DISCUSSION PAPER SERIES

DP12242

COGNITIVE BIAS IN INSURANCE: EVIDENCE FROM INDIA

Jean-Philippe Platteau and Darwin Ugarte Ontiveros

DEVELOPMENT ECONOMICS

ISSN 0265-8003

COGNITIVE BIAS IN INSURANCE: EVIDENCE FROM INDIA

Jean-Philippe Platteau and Darwin Ugarte Ontiveros

Discussion Paper DP12242
Published 25 August 2017
Submitted 25 August 2017

Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
Tel: +44 (0)20 7183 8801
www.cepr.org

COGNITIVE BIAS IN INSURANCE: EVIDENCE FROM INDIA

Abstract

This paper is an attempt to understand the factors behind low contract renewal rates frequently observed in insurance programs in poor countries. This is done on the basis of the experience of a micro-insurance health program in India. We show that poor understanding of the insurance concept, compounded by a serious supply-side information failure, is a major cause of low contract renewal among households which had previously enrolled into the program. Controlling for the level of their information about how to collect the insurance payout, households that did not experience a health shock during the first year tended to pull out of the scheme when they are subject to a cognitive bias reflected in short-term framing. When they are classic expected utility maximizers, however, the absence of a health shock did not affect their contract renewal decision. The policy implication of our findings is considerable since they provide a strong justification for mandatory universal health insurance.

JEL Classification: D01, D03, I13, O12, O16

Keywords: Insurance, myopic behavior, cognitive ability, health economics, non-governmental organizations, information failure

Jean-Philippe Platteau - jean-philippe.platteau@unamur.be
Université de Namur and CEPR

Darwin Ugarte Ontiveros - darwinismo@hotmail.com
Universidad Privada Boliviana

Acknowledgements
We want to express our special gratitude to the Micro-insurance Facility (Geneva) and the Bill and Melinda Gates Foundation which have funded this study and connected us with the local partner organization. We also want to extend special thanks to Catherine Guirkinger who provided helpful advices during the preparatory phase of the field survey, and useful comments at later stages. Moreover, we benefited from useful comments by Jean-Marie Baland, Clive Bell, Erlend Berg, François Bourguignon, Pierre-André Chiappori, Marcel Fafchamps, James Fenske, Jan Willem Gunning, Rashid Laajaj, Santiago Levy, Andreas Mandelstam, Juan-Antonio Morales, Karlyn Morsink, Simon Quinn, Pieter Serneels, Vincent Somville, Tim Swanson, Cedric Tille and Diego Ubfal.

Cognitive Bias in Insurance: Evidence from India*

Jean Philippe Platteau and Darwin Ugarte Ontiveros*****

August 2017

* We want to express our special gratitude to the Micro-insurance Facility (Geneva) and the Bill and Melinda Gates Foundation which have funded this study and connected us with the local partner organization. We also want to extend special thanks to Catherine Guirkinger who provided helpful advices during the preparatory phase of the field survey, and useful comments at later stages. Moreover, we benefited from useful comments by Jean-Marie Baland, Clive Bell, Erlend Berg, François Bourguignon, Pierre-André Chiappori, Marcel Fafchamps, James Fenske, Jan Willem Gunning, Rashid Laajaj, Santiago Levy, Andreas Mandelstam, Juan-Antonio Morales, Karlyn Morsink, Simon Quinn, Pieter Serneels, Vincent Somville, Tim Swanson, Cedric Tille and Diego Ubfal.

** Professor Emeritus of Economics at the university of Namur and Centre for Research in the Economics of Development (CRED).

*** Professor at the Universidad Privada Boliviana.

Abstract

This paper is an attempt to understand the factors behind low contract renewal rates frequently observed in insurance programs in poor countries. This is done on the basis of the experience of a micro-insurance health program in India. We show that poor understanding of the insurance concept, compounded by a serious supply-side information failure, is a major cause of low contract renewal among households which had previously enrolled into the program. Controlling for the level of their information about how to collect the insurance payout, households that did not experience a health shock during the first year tended to pull out of the scheme when they are subject to a cognitive bias reflected in short-term framing. When they are classic expected utility maximizers, however, the absence of a health shock did not affect their contract renewal decision. The policy implication of our findings is considerable since they provide a strong justification for mandatory universal health insurance.

Keywords

Insurance, myopic behavior, cognitive ability, health economics, non-governmental organizations, information failure

JEL Codes

D01, D03, I13, O12, O16

1. Introduction

In developing countries, many individuals who are poor cannot afford medical treatments, or finance the purchase of medicines. Therefore, health shocks dangerously threaten their lives and are actually among the most important sources of risk confronting them. Adverse effects on their consumption, productivity and human capital have been well documented in the literature and they reinforce the case for universal health coverage (Gertler and Gruber, 2002; Jutting, 2003; Dercon and Hoddinott, 2004; Leatherman et al., 2010). Because governments in most developing countries have not been able to meet the basic health needs of their poor population, the international donor community has come to think that public-private partnerships rather than public coverage is the right approach, at least in the medium term. Community-Based Health Insurance (CBHI) or Micro-insurance programs that provide local healthcare financing options for the poor are thus increasingly considered as one of the ways available to build health coverage initiatives. Over the past few years, they have expanded exponentially.

Programs that offer comprehensive products presenting high value to low-income households remain rare, however. One exception is the CBHI program recently implemented in India by Swayam Shikshan Prayog (SSP) and Swasth India Services (SIS) and underwritten by a local insurance company called Arogya Sandhi. Aimed at going beyond basic in-patient cover and at reducing out-of-pocket health expenditures incurred by low income households, the program supplies a hybrid health insurance product in two districts of Maharashtra state. Against a fixed annual premium that varies with the size of the household, households are granted (i) free access to in-patient care provided in empanelled hospitals, up to an annual benefit of US$667 for the whole family, and (ii) a reduction in out-patient health costs through a 50% discount on consultation fees and a 40-70% discount on the retail price of medicines. Such outpatient discounts are provided only through a specific network of community health workers, physicians, diagnostic centers, clinics, and pharmacies (coordinated by a Community Health Trust).

It may appear surprising that many of these micro-insurance programs have shown disappointing performances as measured by take up and contract renewal rates (see Platteau et al., 2017, for a recent survey). It is thus rather exceptional to see take up rates above 30% and quite frequent to observe rates in the range 5-20%. As for renewal rates, available data suggest that they may be even smaller: 7% in Nicaragua (Fitzpatrick et al., 2011), and 4% in

India (Stein, 2011).[1] The average rate of subscription in the SSP program (2010) was even smaller at less than 2% and, regarding contract renewal, more than two-thirds of the (few) subscribers decided to drop out of the program as their contract expired. Moreover, we recorded a very low rate of (new) subscriptions (around 3%) among the households which did not initially enroll into the program but had the opportunity to do so one year later inside the treatment villages.

We therefore have a unique opportunity to draw lessons from an experience that did not meet the expectations placed in it. The data that we have collected allow us to look systematically into the main causes behind low contract renewal.[2] We believe that such an inquiry supplies a more powerful test of the attractiveness of insurance schemes than an analysis of the determinants of initial subscription rates. Indeed, at the time of the decision to enroll or not into an insurance program, people may be influenced by effective (or ineffective) marketing strategies, false promises, or other factors that do not have a lasting effect. The ultimate test of the validity of an insurance program, or any program for that matter, ultimately rests upon its long-term sustainability. Since payment of the insurance premium has to be renewed at regular intervals (typically, every year), understanding why initial subscribers choose to renew or not to renew their contract is bound to give insights into the manner in which they assess a real rather than prospective experience.

It is common in the literature on micro-insurance to distinguish between supply and demand factors. Supply-side problems include the low quality of the services provided, a problem especially important in health insurance (whether regarding medical services or drugs), inappropriate characteristics of the insurance product or the contract design, ineffective marketing, etc. Demand arising from poor, risk-averse villagers is normally expected to be high but may be actually hampered by liquidity constraints, lack of people's trust in the insurer or in certain characteristics of the product, or a weak understanding of insurance principles (see, e.g., Jutting, 2003; Giné et al., 2007; Chankova et al., 2008; Ito and

[1] The figure of 54% found for Burkina Faso (Dong et al., 2009) is exceptionally high in the light of most available evidence including our own.

[2] Even though the study design allows for an impact assessment evaluation (with comparisons between treatment and control villages), the exercise would be futile: impact is bound to be very disappointing owing to low enrolment rates and low rates of use of the insurance by subscribers in the treatment villages.

Kono, 2010; Carter et al., 2011; Dercon et al., 2012; Cole et al., 2013; Elabed and Carter, 2015).

The most original feature of this paper lies in its focus on, and testing of understanding and information failures, the former in particular. We thus follow up on the business management literature on financial literacy in developed countries, the United States in particular. Its main finding is that lack of information (or misinformation) and cognitive biases are important factors behind poor consumer financial decisions, especially when complex transactions, including insurance, are involved (Gabaix and Laibson, 2006; Lusardi and Mitchell, 2009, 2014; Lusardi et al., 2009; Carlin, 2009; Cole et al., 2013; Kunreuther et al., 2013). For example, Brown et al. (2017) have shown that people differ in their ability to meaningfully value a stream of life annuity relative to a lump sum, and this ability is correlated with measures of cognitive ability including education, financial literacy, and numeracy. Our own conclusion in regard of an Indian micro-insurance program appears less surprising in the light of this literature. It is also in line with the conclusion reached by Giné et al. (2007) regarding the determinants of (low) participation in rainfall insurance schemes in India ("the most common reason given by those interviewed was that they did not understand the product"), or by Cole et al. (2013) and Gaurav et al. (2009), again in the case of India, and by Pratt et al. (2010) in the cases of Ethiopia and Malawi.[3] With respect to information, a study of health insurance in rural Senegal (Bonan et al., 2016) have found that 55% of the people justified their lack of membership in Mutual Health Organizations by an absence of information about the product offered and/or about the existence of these organizations themselves.

The main story told in the paper is the following. Lack of proper understanding of the notion of insurance reflected in its narrow framing discouraged individuals from renewing their contract if they did not collect any insurance payout during the year elapsed. This demand-side failure is compounded by a severe supply-side information failure that prevented many people from receiving their payout even in the presence of an adverse shock. Put in a positive way, a good understanding of insurance mitigates the disincentive to re-enroll when insurance has not been used in the event of illness (or when no payout has been collected). It

[3] Thus, for example, Cole et al. (2013) found that demand for rainfall insurance was higher in villages where individuals were more financially literate.

bears emphasis that the cognitive bias affecting a large majority of subscribers contrasts with their remarkable ability to estimate the profitability of the insurance product offered.

The structure of the paper is as follows. In Section 2, we shortly review the narrow literature that proposes evidence and possible explanations behind the demand-side anomaly in insurance. We then present a simple model that helps understand the difference in behavior between classic, forward-looking agents and myopic agents, thereby allowing us to formulate a straightforward test of the presence of the latter in a population. Section 3 proceeds in several steps. We first explain the context of the health insurance intervention that has motivated our study, the sample design and the method of data collection. We then provide a first set of descriptive statistics that compare subscriber and non-subscriber households along health, education and other individual characteristics. Thereafter, we explain how our main independent variables are measured and we supply basic statistics related to them. Finally, we provide a third set of descriptive statistics that shed light on reasons and non-reasons for dissatisfaction or contract discontinuation. Section 4 presents our estimation strategy, which consists of two successive steps: estimating the determinants of insurance use and the determinants of contract renewal. In Section 5, we present and discuss our central results that neatly validate the hypothesis of cognitive bias. Section 6 summarizes the main lessons from the SSP experience, and draws some important policy implications.

2. The demand-side anomaly in insurance: evidence and theory

2.1 A short survey of the literature

Kunreuther et al. (2013) have noticed the pervasive existence in developed countries of what they call an "underpurchase demand-side anomaly": after maintaining insurance coverage for several years and never submitting a claim, many individuals choose to cancel their policy (e.g., in the US market for flood insurance). They explain such failure to maintain coverage by the fact that consumers treat insurance as a short-term investment so that, if they have not collected on their policy over several years, they feel that the premiums paid have been wasted (pp. 104-105, 117-18).

The same anomaly had been discussed and illustrated earlier by Platteau (1997) in the case of Senegal. Based on anthropological evidence from mutual sea rescue groups in fishing villages, he argues that people interpret insurance in terms of their traditional logic of

balanced reciprocity. This means that people conceive of solidarity as mutual help, implying that a "gift" or transfer should be reciprocated some time in a not-too-distant future, rather than as a mechanism of redistribution from lucky to unlucky individuals. In the particular case of Senegalese fishermen, the insurance premium (or the labor contribution toward helping a fellow fisherman) is viewed as a payment that must be compensated for within a reasonable span of time. If not, they think that they have the right to leave the insurance group and to have the (cash) premium returned to them. Revealingly, when confronted with such a demand, other members of the group considered it legitimate and complied.

Similarly, evidence from Uganda (Basaza et al., 2008) bear out the view of insurance as credit, which is reflected in the expressed belief that, if an individual has not received any payout during the past year, s/he ought not to pay the (health insurance) premium for the subsequent year. In India, likewise, a rainfall index insurance program had to be redesigned and restarted "after there were massive cancellations of contracts by farmers disappointed by the lack of payments in a normal year" (Carter et al., 2008: 1; see also Hill et al., 2013; Mobarak and Rosenzweig, 2012). Finally, a randomized experiment carried out in Ghana shows that the lack of insurance payments during the previous year had the effect of reducing insurance uptake (Karlan et al., 2013).

Clearly, the above-described anomaly violates the prediction of expected utility theory which assumes that a risk-averse individual seeks protection against the prospect (and not the actual occurrence) of a shock and its damaging consequences. An insurance transaction therefore implies that income is not only redistributed intertemporally (like in the case of a credit or investment), but also redistributed from lucky to unlucky members inside the risk-pooling scheme. During the last decades, a (somewhat disturbing) plethora of new theories of behavior toward risk have emerged to account for insurance-related anomalies. These theories include the prospect theory (Kahneman and Tversky, 1979), regret theory (Loomes and Sugden, 1982; Bell, 1985; Braun and Muermann, 2004), ambiguity aversion theory (Ellsberg, 1961), and loss aversion theory (Kunreuther et al., 2013: 96-101; Stein, 2011; Bryan, 2013), and the preference discontinuity theory (Schmidt, 2000, 2004; Andreoni and Sprenger, 2009,

2012).[4] Some of them, the regret theory in particular, account for the celebrated Allais Paradox (Nechyba, 2011: 381-2).

