Do Experimental Games Increase Take-Up Rates for Index Insurance? A Randomized Control Trial Approach

Michael T. Norton, Daniel Osgood, Rahel Diro, Mengesha Gebremichael

Selected Paper prepared for presentation at the Agricultural & Applied Economics Association's 2012 AAEA Annual Meeting, Seattle, Washington, August 12-14, 2012

DRAFT

Do Experimental Games Increase Take-Up Rates for Index Insurance? A Randomized Control Trial Approach

Michael T. Norton, Daniel Osgood
International Research Institute for Climate and Society
Columbia University

Rahel Diro
Columbia University

Mengesha Gebremichael
Relief Society of Tigray

 This research was partially funded by NSF grants NSF-SES 0345840 and NSF-SES 0951516. *For any questions or comments about this paper, please contact Michael Norton by phone: (845) 680-4435 or email: mnorton@iri.columbia.edu*

Abstract:

There has been much recent interest in the demand for index insurance, the influence of financial literacy on demand for financial products, as well as the positive benefits of experimental games. This paper describes a randomized control trial (RCT) that was performed to understand the effect of experimental games on take-up rates for index insurance. Because estimation of the optimal level of take-up is far beyond the scope of the current work, we simply present the impacts we observe on take-up. We are not advocating increased take-up in this paper or suggesting that take up rates are too low. These games were observed to increase take-up of index insurance from 15.75% in the control group to 20.36% in the treatment group, increasing the number of purchasers by nearly one third.

Introduction:

Farmers in developing countries are often fully exposed to climate risks. Local risk pooling organizations exist, but farmers typically do not have access to formal risk pools to hedge against major shocks. The exposure to an uncertain climate can result in the adoption of conservative production strategies as farmers try to minimize downside risk and avoid poverty traps. Helping smallholder farmers manage climate risks will enable them to take productive risks and make their efforts more fruitful.

Index insurance is noted to have the possibility of increasing livelihoods by covering downside climate risks and allowing farmers to take advantage of formal risk pools. Index insurance is so named because it is based on an "index" of objectively measured weather observations instead of crop losses. Although it is not perfect at representing crop yields, index insurance can offer some protection from large covariate events like droughts or delayed monsoon rains.

Interest in index insurance has been increasing in recent years and projects are proliferating around the globe. One challenge is marketing and selling insurance policies to the smallholder farmers, as policies are often very small and margins for profit are thin. Also, farmers often have no experience with commercial insurance products or experience with financial organizations that has led to a lack of trust.

In this paper, we describe a randomized control trial (RCT) that tests the effects of experimental games on sign-up rates for index insurance. In this trial, the treatment group consists of the games participants, and the control group consists of the rest of each village (the non-participants in the games). We find an increase from 15.75% take-up in the control group to 20.36% in the treatment group, increasing the number of purchasers by nearly one third.

It is important to note that take-up substantially exceeded the requirements of the implementation project being studied, and that take-up was not a central goal of the

project, which was focused on adaptation impacts of a larger, holistic set of activities of which insurance was one piece. Because estimation of the optimal level of take-up is far beyond the scope of the current work, we simply present the impacts we observe on take-up. We are not advocating increased take-up in this paper or suggesting that take up rates are too low.

HARITA Project:

Oxfam America and a dozen other institutions including local insurance companies and a global reinsurance company first launched the Horn of Africa Risk Transfer for Adaptation (HARITA) project in 2009 in Tigray region of Ethiopia. The project bundled risk reduction with weather index insurance aimed at ultimately enabling farmers to become prudent risk takers. While the insurance premium is not directly subsidized, the poorest of the poor farmers have the option of purchasing the crop insurance through labor under the "insurance-for-work" arrangement. Under this arrangement, insured farmers would work on what is termed as "risk reduction" activities like tree planting, building terraces and water harvesting structures etc. In exchange for their labor farmers receive insurance vouchers. HARITA had been successful in terms of dramatic expansion, with insurance purchases growing from 200 farms in a single village in 2009 to more than 13,000 farms across 43 villages in 2011. Given the project focus on adaptation goals, the project expansion, and the healthy take-up rate in each village included, current take-up rates substantially exceed project requirements. Preparations are underway in partnership with the UN World Food Program to scale up the HARITA model in other countries under R4 Rural Resilience Initiative.

