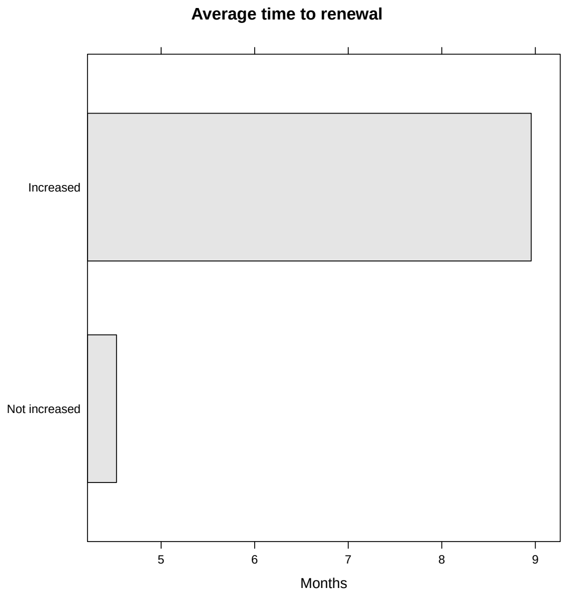


Figure 4 Coverage increases and time to renewal



lower than when expiry of the policy occurs in the month with normal rainfall. The difference in survival probabilities is large when it comes to JLG membership. Those without JLG loans have a much higher survival probability i.e. they are less likely to renew their insurance.

3.3 Does more time to renew imply greater coverage?

We turn next to whether renewal has implied a change in the amount of coverage bought. We use the value of the premium a household pays, and the price of insurance at each age, to determine if the cover purchased by the customer has increased, decreased or stayed the same. Because 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 i.e. a 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 renewal is at least Rs.50,000 more than the coverage purchased for the first policy.

We find that in our sample, only 28 percent of those who renewed had also increased the cover purchased. Figure 4 shows the average time to renewal of those who had increased their insurance coverage. Those who took a longer time to renew their policies seem to have increased their insurance cover.

Table 2 shows the summary statistics of the sample that increased their insurance coverage on renewal. Unlike the renewal decision, where JLG membership seemed to matter, the coverage decision conditional on renewal is not influenced by JLG membership. A larger proportion of those in the lowest asset quartile seem to increase their insurance cover, as do those involved in business.

Table 2 Characteristics of households who increased insurance cover

This table presents characteristics of the sample that increased their insurance cover. For example, of those in the first quartile of the asset index, 31% increased their insurance cover on renewal. 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
Houshold income '000'	126.92	124.14
Age	36.98	8.79
HH size	4.46	1.41
JLG: No	0.28	0.45
JLG: Yes	0.28	0.45
Rainfall: Excess	0.25	0.43
Rainfall: Normal	0.27	0.44
Rainfall: Deficient	0.29	0.45
Rainfall: Scanty	0.27	0.45
Asset index: 1Q	0.31	0.46
Asset index: 2Q	0.28	0.45
Asset index: 3Q	0.27	0.44
Asset index: 4Q	0.26	0.44
Gender: Female	0.28	0.45
Gender: Male	0.27	0.45
Married	0.28	0.45
Single	0.35	0.48
Caste: General	0.31	0.46
Caste: SC/ST/OBC	0.28	0.45
Hindu	0.28	0.45
Non-hindu	0.28	0.45
Occ: Agri-allied	0.26	0.44
Occ: Business	0.31	0.46
Occ: House-wife	0.28	0.45
Occ: Labour	0.28	0.45
Occ: Not working	0.27	0.44
Occ: Others	0.33	0.47
Occ: Salary	0.29	0.46

4 Methodology

4.1 Time to renewal

A static probit model can be used to study insurance policy renewals. A probit model, however, fails to control for each individuals period at risk. When the time between expiry and renewal is long, it is important to control for the fact that some individuals renew policies many months after the expiry of the first, while other renew immediately. We, therefore, estimate a reduced-form hazard functions of a customers spell of non-renewal of the insurance policy after the expiry of the policy.