A snapshot of the aforementioned theories is provided in Appendix I (see also Platteau et al., 2017) from which two important lessons can be drawn. First, most explanations for behavior anomalies regarding insurance decisions concern the decision to purchase a policy rather than the decision to renew the contract. Second, they all assume a specific type of narrow framing or myopia. This is also true of the cognitive bias that underpins the view of insurance as credit or investment. To explain low contract renewal in the latter framework, it is convenient to see the cognitive bias as manifested in the agents' inability to properly interpret a signal sent by the insuring organization. According to this signal, the organization is reliable and trustworthy since it has fulfilled its promise to indemnify insured agents who suffered a shock. Agents with a good understanding capacity, that is, those who consider lifetime wealth rather than changes in wealth from a given reference point and are therefore able to reason in expected utility terms over the long term, find it reassuring that the insuring organization does what it is expected to do. Although they may well have a current negative insurance payout, they know that it could become positive in the future and that assistance will then be forthcoming. On the other hand, individuals who are vulnerable to short-term framing and have a current negative payout are disappointed by the information provided by the signal. They tend to believe that the absence of past shocks will persist in their narrow time frame and they therefore revise their expectations of future insurance benefits in a pessimistic direction. Clearly, in such conditions contract renewal decisions are not adequately explained by the belief updating process posited in the classical Bayesian model.[5]

Another manner of stating the misunderstanding failure is to say that the agents concerned believe that the indemnity, which can either be a direct payout at the end of the first year or a subsequent lowering of the premium, is individual-specific, while the classic model can include this indemnity only as a function of population characteristics. Agents with a cognitive bias wrongly believe that their lack of a realized shock should be monetized at the end of the first year and are reluctant to re-enroll when they realize that it is not. A poor

[4] Other explanations are the Rank-Dependent Expected Utility (RDEU) model, the "hot-hand effect" theory, and the "status-quo bias" theory.

[5] We thank Rachid Laajaj for having clarified this point for us.

understanding of the meaning of insurance should thus have an adverse effect on contract renewal if the insured shock did not materialize. In the next sub-section, we propose a simple model that helps clarify the difference between classic and myopic attitudes vis-à-vis insurance and contract renewal.

2.2 A simple model

Assume that a health risk occurs with varying and unpredictable intensity ε, with $0 < \varepsilon < 1$ and density function $f(\varepsilon)$. The level of damage suffered by a household over a given year is $\varepsilon.L$ where L is the amount of money that would need to be spent on health expenditures if $\varepsilon = 1$. The household can insure against that risk by agreeing to pay an annual premium, P. The amount of indemnity (or insurance payout) is $D(\varepsilon)$, and its relation to the level of damage is given by the simple linear indemnity function $\beta.\varepsilon.L$ where $0 < \beta < 1$. Denoting by W_0 and W_f the household's initial and terminal wealth levels, respectively, its expected utility if it accepts the insurance contract is:

$$\mathrm{E}U\left(W_f\right)^{ins} = \int_0^1 U(W_0 - \varepsilon.L + D(\varepsilon) - P)f(\varepsilon)d\varepsilon =$$

$$\int_0^1 U(W_0 - \varepsilon.L(1-\beta) - P)f(\varepsilon)d\varepsilon \qquad (1)$$

The household will accept the contract if the value of the above expression exceeds the expected utility in the absence of insurance coverage, which is given by:

$$EU(W_f)^{Unins} = \int_0^1 U(W_0 - \varepsilon L)f(\varepsilon)d\varepsilon \qquad (2)$$

To simplify notations, we may just consider two states of nature depending on whether at least one member of the household has fallen ill during the period covered by the insurance. L then represents the corresponding spending and ε is the probability that this eventuality occurs, and $1-\varepsilon$ the probability that it does not. Expressions (1) and (2) become:

$$\mathrm{E}U(W_f)^{ins} = \varepsilon\, U\left[W_0 - L\left(1-\beta\right) - P\right] + (1-\varepsilon)U(W_0 - P) \qquad (1')$$

$$EU(W_f)^{Unins} = \varepsilon U(W_0 - L) + (1-\varepsilon)U(W_0) \qquad (2')$$

We consider an insurance contract whose terms are profitable for the customers: β and P are set by the insurance company at levels that ensure (1') > (2'). A household will therefore buy the insurance, and if it is a classic expected utility maximizer, and if ε is not autocorrelated (so that there is no revelation and updating of risk type over time), the insurance contract will be renewed under the same condition. A classic expected utility maximizer will therefore choose to renew its insurance contract if it initially found it profitable to subscribe to it. Whether a health shock actually materialized or not leaves its decision unchanged. We can therefore state the following:

If the household is a classic maximizer, the contract will be renewed if $\varepsilon = 0$ or if $\varepsilon = 1$.

Let us now consider the case of a myopic household that narrowly frames the cost and benefit of insurance in the process of updating after one year of experience with the contract. The myopic household does not understand the concept of probability as it believes that what has happened in the year elapsed will be repeated in the future. This can be seen as an extreme version of the "hot-hand effect" theory in which people's perception of the risk is influenced by the frequency and intensity of past shocks (see Appendix I). Its decision to renew the contract is defined by the simple following condition:

If the household is a myopic maximizer, the contract will be renewed if $D_t > P_{t-1}$ or if $\varepsilon_t.\beta.L_t > P_{t-1}$, which obviously requires that $\varepsilon_t = 1$. It will not be renewed otherwise.

This condition indicates that the myopic and risk-averse household j will only renew its insurance contract at the end of year t if the discount actually obtained in the course of that year, D_t, exceeds the risk premium that was paid at the end of year $t-1$ (or beginning of year t), labelled P_{t-1}. An important implication of the analysis is that the key factor determining the classic and the myopic households to behave differently is whether a health shock has occurred or not: while a myopic household renews its contract only if a (sufficient) shock has occurred, a classic household is not influenced by shock occurrence when making its renewal decision.

Before describing the econometric approach used to test for the role of cognitive bias in our study area, we need to explain our sample design, our method of data collection, and our way to measure the most important variables. Key descriptive statistics will also be provided about these variables and their inter-relations.

3. Data collection, measurement of key variables, and descriptive statistics

3.1 Sample design

The health micro-insurance program supported by SSP was initiated in year 2010 in two districts of Maharashtra state (Solapur and Osmanabad). A total number of 535 subscriber households, spread over 54 villages, were initially registered, 415 of them in Solapur (in 34 villages) and 120 in Osmanabad (in 20 villages of Tuljapur council). This amounts to a low average subscription rate of 1.6%. The frequency distribution of the subscribers is negatively asymmetric with only 5 villages exhibiting a subscription rate above 5%. The initial plan was to interview 600 households in the villages in which SSP introduced the insurance micro-insurance program (the treated villages), 300 subscribers and 300 non-subscribers.[6] Assuming that there would be at least 5% of the population subscribing, the initial intent was to interview 15 households of each type in each of 20 randomly selected treatment villages. When we realized that this assumption was over-optimistic, we had to change our strategy.

To avoid a sample selection process based on the behavior of the households and to minimize survey costs, we followed a two-stage random sampling procedure leading to a complete sample of 300 subscribers and 300 non subscribers in treatment villages.[7] A village was randomly selected from the list of 54 treatment villages and, if the number of subscribers was smaller than 20 subscribers, their entire population was included in the sample. In the opposite case, 20 subscribers were randomly selected and added to the sample. This procedure was pursued by adding new randomly selected villages till the set objective of 300 subscriber households was reached. In each of these treatment villages, the number of non subscribers surveyed was equal to the number of subscribers. Our village sample was eventually made of 35 units, instead of the 20 villages initially intended.

[6] On the other hand, 450 households were to be interviewed in control villages.

[7] Concentrating exclusively on villages where a sufficient number of households had subscribed would cause an obvious selection bias. The alternative of drawing an identical proportion of subscriber households in each village was also discarded because a very limited number of individuals would then be coming from the low subscription villages, and the selection problem would therefore not vanish. Moreover, owing to the large number of villages that would need to be surveyed, the cost would be very high. Finally, a stratification strategy based on the total population of the village, which might be correlated with the total number of subscribers in the village but exogenous to the behavior under scrutiny, proved to be unfeasible: there is, indeed, no correlation between the village population and the number of subscribers (0.026).

In fact, we slightly increased the above numbers because the understanding of contract renewal behavior among subscriber households (and later enrollment of initially non-subscribing households) necessitated two successive survey rounds with the attendant risk of attrition. While the first round took place in 2010 when the program started in the study area, the second one was effected in 2011 after one year of experience had elapsed and the decision whether to renew the contract (or whether to enroll) had just been made. The initial sample sizes were raised to 315 for both subscribers and non-subscribers, making a total of 630 households in the treatment villages[8], among whom 554 (corresponding to 2,629 individuals) could be traced back in 2011. It is striking that attrition was much more important among non-subscribers than among subscribers (21.3 % as against 2.9 %), since as many as 306 subscribers could be re-interviewed as against only 248 non-subscribers.[9] This difference is caused by the lower willingness of the latter to be re-interviewed rather than their higher mobility.[10] Fortunately, the possible resulting bias will not affect our results in so far as our basic econometric test will be based on the sample of initial subscriber households only.

3.2 Descriptive statistics (1): comparing subscribers and non-subscribers

We may now turn to presenting descriptive statistics of the sample households, distinguishing between subscribers and non-subscribers. These statistics relate to their socio-economic and health characteristics (see Table 2). (The complete list of all the variables used in this paper, as well as their definitions, is presented in Appendix II).

Along many dimensions, no difference exists between subscribers and non-subscribers. In particular, they do not differ in terms of income and wealth or in terms of education. While income is measured continuously, the asset index is constructed by considering several binary asset ownership variables (the questions are reproduced in Appendix III), and applying Multiple Correspondence Analysis (MCA)[11]. Both measures describe a negative asymmetric

[8] Since households interviewed in the control villages numbered 450, we covered a total of 1,080 households.

[9] The number of households interviewed in 2011 in the control villages was 387.

[10] In a significant number of cases, indeed, non-subscribers gave us a wrong phone number so as to prevent us from contacting them again.

[11] Note that MCA is a generalization of the classic Principal Component Analysis (PCA) where the variables to be analyzed are categorical, not continuous.

shape and display a linear correlation of 0.39. Note that while the average income in the sample is 2,820 Rupees, the median income is only 708 Rupees. As for education, it is measured either continuously (number of years of schooling of the household head) or through a binary variable indicating whether sh/e can read and write (which is true for 72 % of them).

Table 1: Personal, health and socio-economic characteristics of the sample households

	Treatment villages	Subscriber households	Non-subscriber households	Difference in means
Gender of head	0.913	0.902	0.927	0.0255
	(0.282)	(0.298)	(0.260)	[1.06]
Age of head	44	42.68	45.63	2.957***
	(10.49)	(9.576)	(11.33)	[3.33]
Schooling of head	6.375	6.275	6.500	0.225
	(4.605)	(4.553)	(4.674)	[0.57]
Literacy	0.724	0.693	0.762	0.0693*
	(0.448)	(0.462)	(0.427)	[1.82]
Size of household (Nr of members)	4.749	4.650	4.871	0.221
	(1.721)	(1.551)	(1.907)	[1.50]
Monthly income	2.820	3.175	2.382	-0.793
	(10.07)	(12.84)	(4.805)	[-0.92]
Asset index	0.180	0.215	0.138	-0.0769
	(0.940)	(0.921)	(0.962)	[-0.96]
Sick_member_present	0.892	0.908	0.871	-0.0375
	(0.311)	(0.289)	(0.336)	[-1.41]
Sick_member_past	0.863	0.863	0.863	0.0002
	(0.344)	(0.345)	(0.345)	[0.01]
Prevention index_present	0.0765	0.191	-0.064	-0.256***
	(0.943)	(0.924)	(0.948)	[-3.20]
Prevention index_past	-0.081	0.154	-0.371	-0.525***
	-1.073	-1.073	-1.001	[-5.89]
Nr of households	554	306	248	554

Standar deviation in parentheses (), t-statistics in brackets [ ]

* p<0.10, ** p<0.05, *** p<0.01

The incidence of health shocks has been measured twice, before the start of the program (*sick_member_past*) and toward the end of the first year after the contract had to be renewed (*sick_member_present*). Table 1 shows that health shocks affecting a family member are quite frequent in the sample: in 89% of the households, at least one member fell sick during the year covered by our survey (2010-2011). Moreover, we cannot reject the null hypothesis that the probability of a health event is identical between subscribers and non-subscribers, which is preliminary evidence that moral hazard behavior should not be a serious concern. No

difference emerges either when we consider the year preceding the start of the program, which suggests that one important source of adverse selection (people more vulnerable to health shocks are more prone to take up insurance) is not likely to be present. The same conclusions are obtained if, instead of measuring health shocks by a binary variable (whether at least one member of the household has been sick during the period considered), we use a continuous measure indicating the number of illnesses inside a household.

Another variable that we have measured twice along the time scale is the so-called prevention index. It is based on variables measuring the knowledge of households regarding basics in health care, personal hygiene, nutrition, sanitation, and water handling (see Appendix III). This information was combined through a MCA to form a single index. The resulting multimodal behavior expresses a strong heterogeneity in preventive behavior in the sample. The average value of this index, when measured at the end of the first year of the program (denoted by *prevention_index_present*), is larger for subscribers (0.19) than for non-subscribers (-0.06), and the difference is strongly significant. When measured before the start of the program (and denoted by *prevention_index_past*), the index value is again larger for the subscribers yet the gap between them and the non-subscribers appears to be much wider.[12] Households which enrolled into the program in 2010 were therefore significantly more health-and-hygiene conscious than others.

Apparently, more health-conscious households do not represent significantly better risks insofar as they are not more successful in avoiding health shocks: the correlation between the health event variable (measured for the year 2010-2011) and the prevention index (measured either for the current year or the past year) is very low, and this is confirmed when we regress the former on the latter and introduce a variety of controls. A possible clue to this apparently counter-intuitive result is that more health-conscious households are perhaps less sick than others yet also more prone to consult with health specialists and report illness events.