Experimental Design:

The data in this paper is based on the results of the games conducted before the 2010 cropping season. In that year, researchers visited four villages in advance of the commercial insurance sales and played a series of games with a randomly selected group of local farmers. Participant demographic characteristics are listed in Table 1.

[Table 1 about here.]

2010 was a year of growth for the HARITA project, as it expanded beyond the village of Adi Ha for the first time. Four new villages were offered insurance in addition to Adi Ha, for a total of five villages. For the five villages offered insurance in 2010, experimental games were also conducted before the insurance was offered. A list of households by village and sub-village separated into male- and female-headed households is listed in Table 2.

[Table 2 about here.]

During the game, we gave each participant an endowment of about 5 USD to allocate between several risk management options. These options included two insurance contracts that paid out based on satellite rainfall estimates, identically to the commercial product. Participants were also able to allocate a portion of the games endowment that they could take home immediately. The other options are an interest-bearing savings account and a community risk pool. (For a comprehensive description of games activities and results, please refer to Norton et al (2011).) The games activities required an additional visit by research staff after the cropping season was finished because the insurance paid out identically to the real insurance contracts and satellite rainfall estimates are only available after the season is completed.

The commercial sales were accompanied with marketing treatments in the form of entertainment. Each visit by the sales team included musicians and a drama performance included well-known local actors. The drama was written to illustrate insurance concepts, such as the benefits of drought protection and the use of satellite rainfall estimates. The performance was advertised beforehand through word-of-mouth with local leaders and was open to the entire village.

Informal feedback about the visit from the actors and musicians was positive, but we have no way of measuring its impact as a marketing treatment. However, since the invitations to the games were selected at random, we can estimate the effect of the games as a marketing treatment compared to people who were not invited to play the games using randomized control trial methodology. The treatment in question is the experimental games, and the treatment group is the group that was selected to play the games. The control group then consists of every other household in the villages in which insurance was sold.

We randomized invitations to the treatment group by selecting every Nth name from the list of all households in the village. Since the lists were partitioned into several parts, it was not purely random. Instead, a representative sample of 30% female-headed households was intentionally chosen, and care was taken so that equal representation was given to each sub-village. In each village, there were 4 sub-villages, which means that 25% of the participants were drawn from each sub-village regardless of population of each.

$$E[Y_i^T - Y_i^C]$$

Where Y is the effect of the treatment, in this case the choice whether or not to buy insurance. T is the treatment group and C is the control group of each i^{th} person.

We have no demographic data on households in the control group, and the research team did not contact the control group at any time during the experimental games exercises. The only data that we do have on the control group is the total number of households in each village, as listed in Table 2. Because of this, we cannot produce a

balance table to examine if the treatment group is a representative sample. However, there is a possible advantage of this approach. Because we did not contact the so-called "control group," the sample will be unbiased by the potential effects of that contact. For example, if a group was surveyed to produce the balance table and was given some payment, it could affect their eventual decision about whether or not to purchase insurance.

We estimate compliance within the treatment group to be as high as 95%. It was not difficult to get people to attend the games activities, but there were some (~5 per village) who did not attend, or declined to participate because of age or poor health.

Results:

After the season, we matched the list of people that played the games against the list of people who bought insurance in the commercial sign-up. The raw take-up rate for commercial insurance in the treatment group was 23.63%, compared to 15.75% in the control group, increasing the number of purchasers by nearly one third.

[Table 3 about here.]

However, because the selection of the participants was stratified by village, as we selected ~100 participants from each village. Since the number of households in each village varies, to understand the average treatment effect we need to provide a average of the treatment effect in each village, weighted by the size of the village. (Duflo et al 2008, p. 3935)

$$\int \{E[Y_i^T | x, T] - E[Y_i^C | x, C]\} P(X = x | T) dx$$

Where X denotes strata, or in this case each village.

[Table 4 about here.]