Let T represent the time to renewal of a micro-insurance policy. We assume that T is a random variable with a cumulative distribution function $P(t) = Pr(T \leq t)$. We are interested in the hazard of renewal i.e., the instantaneous risk of renewal of the insurance policy conditional on it not been renewed until that time. The origin of T i.e. survial time is the time at which the insurance policy expired. T can be censored i.e., the study period ends before the customer may have renewed the policy. We observe $T = min(T, C)$ where C is an indication of whether the observation is censored. The hazard of renewal is defined as

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

We denote $h(t, x)$, 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. We estimate the hazard using the Cox-proportional hazard model has the following functional form:

$$h(t, x) = h_o(t) exp(\beta X)$$

$h_0(t)$ is the baseline hazard, and β gives the covariate effects. In the Cox-proportional model the baseline function $h_o(t)$ is not specified. The effects expressed by β are constant over time implying proportional hazards. A negative coefficient signifies the covariate's ability to decrease the hazard of renewal, a positive coefficient implies an increase in the hazard of renewal.

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, indicating that liquidity through the JLG loans contributes towards paying the premiums. We also control for customer demographics including age, gender, education, and occupation, as well the income of the household the customer belongs to.

4.2 Increases in coverage

We also wish to model the determinants of increase in insurance coverage in subsequent renewals. However, increase in coverage is meaningful only for those who chose to renew their policy. One implication of this is that the dependent variable is observed for a restricted, nonrandom sample. This implies 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.

This problem was first pointed out by (Heckman, 1976; Heckman, 1979). The 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.

We use JLG participation to account for exclusion restrictions. This is because, JLG particpation is seen to have an impact on the probability of renewal. However, conditional on renewal, there it is less likely to have an impact on the amount of cover purchased.

5 Estimation results

5.1 Hazard model estimates

Table 3 presents the results from the Cox-proportional hazard model. Column (1) shows the results when only the rainfall variables are included in the estimation. Column (2) and (3) show the results with the asset and JLG 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. We find that as we increase more covariates to the models, the estimates on rainfall, assets and JLG membership do not change by large amounts. Hence we focus on discussing the results in Column (4).

The base for the rainfall variable is excess rainfall. The base for assets is the first quartile of assets. The base for JLG is non-membership of a JLG. The base for gender is female, for education is graduate and above, for occupation is agriculture, for caste is all castes but the low castes (i.e. general), and for religion is Hindu.

Table 3 Hazard model: Renewals

	(1)	(2)	(3)	(4)
Rain: Normal	−0.011	−0.019	−0.020	−0.024
	(0.015)	(0.015)	(0.015)	(0.016)
Rain: Deficient	−0.038***	−0.040***	−0.030**	−0.029**
	(0.014)	(0.014)	(0.014)	(0.014)
Rain: Scanty	−0.079***	−0.086***	−0.076***	−0.079***
	(0.013)	(0.013)	(0.013)	(0.014)
Assets: 2Q		0.037***	0.031***	0.023**
		(0.010)	(0.010)	(0.011)
Assets: 3Q		0.035***	0.029***	0.018
		(0.010)	(0.010)	(0.011)
Assets: 4Q		−0.111***	−0.110***	−0.107***
		(0.011)	(0.011)	(0.013)
Has JLG			0.379***	0.347***
			(0.007)	(0.010)
Log(hh income 000)				−0.048***
				(0.014)
Log(hh income square)				0.002
				(0.002)
Age				0.094***
				(0.003)
Age square				−0.001***
				(0.00004)
Gender: male				−0.034***
				(0.010)
Education: Illiterate				−0.003
				(0.026)
Education: Primary				0.137***
				(0.025)
Education: Secondary				0.096***
				(0.024)
Occ: Business				0.232***
				(0.015)
Occ: Labour				0.173***
				(0.011)
Occ: Not-Working				0.070***
				(0.013)
Occ: Others				0.068**
				(0.034)
Occ: Salary				0.070***
				(0.021)
Caste: Not general				0.038**
				(0.018)
Religion: Non-hindu				−0.047***
				(0.017)
HH size				0.039***
				(0.003)
Observations	114,143	114,143	114,143	108,306
R^2	0.013	0.015	0.037	0.054
Log Likelihood	−809,397.8	−809,283.5	−808,004.7	−753,591.7