Table 2 presents a flow-chart summarizing key information about our sample households at successive stages of the insurance process. Note in particular that out of the 306 initial subscribers whom we could re-interview in 2011, only 100 (39 + 52 + 9), that is less than one-

[12] A plausible explanation behind the narrowing down of the gap between the two successive years is the following: since the initial level of preventive knowledge was much higher among subscribers, further progress was more difficult to achieve.

third, chose to renew their insurance contract. On the other hand, only 9 out of 248 households which did not subscribe in 2010 (3.6 %) decided to enroll one year later. The last column that displays the net insurance payout will soon be commented.

Table 2: Flow-chart of sample households at successive stages of the insurance process

Subscribed to the insurance contract	Received a health shock	Used the insurance	Renewed the insurance contract (or subscribed after one year)	Net insurance payout (in Rupees)
Yes: 306	Yes: 278 (91%)	Yes: 62 (22%)	Yes: 39 (63%)	+1751
			No: 23 (37%)	-135
		No: 216 (78%)	Yes: 52 (24%)	-533
			No: 164 (76%)	-563
	No: 28 (9%)	Not relevant	Yes: 9 (32%)	-568
			No: 19 (68%)	-508
No: 248	Yes: 216 (87%)	Not relevant	Yes: 9 (4%)	Not relevant
	No: 32 (13%)		No: 239 (96%)	

3.3 Descriptive statistics (2): measures of key independent variables

In the light of the discussion in Section 2, we have gained a precise sense in which the concept of insurance can be deemed to be misunderstood. The three following questions, in particular, seem to be well-designed to gauge people's understanding of insurance principles:

(1) If the discounts obtained turn out to be smaller than the premium paid, should the insurer reimburse (part of) the premium?

(2) Is it unfair that everybody pays the same premium whether falling sick or not?

(3) Is it shocking that other people benefit from the premium that you have paid because they have been sick?

Understanding of the insurance concept should be reflected in negative answers to each question. It is striking that only 30% of the sample subscriber households answered no to either the first or the second question (29% for the first and 31% for the second). In addition, less than half of them (47%) answered negatively to the third question. On the basis of the

answers to these three questions, we can construct three alternative binary measures of understanding: a dummy equal to one if the household has answered correctly (that is, negatively) to the three questions (UND_1), reflecting a very good understanding of what insurance is about; a dummy equal to one if the household has answered correctly to at least two questions (UND_2); a dummy equal to one if the household has answered correctly to at least one question (UND_3). We find that UND_1 = 1 for only 7.5 % of the subscriber households, UND_2 = 1 for 35.3%, and UND_3 = 1 for 74.5% of them. It could be argued that a positive answer to the second question does not necessarily point to bad understanding of insurance because the respondent may believe that a deductible would precisely have the effect of varying the cost between sick and healthy insured individuals. Remember, however, that in the SSP program in-patient care is completely free (up to a certain about the insurance scheme limit). If the above evidence clearly testifies to a problem of understanding among many villagers, it does not enable us to decide which of the two competing explanations of low contract renewal –credit/investment or myopic loss aversion– is valid. The problem arises from the fact that both explanations have close intuitions.

As we know from a number of studies, deficient information may be a serious cause of low participation in insurance programs. To measure the level of information, we use the following questions:

(1) Do you know the discounts provided by the insurance scheme?

(2) Do you know the health facilities in which you can obtain the discounts provided by the insurance?

(3) Do you know how to renew the contract?

Good information is reflected in positive and justified answers to these questions. The data reveal that only one-fifth of the subscriber households could provide the correct details of the discounts offered by the SSP scheme. A little more than one-third of them (34%) knew that discounted prices can only be obtained in a limited number of health facilities, which they were able to identify. Finally, two-fifths of them knew how to renew their insurance contract. On the basis of answers to the above three questions, we construct three alternative binary measures of information: a dummy equal to one if the household has answered correctly to the three questions (INFO_1), reflecting very good information about the product and the functioning of the scheme; a dummy equal to one if the household has answered correctly to

at least two questions (INFO_2); a dummy equal to one if the household has answered correctly to at least one question (INFO_3). From our dataset, it is evident that INFO_1 = 1 for less than one-tenth of the subscriber households (8.8%); INFO_2 = 1 for about 23% of them; and INFO_3 = 1 for about 62%.

Unsurprisingly, a significant correlation exists between understanding and information. This correlation, however, is far from perfect except when the highest levels of understanding and information are considered.[13] Much less expected is the finding that the level of understanding of the household head is not correlated with personal characteristics such as schooling, literacy, assets, income, health awareness, participation in self-help groups, and occurrence of sickness.[14]

The above information has been collected at endline, that is when we re-surveyed the households just after they took their decision to re-enroll or not. This timing is explained by the fact that we decided to re-orient the study once the failure of the SSP scheme became so clear that there was no point any more to assess its impact (our initial objective). Although ex post querying of the households is at first sight an incorrect procedure, some considerations suggest that things are more complicated. On the one hand, ex ante querying carries the risk of over-estimating the extent of ill-information by testing people's knowledge about the scheme before they actually needed to use it. Therefore, we ought to be concerned about the possibility that insured people strive to acquire the necessary information only when they, or a member of their family, has fallen sick. On the other hand, when perceptions about the fairness of the insurance mechanism are measured before the interviewees possibly went through an actual experience of insurance (and through the eventuality of making a loss on their insurance account), the questions may look abstract and are thus susceptible of eliciting

[13] When we compare measures of similar order, for example, UND_3 with INFO_3, we have that: out of 228 households for which UND_3=1 (low level of understanding), 157 (68.9%) also have a low level of information (INFO_3=1); out of 108 households for which UND_2=1, 73 (67.5%) have an intermediate level of information (INFO_2=1); and out of 23 households for which UND_1=1, 20 (86.9%) are well informed (INFO_1=1).

[14] We carried out statistical tests of difference-in-means comparing households for which UND_2=1 with those for which UND_2=0. The only significant difference (at 90% confidence level only) is observed for income but its sign is opposite to intuition: poorer households have a slightly higher level of understanding. Yet, this result is not very robust. Indeed, when we run a regression of income on the the dummy UND_2 (so that the constant is the income when Und_2=0, and the coefficient is the difference), and we use clusterized standard errors, the difference is not significant anymore. On the other hand, there is no evidence of inter-village differences in understanding levels.

casual or perfunctory answers. Unfortunately, ex post querying about the subscribers' understanding of insurance may cause other types of bias, particularly if the interviewees are keen to justify or rationalize their choices and behaviour ex post. We shall later discuss how we address this legitimate concern.

Our third key variable, the net insurance payout, is also constructed on the basis of endline data, since it is calculated by using the 2010-2011 period as reference. To derive it, we have subtracted the premium from the cost-savings realized in health expenditures as a result of the discounts provided by the insurance scheme.[15] For almost 86% of the subscriber households in our sample, the net insurance payout has been negative during the 2010-2011 period. The mean value of the net payout is -227 Rs while the median value is -450 Rs. (The gross payout is 1,227 Rs, on an average, for those households which actually used the insurance services, while the median value is 660 Rs). When we ask the subscriber households whether they perceive that their net payout has been positive or negative, we find that 89% of them believe that they have incurred a loss from participating in the insurance scheme. Comparing perceptions with actual facts gives an idea about the degree of distortion of these perceptions. The outcome of such a comparison is presented in Table 3.

Table 3: Comparison between perceptions and facts regarding the sign of the net insurance payout (sample subscribers)

	Freq.	Percent
Think correctly that the net insurance payout has been negative	247	80.72
Think correctly that the net insurance payout has been positive	18	5.88
Think incorrectly that the net insurance payout has been negative while it has been actually positive (pessimistic belief)	26	8.5
Think incorrectly that the net insurance payout has been positive while it has been actually negative (optimistic belief)	15	4.9
Total	306	100

It is remarkable that the great majority of subscribers (86.6%) have a correct perception about the sign of the net insurance payout. The remaining 13.4% are either too optimistic (they think that the net insurance payout has been positive while it has been actually negative) or too pessimistic (in the converse case). The degree of distortion in the subscribers' perception is much smaller than we could have expected given the complexity of the

[15] We have not followed the alternative method consisting of computing the ratio of cost savings to the amount of the premium. This is because there would then be many zero values that would unnecessarily complicate the econometric analysis.

calculations involved (recording the discounts and adding them up). This surprising ability to estimate costs and benefits from the health insurance program singularly contrasts with the widespread lack of understanding of the functioning mechanism of insurance and its implications.

The fact that so many subscribers incurred a net loss over the first year of the program begs an explanation, especially so because we know that more than 90% of them have had a health shock during that year. The clue behind this puzzle lies in a low use of the insurance by many subscribers. It is thus noticeable that, out of 278 households which suffered some health problem during the period 2010-2011, as many as 216 households (77%) did not actually make use of their insurance! In other words, the net insurance payout is negative not only for the few households which did not need to call for health services but also for those numerous households which needed the insurance but did not take advantage of it. In Table 3, we can moreover see that the net payout for these two categories of households is about the same (between -500 and -570 Rupees) and is significantly lower than the payout for the households which used the insurance, especially those which chose to renew the contract.

3.4 Descriptive statistics (3): reasons for dissatisfaction or contract discontinuation

The main factor behind the low rate of use of insurance is poor information: among the subscribers who did not use the insurance services while being sick, the fraction of those ignoring the discounts offered by the SSP program was considerably higher (90%) than among the subscribers who did use their insurance (42%). Albeit somewhat less marked, the contrast is also observed when we compare the proportions of subscribers who ignored that discounts are only provided in a limited number of health facilities: 70% for those who did not use their insurance as against 53% for those who did use it.

A large majority (74%) of the subscriber households expressed disappointment or strong disappointment with the SSP program (their number being equally shared among those disappointed and those strongly disappointed). By contrast, only 6% were very satisfied while the remaining 20% were satisfied. There is a strong yet far from perfect correlation between satisfaction and the contract renewal decision: 56% of satisfied (or very satisfied) households chose to renew their contract compared to only 25% for the disappointed (or very disappointed) households. On the other hand, 61% of the households which actually used their insurance expressed satisfaction (or great satisfaction) as against 16% only for those

which did not. Again, the contrast is marked but actual use does not fully explain satisfaction about the insurance scheme.

The quality of the services covered by the insurance, as well as the claiming and contract renewal procedures, have been considered quite satisfactory by the subscriber households. Nine-tenths of the households which did use their insurance considered it useful and rather easy to handle. Moreover, among the households which perceived a negative return from the program, only 21% deemed the premium expensive and hard to finance. When queried about the rationale behind their decision not to renew their insurance contract, the majority of the households concerned mentioned either a lack of information about how and where to use the insurance and how to renew it (33%+15%), or the absence of benefits and the lack of need for an insurance given the non-occurrence of illness problems (28%+15%). Barely 9% of the households mentioned the level of the premium and less than 0.5% the low quality of the services covered. It is also worth noting that not a single household head complained that the risk premium was too high owing to the presence of opportunists, even among the subsample of relatively health-conscious households. In point of fact, the problem of moral hazard has never been alluded to in our interviews with subscriber households.[16] We can therefore rule out the possibility that low contract renewal is explained by either the low quality of the health delivery services or problems of moral hazard arising from negligence or strategic manipulation.

Given our main objective in this study, the following bears emphasis: whichever the question considered to measure the level of understanding, a significant correlation exists between understanding and the renewal decision,. The correlation is especially strong when the second question is considered: 78% of the households which dropped out (as against 50% of the households which did not) consider it unfair to pay the premium if it later turns out that no payment could be collected on the insurance.[17]

[16] This is not really surprising inasmuch as they do not seem to conceive that incentive problems (whether of the adverse selection or the moral hazard kinds) are taken into account by the insurance company while setting the level of the insurance premium.

[17] Likewise, there is a statistically significant relationship between contract renewal behavior and the answers given to each of the questions used to measure the level of information. Thus, as many as 87% of the households which dropped out did not know the amount of the discount granted by the insurance scheme, while 69% of them did not know how to renew their contract, and 78% of them

Finally, while 29% of the households which renewed their insurance contract had a positive net insurance payout during the period 2010-2011, the proportion is as low as 8% among those which dropped out of the program. The average net insurance payout was +350 Rs for the former and only -509 Rs for the latter. Because of the low rate of use of the insurance in the presence of health shocks, it is not surprising that the average value of the insurance premium paid by all the sample subscriber households (582 Rs) greatly exceeded the average value of the (gross) insurance benefits (352 Rs).[18]

4. Estimation strategy

4.1 General considerations

Our central goal is to show that low contract renewal in insurance may be partly explained by cognitive bias resulting in narrow framing or myopia. Two tests are proposed that are based on the following predictions. First, when a cognitive bias is present, the past realization of an adverse shock at the level of the individual, and the ensuing collection of a payout, does affect (positively) the decision to renew the insurance contract. The re-enrolling decision of a rational, forward-looking agent should be independent of whether a shock has occurred or not, if we leave aside the possibility that the shock triggers an updating of the individual's type (autocorrelation of shocks brings new information about the household's vulnerability to events of bad health). The second prediction is a corollary of the first: the negative impact of a lack of shock on contract renewal is mitigated when the notion of insurance is better understood, and should even disappear when the level of understanding is satisfactory enough to transform short-term framing into forward-looking expected utility maximization.

In our specific context, contract renewal is especially low because lack of understanding is compounded by lack of information: the absence of an insurance payout may result from the inability to reap the insurance benefit when a shock has actually occurred. The latter

expected to receive discounts in any health facilty. By contrast, the proportions for households which did renew their insurance contract are 65%, 36%, and 42%, respectively.