Controls for month and year fixed effects
Estimated for each district and then aggregated
Note: *p<0.1; **p<0.05; ***p<0.01

Large deviations from long-term rainfall reduce the hazard of renewal - relative to excess rainfall, expiry of the policy in months with deficient rainfall is likely to reduce the hazard of renewal by 3 percent, statistically significant at the 5 percent level. The expiry of the policy in months with scanty rainfall is likely to reduce the hazard of renewal by 8 percent, statistically significant at the 1 percent level. There is no difference in the renewal hazard when rainfall is normal, relative to when there is excess rainfall. This implies that collecting premiums during a lean period resulting from poor rainfall outcomes restrict the ability to pay premiums.

Individuals in the second quartile of assets have a higher renewal hazard than those in the first quartile. This decreases as we move up the asset index - those in the last quartile of assets are 11 percent less likely to renew their insurance relative to those in the first quartile of assets. This is consistent with the view of Gollier (2003) that only when individuals don't have enough buffer stock wealth, do they consider the purchase of insurance. This is also consistent with empirical evidence from Ontario in 1892 which shows that households primarily demanded life insurance when they lacked accumulated reserves, or wealth, for self-insurance (Matteo and Emery, 2002).

A JLG loan increases the renewal hazard by 35 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. Our results suggest that access to credit seems to provide the liquidity to pay premiums. It may also be possible that there are complementarities between credit and insurance take-up. This 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). Since credit and insurance are offered in the same branch, it may be possible that a higher demand for credit automatically translates into higher renewal of insurance. 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. We are not able to distinguish between the mechanism that drives credit and insurance purchase.

Renewal hazard decreases with income. We find that renewal probability increases with age, and then declines. This is in contrast to the result of (T. Arun, Bendig, and S. Arun, 2012) who find that insurance demands decreases with age, but after a certain level, increases again. 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.

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. Those with a primary or secondary schooling are more likely than those with a graduate degree or above to renew their insurance. Non-hindus are less likely to renew their insurance than Hindus - this is consistent with other work that shows that religion can play a role on insurance decisions (Browne and Kim, 1993).

This model contains individuals from the same households as well, and it is likely that the decisions of individuals in the same households are correlated. We therefore conducted the same analysis using only one member per household. Once again, we find that our results do not change.[9]

5.2 Increases in coverage

Table 4 shows the results from a Heckman selection model on the determinants of increase in coverage. 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 renewals. Those who were members of a JLG at the time of the purchase of the policy are 35 percent more likely to renew their insurance than those who were not members of a JLG. Men are less likely to renew their insurance than women, as are the illiterate relative to those with a graduate degree. Those with a primary schooling are more likely to renew.

The individuals in agriculture are the least likely to renew their policies on expiry. Businessmen and women are 24 percent more likely to renew, while labourers are 19 percent more likely to renew. Renewal probability decreases with household income and then increases. Those in the highest asset quartile are the least likely to renew.[10]

The longer a customer takes to renew, the more likely she is to increase her cover (column (2)). This is a very interesting result as it indicates that, perhaps people postone decisions till they have adequate resources to purchase the amount of insurance they truly desire. In some way, it also lins to the liquidity constraints issue discussed earlier.

Conditional on renewal, age is negatively correlated with an increase in coverage. Those higher on the asset index are less likely to increase coverage. 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. It is likely that we have this result because a large number of house-wives have been classified as not working.