[18] According to expected utility theory, risk-averse people are willing to pay a premium greater than the expected value of losses from the insured risky events. However, the gap between average insurance premium and benefits is too large to be accounted for in terms of this standard explanation only: it would suggest an absurdly high degree of risk aversion.

failure generates frustrations about the insurance scheme that may have nothing to do with short term framing. Indeed, unwillingness to renew the contract may just reflect a loss of trust in the scheme rather than myopic behaviour as such. In order to avoid confounding the two causes of low contract renewal, we need to control for information at household level when testing for the role of cognitive bias. In other words, the role of an understanding failure will be clearly established only when it is shown that a small insurance payout resulting from a lack of health shocks and not necessarily from a poor access to critical information discourages households from renewing their participation to the scheme. The necessity to control for information would not exist if information about how to collect the insurance payout could be obtained as a result of deliberate efforts deployed by the household when the need arises. Use of the insurance would then be fully determined by the occurrence of a shock leaving no residual role for a supply-side information constraint. Our raw data suggest that a serious supply-side problem exists in the study area: there is no correlation between shock occurrence and the level of information (households which had a sick member during the period 2010-2011 are not better informed than the other households). Also, there is a surprisingly low (equal to 0.11) correlation between the health prevention index and information. Thus, subscribers who went through events of illness and relatively health-conscious subscribers, that is, those who should value information about the insurance scheme more than others, did not generally succeed in getting more of it.[19]

In testing for the presence of cognitive bias, we therefore need to confirm that the SSP scheme has been afflicted by a genuine information failure in the sense of a supply-generated constraint. In the next sub-section we explain how this preliminary exercise is carried out and then discuss our strategy to estimate how the understanding failure affects contract renewal.

4.2 Estimating the determinants of insurance use

We want to establish that household access to information determines the use of the insurance after controlling for health shocks and for demand factors reflected in characteristics of the subscriber and his (her) household, education, health awareness, and wealth in particular. Toward that purpose, we estimate two different econometric models

[19] Note that the correlation between the prevention index and income is 0.23. The correlation between the prevention index and education is 0.24 when education is measured by the number of years of schooling and 0.18 when it is measured by the literacy dummy.

based on two different datasets. The first model is a simple linear probability model based on data related to subscriber households only. The second model is a Heckman Probit model that includes a first-stage selection equation to determine entry into the micro-insurance program. It therefore uses the complete sample of households interviewed in the treatment villages, whether subscribers or not. The advantage of estimating this second model is not only that it provides a robustness check for the results obtained with the standard OLS model, but also that it sheds light on the determinants of the subscription decision in addition to those of the renewal decision. The first-stage equation therefore presents an interest in itself.[20]

The first model has the following form:

$$Use_{iv} = \propto + \beta Info_{iv} + \gamma Shock_{iv} + \delta Attributes_{iv} + \mu Villages + \varepsilon$$

The dependent variable, Use_{iv}, is a dummy with value one when household *i* of village *v* has actually used its insurance during the period 2010-2011. The first independent variable, $Info_{iv}$, is our measure of the household's level of information, whether INFO_1, INFO_2, or INFO_3.[21] The health shock is measured by *sick_member_present*, and the set of characteristics of the household (head), denoted by $Attributes_{iv}$, comprises a large number of variables including age, gender, education level, current health awareness (about the importance of prevention) and participation of the head in self-help groups, plus household size. Village fixed effects are also added.

[20] A natural concern is related to the assumption of normality of the error term that characterizes the Heckman selection model. To address this aspect, we also estimate the semi-nonparametric selection model of Gabler et al. (1993), which relaxes the Gaussian distributional assumption by specifying the likelihood function semi-parametrically. Because the results obtained with this model are similar to those of the Heckman model, they will not be shown. Our findings do not appear to be influenced by distributional assumptions.

[21] It must be pointed out that our dependent variable, use of the insurance policy, is reported for a period that preceded the time at which the household's degree of information was tested. Since information can only have improved over the one-year period concerned, our measure is possibly over-estimated relative to what it was at the relevant time. How this affects our estimate of the effect of information on Use_{iv} is not clear. Yet, if we make the reasonable assumption that households which failed to use their insurance policy acquired *ex post* more information than those which succeeded in doing so (say, because they did not want to see a repetition of their failure), we will under-estimate the impact of information on Use_{iv}.

We do not believe that information is endogenous to actual use: why should a household refrain from using services covered by an insurance to which it has subscribed (at a positive cost), or why should it choose not to acquire the necessary information although it has been hit by a shock? On the other hand, the omitted variable problem appears to be even less serious than the reverse causality problem: since our information measure relies on straightforward knowledge of the conditions under which the insurance policy can actually be used, it must have a direct impact on the ability of insured individuals to obtain discounts in the event of a health shock.

The second model, the selection model, has the following form:

$$Use_{iv}^{*} = \propto + \beta Info_{iv} + \gamma Shock_{iv} + \delta Attributes_{iv} + \mu Villages + \varepsilon$$
$$S_{iv}^{*} = \theta P_{iv} + \gamma' Shock_{iv} + \delta' Attributes_{iv} + \mu' Villages + \eta$$
$$Use_{iv}^{*} = \begin{cases} Use_{iv} & \text{if } S_{iv}^{*} = 1 \\ NA & \text{if } S_{iv}^{*} = 0 \end{cases}$$

The selection equation explains the unobservable propensity to subscribe to an insurance, S_{iv}^{*}, as a function of a set of instruments, P_{iv}^{*}, and the independent variables included in the second-stage equation. The dependent variable use_{iv} is observed only when $S_{iv}^{*}=1$. The two instruments that we use are (1°) the prevention index of the household as measured historically (prior to the start of the SSP program), *prevention_index_past*, and (2°) a dummy (labeled *aware*) indicating whether the household was aware of the existence of the SSP program when it was launched or before.[22] We expect the exclusion restriction to be satisfied for the first instrument since actual use of the insurance is liable to be influenced by the household's level of health and hygiene consciousness during the year 2010-2011, and not by the same variable measured for the previous year which should have influenced the subscription decision instead.[23] In other words, it is reasonable to assume that the prevention index value prior to the start of the program influences actual use of insurance services only

[22] In the light of our findings reported in Table 2, there was no hope that the health status of the household before the program started (whether at least one its members fell sick during the period 2009-2010) could prove to be a valid instrument.

[23] This implies that our set of controls is not exactly identical between the first and the second stage equations. Indeed, the health status variable, which is present in both equations, refers to the state of health pertaining to two different periods of time (2009-2010 or 2010-2011) depending on which equation is considered.

through the channel of the subscription decision. Regarding the second instrument, we cannot be entirely certain that the exclusion restriction is theoretically satisfied, yet this is quite likely because we control for information. Finally, we need to mention that, in both the LP and the selection models, the standard errors are clustered at the village level.

4.3 Estimating the determinants of contract renewal

As we know from subsection 4.1, two terms play a key role in any test of the influence of cognitive bias on the contract renewal decision: the shock measure and the interaction between it and the level of understanding of insurance. We have also learned that, in order not to confound understanding and information failures, knowledge about how to collect the insurance payout must feature among the main determinants of contract renewal. However, the degree of information of the household does not determine, conjointly with the level of understanding of insurance, how a shock affects its contract renewal decision. Indeed, if a shock occurs and the information is good, both myopic and forward-looking households renew their contract while if a shock occurs and information is bad, both types do not renew it. In other words, it is only when a shock does not occur that the two types behave differently, regardless of the degree of information. We do not therefore need to be concerned with a triple interaction effect between the shock, understanding and information variables. This is good news because the restricted size of our sample makes us wary of losing too many degrees of freedom by multiplying interaction variables. There remains the possibility that by bringing new information about the household's vulnerability to events of bad health, autocorrelation of shocks affects contract renewal. To address this issue, we will propose a simple test to be explained in the course of presenting our results.

In the light of the above considerations, the linear probability model of contract renewal can be specified as follows:[24]

$$Renewal_{iv} = \propto + \beta Info_{iv} + \lambda Und_{iv} + \gamma Shock_{iv} + \omega Und_{iv} x Shock_{iv} + \delta Attributes_{iv} + \mu Villages + \varepsilon$$

The dependent variable is $Renewal_{iv}$, a dummy equal to one if the household has chosen to renew the insurance contract. Compared to the model for insurance use, three new

[24] We will also estimate a model in which the interaction term $Shock_{iv}.Info_{iv}$ is added, but we know that the price to pay is a reduction in the efficiency of the estimators.

independent variables are featured. The first one is Und_{iv}, our measure of the household's level of understanding of the insurance concept, whether UND_1, UND_2, or UND_3. The second variable is $Shock_{iv}$, which we measure in two different ways: through the dummy *sick_member_present* and through a continuous variable indicating the number of illnesses suffered by the household during the year 2010-2011 (labeled *nr_illnesses*). $Shock_{iv}$ is an exogenous variable that signals potential insurance benefits. It will allow us to estimate the impact of potential benefits on contract renewal for a given information level (since we control for $Info_{iv}$). In an alternative specification, we replace $Shock_{iv}$ by $peer\_effect_{iv}$, which is a binary variable indicating the presence of a relative or friend who has opted out of the program. The idea here is to check whether the contract renewal decision is influenced by a peer effect rather than by own personal experience.[25]

In still another attempt, we replace $Shock_{iv}$ by either of the two following variables: $payout_{iv}$ and *low_visit_frequency*. While the latter is a dummy indicating equal to one if the household has visited a health facility (any one of them, covered or not by the scheme) fewer than three times during the year 2010-2011 (corresponding to the median value), the former measures the net payout accrued to the household at the end of the same year. We use different versions of this variable, such as a continuous variable constructed in such a way that all values equal to or higher than zero are set to zero (to prevent the mixing up of positive and negative values that complicates the interpretation of the interaction term mentioned below), a binary variable with value one if the net insurance payout has been negative (and zero if it has been positive or nil), a binary variable with value one if the net payout has been lower than the median value (equal to -450 Rs), and value zero if it has been higher, or similar variables in which the threshold is different from the median (for example, a critical value corresponding to the first tertile of the distribution so that value one is assigned to any household belonging to the one-third of households exhibiting the lowest values of the negative net payout).

Finally, the third new independent variable is an interaction term between Und_{iv} and $Shock_{iv}$ (or whichever variable replaces it). In the presence of cognitive bias, we expect the sign of $Shock_{iv}$ to be positive and the sign of the interaction to be negative: formally, $\gamma > 0$ and

[25] Indeed, many insurance decisions appear to be based "on what other people are doing or on what those who one respects believe is an appropriate action to take" (Kunreuther et al., 2013: 107).

$\omega < 0$. Moreover, we expect the interaction coefficient to be of about the same size as the shock coefficient, indicating that there is no effect of a health shock on contract renewal when understanding of insurance is reasonably good: γ is not statistically different from ω. When $shock_{iv}$ is replaced by $peer\_effect_{iv}$, or when it is replaced by either $payout_{iv}$ or *low_visit_frequency*, the prediction is $\gamma < 0$ and $\omega > 0$. Finally, we expect β and λ to have a positive sign.

Before turning to the results, we have yet to discuss some measurement and endogeneity issues regarding the information and understanding variables. In measuring the latter, we adopt the following definitions: *Info=INFO_2*, and *Und=UND_2*, implying that the reference category consists of households which answered incorrectly to two or three questions raised to them. (Using the highest, rather than the intermediate, levels of understanding and information is not a good option because the corresponding subscribers are quite few and the interaction term would therefore concern an even smaller group). To see the rationale behind the choice of *UND_2*, let us re-define our measure of understanding by using three dummy variables that must be used simultaneously: *UND_A=1* if the household has answered correctly to one question, *UND_B=1* for two correct answers and *UND_C=1* for three correct answers (*UND_C* is thus identical to *UND_1*). The reference category therefore consists of households which answered incorrectly to the three questions. When we analyze the effects of these variables on contract renewal (without the interaction term), we find that the coefficient of *UND_A* is not statistically different from zero while the coefficients of both *UND_B* and *UND_C* are strongly significant. Moreover, and as expected, the coefficient of *UND_C* is much higher than the coefficient of *UND_B* (see Appendix IV, columns (2) and (4)).[26] In words, the households which answered correctly to only one of the three questions do not behave differently from those which incorrectly answered to all three questions. We are therefore justified in clubbing together the households for which *UND_B=1* and *UND_C=1*, which is equivalent to using *UND_2*. Note that we find exactly the same results for the information variable, thus justifying our use of *INFO_2* (see Appendix IV, columns (1) and (3)).

[26] With the LP model and village fixed effects, the coefficient of *UND_C* is 0.46 compared to 0.16 for *UND_B*.

Endogeneity of the information and understanding variables caused by simultaneous or reverse causality is unlikely to be a real problem. Beginning with understanding, there is substantial evidence that cognitive bias in matters of complex financial transactions is quite "sticky", and it is this "stickiness" that explains the poor financial literacy even in highly developed countries (Kunreuther et al., 2013). Moreover, several empirical studies have recently concluded that levels of understanding are not easily raised in developing countries (see; e.g., Dercon et al., 2012 for Kenya; Bonan et al., 2012 for Senegal; and Anagol et al., 2013 for India).[27] Evidence from our own data reinforces the idea that it is hard to transform myopic into long-term framing of insurance in people's mindset: individuals confronted with at least one health shock do not exhibit a higher level of understanding than the others while this could have helped them to better counter the shock.[28] Likewise, the correlation between health consciousness and understanding is not statistically significant: we cannot reject the null hypothesis that the value of the prevention index is similar between those with a good understanding of insurance (UND_2=1) and those with a poor understanding (UND_2=0).

It could still be argued that, since it is measured ex post, the level of understanding is a simple reflection or a rationalization of the experience undergone by the household. If this is true, however, the understanding variable should be highly correlated with any variable measuring the insurance experience (such as *shock* or *payout*), which does not turn out to be the case. Our econometric estimation will supply us with a further test as to whether the understanding variable maintains its significance in the presence of experience variables and various controls.

As regards information, we already know that failures are essentially driven by problems on the supply side: no correlation exists between information and health status or health prevention, suggesting that additional information could not be acquired by household heads who should have particularly valued it. Still, subscribers could seek to enhance their knowledge once the decision before them is contract renewal, assuming that fresh information is made available at that time. Causality would then be reversed. In our context, however, the

[27] Carter et al. (2010) reached more encouraging conclusions from dynamic field experiments in Morocco, Kenya, and Peru, yet their so-called comprehension index only partly includes aspects related to insurance.

[28] For example, the proportion of households with at least one health event during the year 2010-2011 for which UND_2=1 does not significantly differ from the proportion of those with no health event.

procedure of renewal consisted of simply approaching a clerk dedicated to the purpose without any further information or training meeting. As hinted at earlier, information was essentially supplied through local self-help groups whereas SSP did not manifest itself on the ground to provide systematic information and training, or to ensure a modicum of follow up action. It is no exaggeration to say that SSP's role was mainly played out when it helped to form the self-help groups. In these circumstances, it is not surprising that many subscribers ignored the precise conditions under which they could obtain discounts on medicines or free medical services, in particular the empanelled hospitals or dispensaries where free in-patient treatment was offered.

Could we estimate a 2SLS model in which the second-stage equation features actual use of insurance as one of the RHS variables while information serves to explain this variable in the first stage? The exclusion restriction would be satisfied since it is reasonable to think that the level of information influences contract renewal behavior only through the channel of the experience of actually using the policy. The problem, however, is that there is no theoretical ground for including understanding, a key explanatory variable in the second-stage equation, into the first-stage equation: if the level of understanding may clearly influence contract renewal behavior, it is hard to see how it could affect the use of the insurance policy. By dropping the understanding variable from the first stage, our estimation would suffer from an omitted variable bias and the estimates would not only be biased (which is always the case with 2SLS) but, more seriously, they would also be non-converging.

For our second model, we therefore stick to a Heckman selection model directly adapted from the model presented in Subsection 4.1. The only difference is that there are now three additional independent variables in the second-stage equation. In both the LP and the selection models, the standard errors are clustered at the village level.

5. Results

5.1 Determinants of insurance use

In Table 4, results of the LP model and the Heckman probit selection model (with average marginal effects) are displayed. We show the estimates of six different regressions depending on which information variable is used. In order not to overburden the table, results for the LP model without village fixed effects, which are very close to those with such effects,

are not shown. The first-stage selection equation is reported in the last column. For the selection model, we only show the results obtained in the absence of village fixed effects.

Table 4: Determinants of actual use of insurance services

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Linear Probability model			Heckman			Probit
Sick_member_present	0.23***	0.25***	0.21***	0.23***	0.24***	0.23***	
	(0.06)	(0.07)	(0.06)	(0.05)	(0.04)	(0.04)	
INFO_1	0.45***			0.41***			
	(0.07)			(0.07)			
INFO_2		0.29***			0.26***		
		(0.05)			(0.04)		
INFO_3			0.21***			0.27***	
			(0.06)			(0.06)	
Prevention _index _past							0.02**
							(0.01)
Aware							0.83***
							(0.03)
Village FE	Yes	Yes	Yes				
Attributes[*]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	306	306	306	554	554	554	554
R-squared	0.34	0.34	0.31				

Robust clustered by villages standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
[*] Estimates for Attributes are displayed in Appendix V.

As expected, the household is more likely to make actual use the insurance services when at least one of its members has fallen sick during the current period (2010-2011). Moreover, controlling for the health risk (and for a large set of characteristics of the household (head)), the level of information has a highly significant positive impact on insurance use. This is true whatever the way information is defined. In addition, when using the LP model, the size of the coefficient decreases monotonously as the intensity of information declines (being the highest for *Info=INFO_1* and the lowest for *Info=INFO_3*). Among characteristics that appear to play a significant role (see Appendix V), SHG_{iv}, a dummy equal to one if the household belonged to a self-help group before the start of the micro-insurance program, comes out with a strongly significant positive coefficient: membership in a self-help group raises the likelihood that insurance services are taken advantage of, thus suggesting that members of such groups are better aware of the need to consult with a specialist in the event

of a health problem. On the other hand, it is striking that neither the education level of the household head –whether measured in terms of literacy or number of years of schooling– nor the wealth of the household appears to bear upon the use of insurance.[29] There is thus little evidence that observable characteristics of the households and their heads determine insurance use, thereby suggesting that demand factors are not very important.

Let us now turn to the selection equation. First, the two instruments are statistically significant with a positive sign: enrolment into the program is more likely if the household possessed a higher level of preventive knowledge prior to its start, and if it was aware about its existence through the actions of SSP. When we test for the validity of the instruments by re-estimating the second-stage equation with the instruments included in the list of regressors, we find that none of them turns out to be statistically significant.[30] This implies, in particular, that *preventive_index_past* is not significant in the presence of *preventive_index_present*, which remains strongly significant. Second, a household had stronger incentive to enroll if it participated in a self-help group (SHG) prior to the start of the program. This is not surprising since the organization in charge of the program (SSP) used the pre-formed SHG as a lever to propagate the idea of health insurance and canvass for customers. Since 90 percent of the sample household heads are men (see Table 2), we infer that the effect of self-help groups mostly takes place through the influence of the head's wife.[31]

Third, female heads (about ten percent of the sample) were more likely to subscribe to the insurance than their male counterparts. Finally, richer households (in terms of wealth) were more willing to get insured than poorer ones. If, instead of measuring assets and incomes

[29] *Age* is measured continuously while *gender* is a dummy with value one when the household head is a man. The size of the household (*hholdsize*) corresponds to the number of members of all ages in the household. Education is measured in two different ways. We use a dummy (*literacy*) equal to one if the household can read and write, and a continuous variable (*schooling*) that indicates the total number of years of schooling (at the primary, secondary, and higher levels). To test for the concavity of the schooling variable, we add a square term, *schooling2*. Finally, *lnincome* is income measured in logarithmic terms while wealth is captured by a composite index denoted by *asset_index* (see Section 3).

[30] No other test is available because the endogenous explanatory variables are constant for the observed values of the dependent variable in the second-stage equation: households which used insurance are necessarily subscriber households.

[31] It also bears emphasis that the SHG variable is strongly significant even in the presence of *aware*, itself strongly significant.

continuously, we use the tertile distributions, we find that households belonging to the lowest tertile for both the income and the asset distributions are less likely to have enrolled into the insurance program, testifying to its exclusionary character vis-à-vis the poorest households (effects significant at the 95 percent confidence level ─results not shown). Excluded households turn out to be very poor since the threshold corresponding to the lowest tertile of the distribution (median value = 260 Rs) is significantly smaller than the poverty line in India (equal to 673 Rs).[32]

5.2 Determinants of contract renewal

In Tables 5 and 6, we show successively the results of the LP and the selection models when the dependent variable is *Renewal*. In column (1) of each table, the shock variable and the corresponding interaction term are omitted, but all control variables (age and gender, household size, schooling and literacy, income and assets) are present. (Estimates for *Attributes* in the two models are displayed in Appendixes VI and VII, respectively). In the following columns, we add a measure of the health shock (see (2) and (3)), the peer effect variable (see (4)), or a variable partly related to the shock (see (5) and (6)), always associated with the corresponding interaction with UND_2.[33]

Main results

Our central prediction stands neatly and consistently confirmed, and this is true whether we use the LP or the Heckman models.[34] The coefficient of *sick_member_present* is positive and highly significant, and this is also true when *nr_illnesses* is used although statistical

[32] Since the median income in our sample is around 700 Rs, the implication is that at least half of the sample population can be considered as poor, by Indian standards. Moreover, using tertile dummies instead of continuous measures of incomes and assets in the selection equation does not affect the estimates obtained in the second stage (whether in terms of statistical significance of the coefficients of the various regressors or in terms of their size). This holds true not only for the present but also for the following regression estimates. On the other hand, the semi-parametric estimates of the Heckman model are not different from those obtained here, and they will therefore not be shown.

[33] We have also estimated the same regressions by adding the interaction term $Shock_{iv}.Info_{iv}$. Our main results continue to hold but, as expected, the effects are less precisely estimated (results not shown).

[34] Caution is nevertheless needed when considering the results of the selection model. Indeed, when we re-estimate the second-stage equation with the two instruments included in the list of regressors, we find that only one of them (*aware*) is statistically insignificant. As pointed out before, no other test of the validity of our instruments is available.

significance is lower. Moreover, the coefficient of the interaction with *UND_2* is negative and highly significant in the two instances, and the sum of the two coefficients is not statistically different from zero: when the notion of insurance is well understood (there is no short-term framing), the occurrence of a shock does not influence the contract renewal decision.[35] Also noteworthy is the positive and highly significant coefficient of both *UND_2* and *INFO_2*. These effects remain even after controlling for the education variables, and their significance persists when we change the definitions of these two variables using almost all conceivable combinations.

When we use *UND_3*, which corresponds to the lowest level of understanding (except for complete ignorance), the size of the coefficient decreases whereas if we use *UND_1*, corresponding to the highest level, it increases. Similar results are obtained when we change the definition of the information variable (results not shown). An idea of the magnitude of the effects of *INFO_2* and *UND_2* is obtained by looking at the basic LP model reported in column (1): the probability of renewal is increased by more than 30% if the household improves its level of information (from ignoring the correct answers to all three key questions or knowing the correct answer to only one question to knowing the correct answers to at least two questions), and by 17% if it improves its level of understanding (with improvement defined in the same manner as for the information variable).

When we start estimating the models with *UND_2* as the only explanatory variable and then add other independent variables in a stepwise manner, we find that the coefficient of *UND_2* is always strongly significant (but its size may be reduced). It is therefore difficult to conceive that this variable could be endogenous in the sense of being a simple reflection or rationalization of the type of insurance experience encountered (a bitter experience if no health risk materialized or if it materialized but the proper information about how to obtain the discount was lacking).

[35] Bearing in mind that the marginal effect of a change in the interacted variables is not equal to the marginal effect of a change in the interacted term, we have estimated the marginal effects following the method proposed by Ai and Norton (2003). That is, the marginal effects have been computed as the cross derivative of the expected value of the dependent variable instead of the derivative of the interaction. Caution is nevertheless needed when considering the results of the selection model. Indeed, when we re-estimate the second-stage equation with the two instruments included in the list of regressors, we find that only one of them (*aware*) is statistically insignificant. As pointed out before, no other test of the validity of our instruments is available.

Table 5: Determinants of contract renewal: LPM estimations

VARIABLES	(1) Renew	(2) Renew	(3) Renew	(4) Renew	(5) Renew	(6) Renew
INFO_2	0.31***	0.30***	0.32***	0.31***	0.32***	0.30***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
UND_2	0.17***	0.52***	0.29***	0.13***	0.08**	0.10***
	(0.03)	(0.10)	(0.06)	(0.05)	(0.04)	(0.03)
Sick_member_present		0.20***				
		(0.06)				
UND_2 x Sick_member_present		-0.38***				
		(0.11)				
Nr_illnesses			0.04*			
			(0.02)			
UND_2 x Nr_illness			-0.07**			
			(0.03)			
Peer effect				-0.21**		
				(0.08)		
UND2_ x Peer effect				0.19*		
				(0.10)		
Payout					-0.11**	
					(0.05)	
UND_2 x Payout					0.19**	
					(0.09)	
Low_visit_frequency						-0.09*
						(0.05)
UND_2 x Low_visit_frequency						0.20**
						(0.09)
Attributes[*]	Yes	Yes	Yes	Yes	Yes	Yes
Village fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	306	306	306	306	306	306

Robust clustered by villages standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
[*] Estimates for Attributes are displayed in Appendix VI.

Table 6: *Determinants of contract renewal: Heckman probit estimations*

VARIABLES	(1) Renew	(2) Renew	(3) Renew	(4) Renew	(5) Renew	(6) Renew
INFO_2	0.29***	0.29***	0.30***	0.28***	0.30***	0.29***
	(0.04)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)
UND_2	0.19***	0.59***	0.31***	0.14***	0.09**	0.11***
	(0.03)	(0.13)	(0.06)	(0.03)	(0.04)	(0.04)
Sick_member_present		0.30***				
		(0.11)				
UND_2 x Sick_member_present		-0.42***				
		(0.15)				
Nr_illnesses			0.06***			
			(0.02)			
UND_2 x Nr_illness			-0.08***			
			(0.03)			
Peer effect				-0.36***		
				(0.13)		
UND2_ x Peer effect				0.40***		
				(0.15)		
Payout					-0.13**	
					(0.05)	
UND_2 x Payout					0.23***	
					(0.09)	
Low_visit_frequency						-0.12**
						(0.05)
UND_2 x Low_visit_frequency						0.21***
						(0.08)
Attributes[*]	Yes	Yes	Yes	Yes	Yes	Yes
Observations	554	554	554	554	554	554

Robust clustered by villages standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
[*] Estimates for Attributes are displayed in Appendix VII.

It is remarkable that *peer_effect* and the corresponding interaction term behave in a way very similar to the shock variables. Households are negatively influenced by the dropping-out behavior of close acquaintances, but only if they have a poor understanding of insurance. Absent the cognitive bias, what the peers decide does not affect the contract renewal decision of a household head: as is evident from Tables 5 and 6, the coefficients of the two above variables are very close to each other and of opposite signs.

When the net insurance payout, measured here by the median dummy (equal to one for households with a net payout smaller than the median), and the frequency of visits to hospitals or dispensaries are alternatively used as explanatory variables, the predicted effects are again confirmed. Because of their possible endogeneity, however, these results are better interpreted

as correlations than as causal relationships. In particular, having received a comparatively low net insurance payout during the current period (2010-2011) is associated with a relatively low probability of contract renewal but only for households with a cognitive bias. Interestingly, the threshold (median) value used, equal to -450 Rs, is not very different from the average or median value of the insurance premium paid by the sample households (average: 582 Rs; median: 600 Rs). Bearing in mind our previous finding that the average net payout is -509 Rs for the households which did not renew their contract (as against +350 Rs for those which did), this implies that those households roughly paid the average premium and did not obtain any discount.[36] It appears that households respond differently to a negative (net) payout depending not only on their level of understanding of insurance but also on the size of the loss: when the negative payout is not too large, that it, smaller on average than the (average) risk premium, their renewal decision is not influenced by the loss incurred.[37]

Finally, we have tested for the possible influence of updating of risk type on contract renewal. Toward that purpose, we have replaced our variable *sick_member_present* by another dummy equal to one when at least one member of the household has fallen ill during both the year 2010-2011 and the year 2009-2010, and equal to zero otherwise. This new variable does not have a significant effect on the decision to renew the contract (results not shown): only the occurrence of a shock during the year covered by the insurance appears to affect contract renewal. Our central hypothesis according to which households short frame the costs and benefits of insurance appears to be further validated.