[9] These results are available on request.
[10] Will be good to have an explanation for these results

Table 4 Heckman selection model: Probability increase coverage

	selection (1)	*outcome* (2)
JLG: Yes	0.345***	
	(0.010)	
Time to renewal		0.018***
		(0.0002)
Age	0.005	−0.005***
	(0.0004)	(0.0002)
Gender: MALE	−0.045***	−0.039***
	(0.010)	(0.004)
Education: Illiterate	−0.096***	−0.012
	(0.025)	(0.011)
Education: Primary	0.064***	−0.011
	(0.024)	(0.010)
Education: Secondary	0.037	−0.001
	(0.023)	(0.010)
Caste: Not general	0.040**	0.020***
	(0.016)	(0.007)
Occ: Business	0.244***	0.032***
	(0.015)	(0.007)
Occ: Labour	0.192***	0.023***
	(0.011)	(0.005)
Occ: Not-Working	0.036***	0.012**
	(0.014)	(0.005)
Occ: Others	0.070**	0.013
	(0.032)	(0.014)
Occ: Salary	0.083***	0.014*
	(0.020)	(0.008)
HH size	0.047***	0.001
	(0.003)	(0.001)
HH income (Rs.000)	−0.099***	−0.003
	(0.017)	(0.006)
HH income squared (Rs.000)	0.007***	0.001
	(0.002)	(0.001)
Assets: 2Q	0.009	−0.009**
	(0.011)	(0.004)
Assets: 3Q	−0.006	−0.014***
	(0.011)	(0.004)
Assets: 4Q	−0.134***	−0.010*
	(0.013)	(0.005)
Observations	125,562	80,574
Log Likelihood	−72,336.55	
Akaike Inf. Crit.	144,761.10	
ρ		0.244
Inverse Mills Ratio		0.102*** (0.022)

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

References

Arun, Thankom, Mirko Bendig, and Shoba Arun (2012). "Bequest Motives and Determinants of Micro Life Insurance in Sri Lanka". In: *World Development* 40.8, pp. 1700–1711.

Bauchet, Jonathan (2014). "Price and Information Type in Microinsurance Demand: Experimental Evidence from Mexico". In: *Available at SSRN 2474620*.

Bendig, Mirko and Thankom Arun (2011). *Enrolment in Micro Life and Health Insurance: Evidences from Sri Lanka*. Discussion Paper Series 5427. IZA.

Bock, Ombeline De and Wouter Gelade (2012). *The demand for microinsurance: A literature review*. Research Paper 26. Microinsurance Innovation Facility, EUDN, and the International Labour Office Geneva.

Browne, Mark J. and Kihong Kim (1993). "An International Analysis of Life Insurance Demand". In: *The Journal of Risk and Insurance* 60.4, pp. 616–634.

Churchill, Craig Farren (2006). *Protecting the poor: A microinsurance compendium*. Vol. 1. International Labour Organization.

Clarke, Daniel and Stefan Dercon (2009). *Insurance, Credit and Safety Nets for the Poor in a World of Risk*. Working Paper ST/ESA/2009/DWP/81. DESA.

Cole, Shawn, Xavier Giné, et al. (2013). "Barriers to household risk management: Evidence from India". In: *American Economic Journal. Applied economics* 5.1.

Cole, Shawn, Thomas Sampson, and Bilal Zia (2011). "Prices or Knowledge? What Drives Demand for Financial Services in Emerging Markets?" In: *The Journal of Finance* LXVI.6.

Cole, Shawn, Daniel Stein, and Jeremy Tobacman (2014). "Dynamics of Demand for Index Insurance: Evidence from a Long-Run Field Experiment". In: *The American Economic Review* 105.5, pp. 284–290.

Dercon, Stefan (2002). "Income Risk, Coping Strategies and Safety Nets". In: *The World Bank Research Observer* 17.2, pp. 141–166.

Dercon, Stefan et al. (2014). "Offering rainfall insurance toinformal insurance groups: Evidence from a field experiment in Ethiopia". In: *Journal of Development Economics* 106, pp. 132–143.