Secondary results

There are a number of interesting results emerging from Appendixes VI and VII. To begin with, belonging to a self-help group before the start of the insurance program (typically

[36] We did not introduce the actual use of the insurance contract as a regressor because it is too much correlated with the net payout variable. The correlation between the dummy measuring whether the insurance was actually used and the *payout* variable measured by the median dummy is quite strong since 51.6 percent of the households which did not actually use the insurance received a net payout smaller than the median. By contrast, 72.6 percent of those which used it received a net payout higher than the median.

[37] When we change the threshold, taking the average rather than the median value, when we use a continuous definition of *payout* (setting all positive values to zero and multiplying all negative values by -1 so as to avoid mixing up negative and positive values), or when we use a subjective definition (a dummy equal to one when the household head perceived thhat s/he had earned a negative payout), the effect of the interaction term ceases to be significant, yet the sign of ω always remains positive.

through the wife of the head) has a positive effect not only on the probability to enter into that program (see the first-stage equation in the Heckman model of Table 4) but also on the probability to renew the insurance contract. Yet, this effect is not observed when village fixed effects are added, indicating that villages differ with respect to the presence of self-help groups. There is thus a noticeable difference between villages where SH groups exist and villages where they do not. It is plausible that in the former the information about the program and awareness about its usefulness have been spread more effectively among subscriber households, whether or not they themselves participate in a group.

The next result concerns the impact of wealth: less wealthy households appear to be more likely to renew their contract although, in the presence of village fixed effects, the impact of wealth often vanishes. However, if we replace the continuous measure of the asset index by tertile dummies, we find that households belonging to the lowest tertile have a higher probability to renew their contract compared to the other two tertiles, with or without village fixed effects. This finding is especially relevant when put into the perspective of an earlier result: if the poorest households are less likely to enroll into the insurance program (see Table 4), it now appears that they are more likely to stay on once they have experimented with it.[38] On the other hand, the amount of preventive knowledge that a household possesses in matters of health and hygiene appears to wield a positive influence on contract renewal: households exhibiting higher values of the preventive index are more likely not only to enroll into the insurance program but also to renew their contract after one year of experience.

A factor whose role is often discussed in the literature on micro-insurance is trust in the insurance company (see, e.g., Cai et al., 2009; Dercon et al., 2012). Our measure of trust is rather crude since it is a simple binary variable (named *trust*) equal to one when the household has answered positively to the following question (raised during the second round of the survey): "Do you fully trust the Arogya Sandhi program"? Nonetheless, whenever this variable is added to our list of regressors, it always comes out with a positive and significant coefficient, as expected (results not shown). The only qualification is that both the size and

[38] We have also queried about the occupations of the household heads. We are thus able to differentiate households (i) in which the head receives a wage income, (ii) is involved in a non-agricultural business or receives remittances or transfers, and (iii) whose incomes entirely depend on agriculture. Using (iii) as the reference category, we define two binary variables indicating whether the household belongs to category (i) or to category (ii), respectively. These variables are omitted from the tables displayed because their coefficients are never statistically different from zero.

the statistical significance of this coefficient are reduced when village fixed effects are added, suggesting that trust (or mistrust) tends to spread locally. Equally noticeable is the observed decrease in the size of the coefficient of *UND_2* when *trust* is present. This reflects the significant correlation between the two variables: while more than 57% of household heads with a good understanding of insurance (*UND_2*=1) confessed complete trust in the program, the proportion falls to barely 22% for those with a poor understanding (*UND_2*=0). The effect of trust is therefore partly confounded with the effect of understanding, a finding that deserves to be carefully pondered by policy makers. An effective way to enhance trust among potential clients might consist of improving their grasp of the concept of insurance.[39]

Finally, the effects of literacy and formal education are surprisingly contrasted. If literacy increases the propensity to renew the contract, the effect of schooling measured continuously is non-monotonous: it is negative in the first years and becomes positive once a sufficient level of education (computed to be as high as nine years) has been achieved. Bearing in mind that we control for the level of understanding of insurance, these results point to the existence of a different channel through which learning influences contract renewal decisions. And this channel must operate in such a way that learning discourages (or encourages) contract renewal but not insurance subscription (since we know that the latter effect does not exist). On the other hand, the opposite effects of literacy and formal schooling make sense only because the two variables are imperfectly correlated: schooling does not necessarily imply literacy –people who did attend school sometimes confessed to be illiterate– and, less surprisingly, people who did not go to school sometimes stated an ability to read and write.[40]

How can we account for the paradoxical finding that formal education, well into the secondary school, tends to discourage contract renewal all else being equal (including the level of understanding)? The most plausible explanation, based on field observations, is that information deficiencies gave rise to a climate of frustration and even anger in the treatment villages. To the extent that schooling imparts the habit of criticism and the ability to articulate opinions and express grievances, we expect educated subscribers to be especially disgruntled

[39] When *trust* is interacted with *UND_2*, the associated coefficient is not significantly different from zero. This is also true when *SHG* is interacted with *UND_2* on the ground that membership in a self-help group might be a proxy for trust (results not shown).

[40] It must be borne in mind that our question was framed as follows: "Can you read and write properly?", so that explicit room was left for a subjective appreciation of the skills involved.

about the lack of information and ready to react aggressively against the organization in charge. They are therefore more loth to renew their insurance contract than other subscribers. Beyond a critical level of schooling, however, this "assertion effect" is dominated by another counteracting effect, somehow identical to that underlying the role of literacy: learning stimulates contract renewal whether insurance is adequately understood or not, plausibly because the transaction cost of renewing the contract is smaller for, or perceived to be smaller by, literate people.

If the above story of higher frustration among educated people (up to a certain level) is true, it should show up in estimations aimed at explaining satisfaction about the program (see Appendix VIII). Based on a model similar to the one used for contract renewal, we find the following: the effects of *schooling* and *schooling2* are no more statistically significant yet, if we drop the square term, the coefficient of *schooling* is negative and close to significance (at the 90% confidence level) while the coefficient of *literacy* remains positive and strongly significant (results not shown). In other words, being more formally educated has the effect of raising the probability of being dissatisfied with the insurance program. Inspection of the same table also reveals that, as expected, the effects of information and understanding are positive and highly significant. In addition, households which participated to a self-help group prior to the start of the program are more likely to be satisfied.[41]

As a last remark, when we interact the education measures, either literacy or formal schooling, with the understanding variable, the effect is never statistically significant. The effect of a better understanding of insurance on contract renewal does not increase with the level of education of the household head.[42]

5. Conclusion and policy implications

To explain the low rate of contract renewal in an Indian micro-insurance health program, we cannot stick to the conventional expected utility framework. Many subscribers appear to

[41] We do not include in the table the interaction terms between UND_2 and a shock variable (or the peer effect variable) because the corresponding effects are never significant.

[42] It does not increase with wealth status either: when the lowest tertile dummy is interacted with the understanding variable (after removing the interaction term between the shock variable and *UND*_2), the effect is not significant.

have a cognitive bias reflected in short-term framing of insurance costs and benefits. As a result, they are reluctant to renew their contract if they did not collect any (or enough) payout because the health risk did not materialize. The deal is deemed unfair or unbalanced in so far as the premium paid for the period elapsed is seen as wasted, or as an investment which did not yield any (or sufficient) return. In our study area, the cognitive bias is compounded by a serious supply-side information failure: when a health shock occurs but missing or misleading information about how to collect the insurance payout prevents the subscribers from reaping it, a feeling of waste and the accompanying loss of trust in the insurance scheme exist even for classic expected utility maximizers.

The information failure could have been avoided because it is supply-driven. In this regard, it is reassuring that those households which have been able to actually use the insurance are generally satisfied with the program and that very few households have complained about the level of the premium, the quality of the health services delivered, or incentive problems. What the organization in charge of implementing the program has failed to do is to provide sufficient follow-up on the field through a minimum of physical presence and staff availability. It mistakenly believed that self-help groups, once established, could play the role of powerful catalysts and effective information providers. In fact, these effects were largely confined to the community where these groups were set up.

It is not sufficient either to believe in dynamic learning effects that would hopefully help reduce the information problem over time. This is because, at the dropping out rate that we have observed, the insurance scheme might well have entirely collapsed before these effects could take place. Finally, since the main informational problem encountered by subscribers has arisen from the existence of a restricted list of health providers operating within the ambit of the program, a straightforward solution seems to lie in an inclusive approach. If the services of all health providers were subsidized, insured villagers could never make the mistake of going to the wrong doctors or pharmacists. This is forgetting about another key aspect of the program, however. Behind the selective process lays the preoccupation of ensuring a minimum of quality in the services delivered. There thus exists an unavoidable trade-off between the quality of insured services and the complexity of information, two equally important considerations.

Because the underlying cognitive bias is persistent and hard to correct, the understanding failure is much harder to overcome than the information failure. Excessive optimism regarding the impact of financial training sessions or dynamic learning effects must be tempered by the available evidence. To surmount the understanding problem, two main pathways are available. The first option consists of designing the insurance products in such a way that people unaccustomed to the complex meaning of insurance can most easily perceive their value for them. Possible solutions consist of offering rebates to households which did not collect payments (Kunreuther et al., 2013: 99-100), mixing up a variety of risks so that the probability of receiving an indemnity in a rather short time span is sufficiently high for each and every household (Platteau, 1987, 1991, 1997; Udry, 1990, 1993, 1994), or bundling insurance products with other benefits, such as low-interest loans (Miranda and Farrin, 2012). The main problem with this approach is the efficiency cost involved: insurance policies offering rebates or low deductibles, for example, are not as profitable as standard policies,[43] and the (majority of) households which prefer the former over the latter contract would therefore suffer financial losses. These losses would not vanish over time because dynamic learning effects are unlikely given the "stickiness" of the cognitive bias behind the contract choice.

The second pathway takes the evidence provided in this paper as well as evidence of poor consumer financial decisions (when transactions are complex) in developed countries themselves as justifying a paternalistic approach to insurance. If the government wants to protect people against health risks, for example, it should make subscription to the standard, optimal insurance policy mandatory for everybody. Here, the problem is enforceability: while it is easy to impose the efficient contract on employees of the formal sector (premia can be automatically subtracted from gross salaries), dealing with informal workers may prove much harder. In poor countries with large informal sectors, enforcement costs are likely to exceed efficiency gains, making the first, optional approach more cost-effective overall.

The above is the essential message that we draw from our study. Two side results are also worth pondering. First, literacy positively influences contract renewal and the same can be

[43] Note that, when many risks are packaged together, the temptation to impose large deductibles is stronger (Rabin and Thaler, 2001).

said of people's training in matters of basic health care and hygiene, which increases the likelihood of not only renewal but also the initial take-up rates significantly. Second, there is the effect of wealth: other things being equal, the poorest households are less likely to enroll into the micro-insurance program yet, once they have experimented with it and other things being equal (occurrence of sickness, understanding and information levels, etc.), they have a higher probability to renew their contract than other households. This is an encouraging finding suggesting that campaigning efforts ought to be concentrated on the poorest segment of the population since it appears to draw comparatively large benefits from health micro-insurance when the circumstances are favorable.

References

Ai, C., and E. Norton, 2003. "Interaction Terms in Logit and Probit Models". *Economics Letters,* Vol. 80, pp. 123–129.

Anagol, S., S. Cole, and L. Litvine, 2013, "Overcoming Sub-Optimal Consumer Financial Decisions Using Behavioral 'Nudges': Experiments on the Life Insurance Purchase Decisions of Indian and US Workers", Research Paper, Micro-insurance Innovation Facility, International Labour Office, Geneva.

Andreoni, J., and Sprenger, Ch., 2009. "Certain and Uncertain Utility: The Allais Paradox and Five Decision Theory Phenomen", University of California San Diego Working Paper.

Andreoni, J., and Sprenger, Ch., 2012. "Estimating Time Preferences from Convex Budgets", *American Economic Review*, Vol.102, N° 7, pp. 3333–3356.

Basaza R., B. Criel, and P. Van der Stuyft, 2008. "Community Health Insurance in Uganda: Why Does Enrolment Remain Low? A View from Beneath", *Health Policy,* Vol. 87, pp. 172-184.

Bell, D.E., 1985. "Disappointment in Decision Making Under Uncertainty", *Operations Research*, Vol. 33, pp. 1-27.

Benartzi, S., and R. Thaler, 1995. "Myopic Loss Aversion and th e Equity Premium Puzzle", *Quarterly Journal of Economics,* Vol. 110, pp. 73-92.

Bonan, J., O. Dagnelie, P. Lemay-Boucher, and M. Tenikue, 2016, "The Impact of Insurance Literacy and Marketing Treatments on the Demand for Health Micro-insurance in Senegal: A Randomized Evaluation", *Journal of African Economies*, Vol. 26, pp. 169–191.

Braun, M., and A. Muermann, 2004. "The Impact of Regret on the Demand for Insurance", *Journal of Risk and Insurance*, Vol. 71, pp. 737-767.

Brown, J.R., A. Kapteyn, E.F.P. Luttmer, and O.S. Mitchell, 2017. "Cognitive Constraints on Valuing Annuities", *Journal of the European Economic Association*, Vol. 15, N° 2, pp. 429-462.

Bryan, G., 2013. "Ambiguity and Insurance", mimeo, London School of Economics.

Cai, H., Y. Chen, H. Fang & Zhou, L., 2009, "Micro-insurance, Trust and Economic Development: Evidence from a Randomized Natural Field Experiment", NBER Working Paper No. 15396.

Cai, J., A. de Janvry, A., and E. Sadoulet, 2013. "Social Networks and the Decision to Insure", Munich Personal RePec Archive OOWE 46861.

Carlin, B., 2009, "Strategic Price Complexity in Retail Financial Markets", *Journal of Financial Economics,* Vol. 91, pp. 278-287.

Carter, M.R., C.B. Barrett, S. Boucher, S. Chantarat, F. Galarza, J. McPeak, A. Mude, and C. Trivelli, 2008. "Insuring the Never Before Insured: Explaining Index Insurance Through Financial Education Games", *Basis Brief*, October, pp. 1-8.

Chankova, S., S. Sulzbach, and F. Diop, 2008, "Impact of Mutual Health Organizations: Evidence from West Africa", *Health Policy and Planning*, Vol. 23, N°4, pp. 264-276.