DFS (2015a). *Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY)*. Department of Financial Services, Government of India. URL: `http://jansuraksha.gov.in/Default.aspx`.

– (2015b). *Pradhan Mantri Suraksha Bima Yojana*. URL: `http://jansuraksha.gov.in/Default.aspx`.

Dong, Hengjin et al. (2009). "Drop-out analysis of community-based health insurance membership at Nouna, Burkina Faso." In: *Health Policy* 92.2, pp. 174–179.

Eling, Martin, Shailee Pradhan, and Joan T Schmit (2014). "The Determinants of Microinsurance Demand". In: *The Geneva Papers on Risk and Insurance - Issues and Practice* 39. doi:10.1057/gpp.2014.5, pp. 224–263.

Filmer, Deon and Lant Pritchett (1998). *Estimating Wealth Effects without Expenditure Data or Tears: With an Application to Educational Enrollments in States of India.* Policy Research Working Paper 1994. The World Bank.

Fitzpatrick, A, B Magnoni, and Rebecca Thornton (2011). "Microinsurance utilization in utilization in nicaragua: A report on efects on children, retention, and health". In: *ILO Microinsurance Innovation Facility Research Paper.*

Gaurav, Sarthak, Shawn Cole, and Jeremy Tobacman (2011). "Marketing Complex Financial Products in Emerging Markets: Evidence from Rainfall Insurance in India". In: *Journal of Marketing Research.*

Giesbert, Lena, Susan Steiner, and Mirko Bending (2011). "Participation in micro life insurance and the use of other financial services in Ghana". In: *The Journal of Risk and Insurance* 78.1, pp. 7–35.

Giné, Xavier, Robert Townsend, and James Vickery (2008). "Patterns of rainfall insurance participation in rural India". In: *World Bank Economic Review* 22.3, pp. 539–66.

Gollier, Christian (2003). "To Insure or Not to Insure?: An Insurance Puzzle". In: *The Geneva Papers on Risk and Insurance Theory* 28, pp. 5–24.

Heckman, James (1976). "The common structure of statistical models of truncation, sample selection and limited dependent variables and a simple estimator for such models". In: *Annals of Economic and Social Measurement* 5.4, pp. 475–492.

– (1979). "Sample selection bias as a specification error". In: *Econometrica* 47.1, pp. 153–161.

Li, Donghui et al. (2007). "The Demand for Life Insurance in OECD Countries". In: *The Journal of Risk and Insurance* 74.3, pp. 637–652.

Liu, Yanyan, Kevin Chen, et al. (2013). *Borrowing from the Insurer: An Empirical Analysis of Demand and Impact of Insurance in China.* Discussion Paper 01306. IFPRI.

Liu, Yanyan and Robert J. Mayers (2014). "The Dynamics Of Microinsurance Demand In Developing Countries Under Liquidity Constraints and Insurer Default Risk". In: *The Journal of Risk and Insurance.*

Matteo, Livio Di and J.C. Herbert Emery (2002). "Wealth and the demand for life insurance: evidence from Ontario, 1892". In: *Explorations in Economic History* 39.4, pp. 446–469.

Morduch, Jonathan (2004). *Micro-insurance: The Next Revolution?* Tech. rep. Forthcoming in What Have We Learned About Poverty? edited by Abhijit Banerjee, Roland Benabou, and Dilip Mookherjee. The Financial Access Initiative.

Platteau, Jean Philippe and Darwin Ugarte Ontiveros (2013). *Understanding and information failures in insurnace: Evidence from India*. Development Research Working Paper Series 07/2013. Institute for Advanced Development Studies (INESAD).

Roth, Jim, Michael J. McCord, and Dominic Liber (2007). *The Landscape of Microinsurance in the World's 100 Poorest Countries*. Tech. rep. The MicroInsurance Centre, LLC.

Thornton, Rebecca et al. (2010). "Social security health insurance for the informal sector in Nicaragua: a randomized evaluation." In: *Health Economics* 19.181-206.

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 renewal

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. Renewals 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. Renewals 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