Cole, S., X. Giné, J. Tobacman, P. Topalova, R. Townsend, and J. Vickery, 2013, "Barriers to Household Risk Management: Evidence from India", *American Economic Journal: Applied Economics*, Vol. 5, N° 1, pp. 104-135.

De Bock, O., and W. Gelade, 2012. "The Demand for Micro-insurance: A Literature Review", ILO Micro-insurance Innovation Facility Research Paper, Geneva.

Dercon, S. and J. Hoddinott, 2004, "Health, Shocks, and Poverty Persistence". In: Dercon (Ed.), *Insurance against Poverty*, Oxford University Press, pp. 124-136.

Dercon, S., J.W. Gunning, A. Zeitlin, C. Cerrone, and S. Lombardini, 2012, "Health Insurance Participation: Experimental Evidence from Kenya", Research Paper N° 10, Micro-insurance Innovation Facility, International Labour Office, Geneva.

Dong, H., M. De Allegri, A. Souares, and R. Sauerbon, 2009. « Drop-out Analysis of Community-Based Health Insurance Membership at Nouna, Burkina Faso". *Health Policy*, Vol. 92, pp. 174–179.

Elabed, G., and M. R. Carter, 2015. "Basis Risk and Compound-Risk Aversion: Evidence from a WTP Experiment in Mali", *Journal of Economic Behavior and Organization*, Vol. 118, pp. 150-166.

Ellsberg, D., 1961. "Risk, Ambiguity, and the Savage Axioms", *Quarterly Journal of Economics*, Vol. 75, pp. 643-669.

Fitzpatrick, A., B. Magnoni, and R.L. Thornton, 2011. "Micro-insurance Utilization in Nicaragua: A Report on Effects on Children, Retention, and Health". ILO Micro-insurance Innovation Facility Research Paper.

Gabaix, X., and D. Laibson, 2006, "Shrouded Attributes, Consumer Myopia, and Information Suppression in Competitive Markets", *Quarterly Journal of Economics*, Vol. 121, N° 2, pp. 505-540.

Gabler, S., F. Laisney, and M. Lechner, 1993. "Semi-nonparametric Estimation of Binary Choice Models with an Application to Labor-Force Participation". *Journal of Business and Economic Statistics*, Vol. 11, pp. 61–80.

Gaurav S., S. Cole, and J. Tobacman, 2010, "A Randomized Evaluation of the Impact of Financial Literacy on Rainfall Insurance Take-up in Gujarat**",** ILO Micro-insurance Innovation Facility Research Paper No.1, International Labour Office, Geneva.

Gertler, P., and J. Gruber, 2002, "Insuring Consumption against Illness", *American Economic Review,* Vol. 92, N°1, pp. 50–70.

Gilovich, T., R. Vallone, and A. Tversky, 1985. "The Hot Hand in Basketball: On the Misperception of Random Sequences", *Cognitive Psychology,* Vol. 17, pp. 295-314.

Giné, X., R. Townsend, and J. Vickery, 2007, "Statistical Analysis of Rainfall Insurance Payouts in Southern India", *American Journal of Agricultural Economics,* Vol. 89, N°5, pp. 1248-1254.

Giné, X., R. Townsend, and J. Vickery, 2008, "Patterns of Rainfall Insurance Participation in Rural India", *World Bank Economic Review,* Vol. 22, N°3, pp. 539–566.

Hill, R. V., J. Hoddinott, and N. Kumar, 2013. "Adoption of Weather-Index Insurance: Learning from Willingness to Pay Among a Panel of Households in Rural Ethiopia, *Agricultural Economics, Wiley Online Library,* Vol. 44, pp. 385-398.

Ito, S., and H. Kono, 2010, "Why Is the Take-Up of Micro-insurance so Low? Evidence From A Health Insurance Scheme In India", *The Developing Economies,* Vol. 48, N°1, pp. 74-101.

Johnson, E.J., J. Hershey, J. Meszaros, and H. Kunreuther, 1993. "Framing, Probability Distortions and Insurance Decisions", *Journal of Risk and Uncertainty,* Vol. 7, pp. 35-51.

Jutting, J., 2003, "Do Community-based Health Insurance Schemes Improve Poor People's Access to Health Care? Evidence from Rural Senegal", *World Development,* Vol. 32, N° 2, pp. 273-288.

Kahneman, D. and A. Tversky, 1979. "Prospect Theory: An Analysis of Decision under Risk", *Econometrica,* Vol. 47, pp. 263-91.

Karlan, D., R. Osei, I. Osei-Akoto, and C. Udry, 2013. "Agricultural Decisions after Relaxing Credit and Risk Constraints", Mimeo.

Kunreuther, H.C., M.V. Pauly, and S. McMorrow, 2013, *Insurance and Behavioral Economics — Improving Decisions in the Most Misunderstood Industry,* Cambridge: Cambridge University Press.

Leatherman S., L. Jones, and J. Holtz C., 2010. "Innovations and Barriers in Health Micro-insurance", ILO Micro-insurance Innovation Facility Research Paper, Geneva.

Lewbel A., 2012. "Using Heteroskedasticity to Identify and Estimate Mismeasured and Endogenous Regressor Models". *Journal of Business and Economic Statistics,* Vol. 30, pp. 67-80.

Loomes, G., and R. Sugden, 1982. "Regret Theory: An Alternative Theory of Rational Choice under Uncertainty", *Economic Journal,* Vol. 92, pp. 805-24.

Lusardi, A., and O.S. Mitchell, 2014. "The Economic Importance of Financial Literacy: Theory and Evidence", *Journal of Economic Literature,* Vol. 52, N° 1, pp. 5-44.

Lusardi, A., and O.S. Mitchell, 2009. “How Ordinary Consumers Make Complex Economic Decisions: Financial Literacy and Retirement Readiness”, National Bureau of Economic Research, Working Paper 15350, USA.

Lusardi, A., O.S. Mitchell, and V. Curto, 2009. “Financial Literacy and Financial Sophistication in the Older Population”, *Journal of Pension Economics and Finance*, forthcoming.

Lybbert, T.J., F. Galarza, J. McPeak, C.B. Barrett, S. Boucher, M.R. Carter, S. Chantarat, A. Fadlaoui, and A. Mude, 2010. “Dynamic Field Experiments in Development Economics: Risk Valuation in Morocco, Kenya, and Peru”, *Agricultural and Resource Economics Review,* Vol. 39, N° 2, pp. 1-17.

Miranda, M.J., and K. Farrin, 2012. “Index Insurance for Developing Countries”, *Applied Economic Perspectives and Policy*, Vol. 34, N° 3, pp. 391-427.

Mobarak, A. and M. Rosenzweig, 2012. “Selling Formal Insurance to the Informally Insured”, *Yale University Economic Growth Center Discussion Paper*.

Nechyba, T.J., 2011. *Microeconomics: An Intuitive Approach*, South-Western, Cengage Learning.

Platteau, J.-P., 1987, “An Inquiry into Quasi-credit Contracts: The Role of Reciprocal Credit and Interlinked Deals in Small-scale Fishermen Communities”, (with A. Abraham), *Journal of Development Studies,* Vol. 23, N° 4, pp. 461-90.

Platteau, J.-P., 1991, “Traditional Systems of Social Security and Hunger Insurance: Past Achievements and Modern Challenges”, in E. Ahmad, J. Drèze, J. Hills and A.K. Sen (eds.), *Social Security in Developing Countries,* Clarendon Press, Oxford, pp. 112-170.

Platteau, J.-P., 1997. “Mutual Insurance as an Elusive Concept in Traditional Rural Communities”, *Journal of Development Studies,* Vol. 33, pp. 764-796.

Platteau, J.-P., O. De Bock, and W. Gelade, 2017. “The Demand for Microinsurance: A Literature Review”, *World Development,* Vol. 94, N° 2, pp. 139-156.

Pratt, A.G., P. Suarez, and U. Hess, 2010, “How Do Smallholder Farmers Understand Insurance, and How Do They Want It? Evidence from Africa”, *Global Environmental Change*, Vol. 20, N°1, pp. 153-161.

Quiggin, J., 1982. “”A Theory of Anticipated Utility”, *Journal of Economic Behavior and Organization,* Vol. 3, N° 4, pp. 323-343.

Rabin, M., and R. Thaler, 2001. “Anomalies: Risk Aversion”, *Journal of Economic Perspectives,* Vol. 15, pp. 219-232.

Samuelson, P., and R. Zeckhauser, 1988. “Status Quo Bias in Decision Making”, *Journal of Risk and Uncertainty,* Vol. 1, pp. 7-59.

Schmidt, U., 2000. “The Certainty Effect and Boundary Effects with Transformed Probabilities", *Economics Letters,* Vol. 67, N° 1, pp. 29-33.

Schmidt, U., 2004. “Alternatives to Expected Utility: Formal Theories." In *Handbook of Utility Theory,* Springer, New York, Chap. 15, pp. 757-837.

Stein, D., 2011. “Paying Premiums with the Insurer’s Money: How Loss Aversion Drives Dynamic Insurance Decisions”, Working Paper, London School of Economics and Centre for Research in Economic Development (CRED), University of Namur.

Thaler, R., 1985. “Mental Accounting and Consumer Choice”, *Marketing Science,* pp. 199-214.

Udry, C., 1990, “Credit Markets in Northern Nigeria: Credit as Insurance in a Rural Economy”, *World Bank Economic Review,* Vol. 4, N° 3, pp. 251-69.

Udry, C., 1993, “Credit Markets in Northern Nigeria: Credit as Insurance in a Rural Economy”, in Hoff, K., A. Braverman, and J.E. Stiglitz (eds), *The Economics of Rural Organization,* Oxford: Oxford University Press (Published for the World Bank), pp. 87-108.

Udry, C., 1994, “Risk and Insurance in a Rural Credit Market: An Empirical Investigation in Northern Nigeria”, *Review of Economic Studies,* Vol. 61, pp. 495-526.

Appendix I: Theories of demand-side anomaly in insurance

Regret theory assumes that the psychological experience of pleasure or displeasure associated with a particular result of an act of choice (assuming that the result is determined by the state of nature that is realized) will depend not only on the result itself but also on the alternative outcomes that would have arisen had other states of nature been realized. Thus, if it appears ex post that the individual has taken the best decision, he experiences rejoicing while in the opposite cases he is subject to regret feelings. Since people may be able to anticipate feelings of regret, they may decide to avoid entering into an insurance contract that seems attractive in terms of conventional expected utility theory. As pointed out by Thaler (1991), regret theory offers an intuitively plausible explanation of why people may well choose not to choose or to restrict the choice set in advance since this would suppress the possibility of experiencing regret and the associated painful feelings of guilt and responsibility (p. 16). However, the question remains as to why people are then unwilling to avoid an even more serious regret, that of experiencing a significant loss which they could have insured against but chose not to. For regret theory to explain reluctance to insure against a (low probability) shock, it must be the case that individuals narrowly frame short-term results so that they focus attention on the most frequent situations where the shock does not occur. The problem of contract renewal would not arise then. If, on the other hand, the narrow framing effect is not at play, individuals purchase the insurance policy and the ex post revelation that the shock did not occur should not prompt them to revise their initial decision.

The hyperbolic discounting component of prospect theory (time-inconsistent preferences) may explain why, when confronted with the request of an immediate payment of a premium, people may shun away from an actuarially fair insurance contract. Therefore, the question of contract renewal is not addressed. The same holds true of the ambiguity aversion theory according to which people dislike uncertainty about the likelihood that events occur, and not only uncertainty about the events themselves. Since they assume that the worst conceivable probability distribution is the true one when they evaluate their choice, they tend to be pessimistic (Bryan, 2013). The case that this sort of pessimism may limit the uptake of insurance (as well as the take-up of new technologies) is most persuasively made when ambiguity aversion is combined with compound lottery aversion such as may easily happen with index insurance (Elabed and Carter, 2015). Reluctance to purchase the policy then comes from farmers who give much weight to the worst scenario, in which they have a low

individual output while the average output exceeds the pre-specified trigger point.[44] This approach is inspired by the Rank-Dependent-Expected-Utility model of Quiggin (1982) in which the linearity in probabilities of the EU (Expected Utility) model is replaced by a probability weighting, perception, or distortion function.[45]

The theory of (myopic) loss aversion assumes that individuals experience more disutility from a loss than they experience utility from a gain of the same amount (the 'value function' component of prospect theory) (see Benartzi and Thaler, 1995).[46] Loss averse individuals thus dislike experiencing the cost of the accumulated insurance premiums and the additional out-of-pocket cost of the deductible. The theory explains why subscribers who obtain an insurance payout are more likely to renew their contract than those who do not, since they enjoy the feeling that a loss of a certain amount has been avoided, and the payment of the premium is therefore less painful. However, if it may explain why an individual who did not collect on the insurance policy is reluctant to renew the contract, and would like to have the premium returned, it is less clear why other members of the risk-pooling group should comply with such a request, as has been pointed out in Platteau (1997).

An interesting implication of the loss aversion theory is that an insurance contract that offers low deductibles and rebates if one does not suffer a loss would be more attractive to loss-averse people, yet less profitable in financial terms. As a matter of fact, with the value function assumed in prospect theory, the negative value of the additional premium caused by eliminating the deductible is very small relative to the very large reduction in negative value caused by lowering the deductible to zero. An even better contract for an insurer is to offer a

[44] If there is no compound risk, the worst conceivable scenario is that in which the shock occurs and the individual is not insured. Ambiguity aversion should then encourage rather than discourage insurance take-up.

[45] The Rank-Dependent-Expected-Utility approach is closely related to the prospect theory and the ambiguity aversion theory insofar as it overweighs the worst outcomes and underweighs the best ones, thus reflecting a pessimistic attitude. Rather than overweighing the probabilities of low probability outcomes (as prospect theorists initially proposed), the RDEU model overweighs the probabilities of extreme outcomes, which may come down to the same thing in many instances. In insurance, a pessimistic agent would then perceive a distorted low probability of achieving the higher outcome corresponding to the situation where the shock occurs and an indemnity is paid to the subscriber. Hence the reluctance to subscribe.

[46] Note that the theory of the 'status quo bias' (Samuelson and Zeckhauser, 1988; Cai et al., 2013) refers to the fact that people are reluctant to depart from the status quo even though there may be substantial benefits to them from doing so. This behavior can be partially explained by loss aversion.

rebate from which claims are deducted rather than a deductible, since this would encourage insured individuals to avoid making claims. Insurance with a rebate should be more attractive than an equivalent but less expensive policy with a deductible because the perceived benefits of the rebate exceed the perceived cost of the extra premium that lowers the deductible to zero (Kunreuther et al., 2013: 100, 119). Controlled experiments actually suggest that individuals prefer policies with rebates even if the value of such a policy is lower than one in which there is no cash return at the end of the period covered (Johnson et al., 1993).[47]

The "hot-hand effect" theory (Gilovich et al., 1985) also focuses on the role of people's perception of risks. Such perception is seen as influenced by the frequency and intensity of past shocks. The prediction resulting from this theory is ambiguous, though. On the one hand, the experience of a shock can make the risk more salient and induce the individual to overestimate the true probability of a new shock. On the other hand, if he (she) believes that it is unlikely that several (independent) shocks will occur in a short period, the true probability of a new shock could also be underestimated (de Bock and Gelade, 2012). To give an example, "some individuals may treat a string of flood-free years as evidence that the probability of a future flood in their area is now lower than immediately after a flood occurred. But this view is fallacious because, in reality, the risk of damage remains the same as before the flood occurred…" (Kunreuther et al., 2013: 118). The "hot-hand effect" theory is related to what has been called the "availability bias": people tend to assess the probability of an event "by the ease with which instances of occurrence can be brought to mind" (p. 110).

The preference discontinuity theory is based on the idea that expected utility theory is violated only in the neighbourhood of certainty. This is taken to imply that agents exhibit a strong preference for certainty when it is available, yet behave largely as simple expected utility maximizers away from certainty (Andreoni and Sprenger, 2009, 2012). One interesting implication is that agents with preference discontinuity will prefer a flexible insurance contract in which payment of the premium is waived in bad states to a standard contract in

[47] In this experiment, students from University of Pennsylvania were offered the choice between the two following insurance policies: *Policy One,* which costs $1,000 and has a $600 annual deductible which will be subtracted from the total annual claims against the policy, and *Policy Two,* which costs $1,600 and has no deductible but will give a rebate of $600 at the end of the year minus any claims paid by the insurer (should the claims exceed $600, the insurer would give no rebate but will pay the claims). Although Policy Two is obviously less financially attractive than Policy One, since the rebate is essentially a $600 interest-free loan to the insurer, it was chosen by a majority of respondents.

which the premium must always be paid (Carter et al., 2015). Like the regret theory, the preference discontinuity theory provides a plausible account of the famous Allais paradox.

Appendix II: List of variables and their definitions

Variable	Definition
Gender	A dummy variable with value one when the household head is a man
Age	A continuous variable specifying the numbers of years of the head
Schooling	A continuous variable that indicates the total number of years of schooling of the head
Schooling2	The square of the variable Schooling
Literacy	A dummy variable with value equal to one when the household head can read and write
Hholdsize	A continuous variable whose values are the number of members of all ages in the household
lnIncome	A continuous variable stating total monthly income of a household measured in logarithmic terms
Prevention_index_present	A composite index of variables listed in Table II-1 (Appendix) when the program was in course
Prevention_index_past	A composite index of variables listed in Table II-1 (Appendix) when the program did not start
Aware	A dummy variable with value one when the household was aware of the existence of the SSP before the start of the program
Asset_index	A composite index of variables listed in Table II-2 (Appendix)
SHG	A dummy variable with value one when a member participates of a Self Help Group
INFO_1	A dummy variable with value equal to one when the interviewed answered correctly to one out of the three questions aimed to measuring the information level (see Section 3.3)
INFO_2	A dummy variable with value equal to one when the interviewed answered correctly to at least two out of the three questions aimed to measuring the information level (see Section 3.3)
INFO_3	A dummy variable with value equal to one when the interviewed answered correctly to the three questions aimed to measuring the information level (see Section 3.3)
UND_1	A dummy variable with value one when the interviewed answered correctly to one out of the three questions aimed to measuring the understanding level (see Section 3.3)
UND_2	A dummy variable with value one when the interviewed answered correctly to at least two out of the three questions aimed to measuring the understanding level (see Section 3.3)
UND_3	A dummy variable with value one when the interviewed answered correctly to the three questions aimed to measuring the understanding level (see Section 3.3)
Sick_member_present	A dummy variable with value one when a member of a household experimented a health shock during the program
Sick_member_past	A dummy variable with value one when a member of a household experimented a health shock before the start of the program
Nr_illnesses	A continuous variable indicating the number of illnesses suffered by a household during the program
Peer effect	A binary variable indicating the presence of a relative or friend who has opted out of the program
Payout	A dummy variable with value one when the net payout has been lower than the median value (equal to -450 Rs),
Low_visit_frequency	A dummy with value equal to one if the household has visited a health facility fewer than three times during the year 2010-2011

Appendix III: Variables used for the prevention and the asset measures

Table III-1 Variables used for the prevention index

	Yes	No
Did any member of your family participate during last year in any training session discussing basics in health care: personal hygiene, water, nutrition, sanitation, or HIV/AIDS ?	51%	49%
Do you boil water in order to consume it?	5%	95%
Do you use chlorine tablets?	26%	74%
Do you use water filters?	6%	95%
Do you know the importance of eating fruits and vegetables?	82%	18%
Do you wash your hands before eating?	98%	2%
Do you use mosquito nets?	11%	89%
Do you wash your hands after toilet?	96%	4%
Do you know how to prevent HIV/AIDS?	46%	54%
Do you know the reasons for the spreading of diarrhea?	53%	47%
Do you know the reasons for the spreading of malaria?	73%	27%
Do you know the importance of immunizing children?	66%	34%

Table III-2 Variables used for the asset index

	Yes	No
Did you buy a new asset during last year?	43%	57%
Do you have a TV set in your house?	76%	24%
Do you have a fridge in your house?	14%	86%
Do you have a two wheeler vehicle?	31%	69%
Do you have a four wheeler vehicle?	5%	95%
Does someone have a mobile phone in your house?	89%	11%
Do you have TVcable?	32%	68%
Do you have a computer in your house?	2%	98%
Do you own a plot of land?	57%	43%
Do you own livestock?	19%	81%
Do you own this dwelling unit?	93%	7%
Are there more than two persons sleeping in same room?	56%	44%
Use one of the following fuels for cooking: LPG, BIO gas, electricity, or kerosene	37%	63%
Is electricity the main source of lighting?	79%	21%
Where does the drinking water come from?		
Tap	58%	
Well or hadpump	27%	
Tank, pond, river, lake	16%	
The structure of the house is		
Katcha	15%	
Semi pucca	43%	
Pucca	42%	
What do you use as a latrine?:		
Go to open	45%	
Soak pit	15%	
Septic tank	15%	
Community latrine	13%	
No latrine and other	12%	

Appendix IV: Meaningfully measuring the understanding and information variables

Determinants of contract renewal

	(1) LPM	(2) LPM	(3) Heckman	(4) Heckman
Gender	0.21**	0.22**	0.15*	0.18**
	(0.09)	(0.09)	(0.08)	(0.07)
Age	0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Schooling	0.06***	0.06***	-0.06***	-0.05***
	(0.02)	(0.02)	(0.01)	(0.02)
Schooling2	0.00***	0.00**	0.00***	0.00**
	(0.00)	(0.00)	(0.00)	(0.00)
Literacy	0.12*	0.18***	0.20***	0.24***
	(0.06)	(0.06)	(0.07)	(0.06)
Hholdsize	-0.02	-0.02	-0.03*	-0.03*
	(0.01)	(0.01)	(0.02)	(0.02)
lnIncome	-0.03	-0.01	-0.02	0.01
	(0.02)	(0.02)	(0.02)	(0.02)
Asset_index	-0.03	-0.05*	-0.06***	-0.08***
	(0.02)	(0.03)	(0.02)	(0.03)
Sick_member_present	0.08	-0.02	0.11	0.01
	(0.07)	(0.09)	(0.07)	(0.08)
SHG	0.05	0.09	0.13**	0.16***
	(0.06)	(0.06)	(0.06)	(0.06)
Prevention_index	0.04	0.07**	0.03**	0.06***
	(0.03)	(0.03)	(0.02)	(0.02)
INFO_A	-0.01		0.04	
	(0.06)		(0.05)	
INFO_B	0.26***		0.25***	
	(0.09)		(0.07)	
INFO_C	0.60***		0.75***	
	(0.10)		(0.15)	
UND_A		-0.07		-0.09
		(0.06)		(0.06)
UND_B		0.16**		0.20***
		(0.07)		(0.07)
UND_C		0.46***		0.41***
		(0.07)		(0.08)
Village FE	Yes	Yes		
Constant	0.09	0.07		
	(0.26)	(0.24)		
Observations	306	306	947	947
R-squared	0.55	0.52		

Robust clustered by villages standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix V: Estimates for Attributes in Table 4

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Linear Probability model			Heckman			Probit
Gender	0.12	0.09	0.10	0.06	0.06	0.06	-0.08**
	(0.10)	(0.10)	(0.09)	(0.08)	(0.09)	(0.08)	(0.04)
Age	-0.01*	-0.01*	-0.00	-0.01**	-0.01**	-0.00*	-0.00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Schooling	-0.04	-0.03	-0.04*	-0.02	-0.03	-0.03	0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)
Schooling2	0.00	0.00	0.00	0.00	0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Literacy	0.06	0.08	0.09	0.03	0.05	0.07	-0.05
	(0.07)	(0.06)	(0.06)	(0.05)	(0.05)	(0.05)	(0.04)
Hholdsize	0.01	0.02	0.02*	0.01	0.01	0.02*	0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
lnIncome	0.02	0.04*	0.04**	0.02	0.03	0.05**	0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)
Asset_index	0.02	0.03	0.02	0.01	0.01	0.01	0.03**
	(0.03)	(0.04)	(0.03)	(0.02)	(0.03)	(0.03)	(0.01)
SHG	0.19***	0.18***	0.16***	0.15***	0.15***	0.12***	0.11***
	(0.05)	(0.05)	(0.04)	(0.05)	(0.04)	(0.04)	(0.03)
Prevention_index_present	-0.00	0.00	0.01	-0.00	-0.00	0.01	
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	

Robust clustered by villages standard errors in parentheses

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

Appendix VI: Estimates for Attributes in Table 5 (LPM estimations)

	(1) Renew	(2) Renew	(3) Renew	(4) Renew	(5) Renew	(6) Renew
Gender	0.19**	0.19***	0.19**	0.21**	0.20***	0.20***
	(0.07)	(0.07)	(0.07)	(0.08)	(0.07)	(0.07)
Age	0.00	0.00	0.00	-0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Schooling	-0.06***	-0.06***	-0.06***	-0.06***	-0.06***	-0.06***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Schooling2	0.00**	0.00***	0.00**	0.00***	0.00**	0.00**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Literacy	0.16**	0.18***	0.17**	0.16**	0.19***	0.17**
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Hholdsize	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
lnIncome	-0.01	-0.01	-0.01	-0.01	-0.02	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Asset_index	-0.04*	-0.04	-0.03	-0.04	-0.04	-0.04
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
SHG	0.07	0.06	0.08	0.07	0.07	0.06
	(0.06)	(0.06)	(0.05)	(0.06)	(0.05)	(0.05)
Prevention_index	0.05*	0.06**	0.06*	0.05*	0.06**	0.05*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)

Appendix VII: Estimates for Attributes in Table 6 (Heckman probit estimations)

	(1) Renew	(2) Renew	(3) Renew	(4) Renew	(5) Renew	(6) Renew
Gender	0.18***	0.18***	0.17***	0.20***	0.17***	0.19***
	(0.07)	(0.06)	(0.07)	(0.06)	(0.06)	(0.06)
Age	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Schooling	-0.05***	-0.05***	-0.05***	-0.06***	-0.06***	-0.06***
	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)
Schooling2	0.00**	0.00***	0.00**	0.00***	0.00***	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Literacy	0.24***	0.25***	0.24***	0.25***	0.27***	0.25***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.06)
Hholdsize	-0.03	-0.02	-0.03*	-0.02	-0.02	-0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
lnIncome	0.00	0.00	0.00	0.00	0.00	0.00
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Asset_index	-0.07***	-0.07***	-0.06***	-0.08***	-0.08***	-0.07***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
SHG	0.14***	0.13***	0.15***	0.13***	0.13**	0.13***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Prevention_index	0.04*	0.04*	0.05**	0.05*	0.05*	0.05*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)

Appendix VIII: Determinants of subscriber satisfaction

	(1) LPM	(2) Heckman	(3) LPM	(4) Heckman
Gender	-0.01	0.01	0.00	0.02
	(0.06)	(0.06)	(0.06)	(0.07)
Age	-0.01**	-0.00*	-0.01*	-0.00*
	(0.00)	(0.00)	(0.00)	(0.00)
Schooling	0.01	0.02	-0.01	-0.01
	(0.03)	(0.02)	(0.01)	(0.01)
Schooling2	-0.00	-0.00		
	(0.00)	(0.00)		
Literacy	0.17**	0.15***	0.17**	0.16***
	(0.07)	(0.05)	(0.07)	(0.05)
Hholdsize	0.01	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
lnIncome	0.01	0.01	0.01	0.01
	(0.02)	(0.02)	(0.02)	(0.02)
Asset_index	0.03	0.03	0.03	0.03
	(0.03)	(0.03)	(0.03)	(0.03)
Sick_member_present	-0.12	-0.11*	-0.12	-0.11*
	(0.08)	(0.06)	(0.08)	(0.06)
SHG	0.14***	0.12***	0.14***	0.11***
	(0.04)	(0.03)	(0.04)	(0.03)
Prevention_index	0.00	0.02	0.01	0.02
	(0.03)	(0.02)	(0.03)	(0.02)
INFO_2	0.17**	0.12***	0.18**	0.12***
	(0.06)	(0.05)	(0.06)	(0.05)
UND_2	0.31***	0.28***	0.31***	0.28***
	(0.07)	(0.04)	(0.07)	(0.04)
Village FE	Yes		Yes	
Observations	306	554	306	554

Robust clustered by villages standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1