After weighting take-up according to this equation, we arrive at an average treatment effect of an increase of 4.61% in take-up over the control group, a reduced increase in the number of purchasers, but still an increase of nearly one third.

Cost-effectiveness:

The initial objective of the games was to inform product design. However, if a project goal is to increase take-up, it is worth a quick check to see if the games increased insurance purchase more than the cost of the games. For a single round of insurance purchase at the full cost of the games, increased premium revenues would not cover game expenses. It may be that the games have a large enough impact in insurance take-up in future years that the total increase of premium revenues over

the years would cover game expenses. It would be worthwhile to conduct future research to explore the impacts of games and take-up over multiple years.

Because the games were played as a research project, their costs were much higher than they might be if piggybacked on project promotion and sales activities and played without additional subject payments. Through this approach the cost of the games could be easily reduced to substantially less than the increased premium revenues collected. The central question to determine the cost-effectiveness of games on increasing take-up is then if games implemented in this piggybacked manner, without additional subject payments would have similar impacts on take-up as the games we performed. Future work testing these impacts would therefore be worthwhile.

It is important that the main non-research benefit of the games may not be to increase take up, but instead to better educate farmers on the appropriate insurance options to select, how to use insurance to improve productive risk-taking, the appropriate balance of insurance and complementary individual and village risk management options, and to help farmers self-determine for whom insurance was an inappropriate tool. For these cases, future research would be worthwhile not only on the relationship between take-up and measures of insurance value for different farms (such as lower basis risk) but also more fundamental work on the impacts of the games on community livelihood outcomes where insurance is offered.

Extensive vs. intensive effects:
While not addressed in our identification strategy, it is of interest to examine the margin through which take-up proceeds. Perhaps the most basic mechanism for increase in take-up is that the increased demand resulting from the games impacts the extensive margin, that is, farmers who were previously indifferent about purchasing insurance without the games, have marginally increased their value of insurance following the games, leading to a value of the insurance that slightly exceeds the insurance cost. Although our trial does not provide a clean test of this process, the mechanism involved does have its signature, which may be evident in the sign-up data. Because farmers in the HARITA project had a range of options for how much coverage to purchase, we can examine changes in the total level of insurance purchased.

If expansion along the extensive margin reflects the take up effects, we would expect that the new adopters would purchase lower levels of insurance than the adopters who already highly value insurance, in which case we should see the increase in take-up rate reflecting a group that includes the new marginal, small purchase adopters, a group that would have a lower average insurance purchase than previously. If the process was dominated by the intensive margin purchases, we would expect an increased investment in insurance from current adopters to compete with the new, marginal adopters, leading to an ambiguous, or perhaps larger average insurance purchase.

The average size of insurance purchased suggests that expansion along the intensive margin dominates the sign-up impacts of the insurance because the mean policy bought as a result of the games had a lower maximum liability. It appears that the treatment encouraged participants who purchased insurance at the lower levels of insurance purchase, decreasing the average amount covered per policy, while increasing the total amount of money collected. Further work carefully identifying the margin of change in insurance take-up and demand would be valuable.

This has interesting implications in terms of the HARITA project. The farmers had the choice to purchase in cash or labor. For the HARITA project, those farmers purchasing with cash appeared to be the marginal adopters of insurance, purchasing smaller amounts of insurance than those paying with labor. About 19% of the people in the control group paid in cash, whereas 36% of the treatment group paid in cash (Table 5). Therefore, the impacts of the games on take-up for the HARITA project may have been primarily an expansion into the more difficult to reach cash purchasers, providing a potentially effective method for the project to expand beyond the extremely poor to more commercial customers.

Spillover effects:

There may be spillover effects from the treatment ion the control group. There may be spillover effects from interacting with games participants that we cannot measure because we did not designate any control villages to receive no treatment. This could mean that the impacts of the games that we measure are lower than the true impacts on take-up. With the limited number of villages in the 2010 HARITA project, within village spillover effects would be hard to measure. Given the project scale up to 43 villages, measurement of that effect is increasingly feasible. If increased take-up is desired, a spillover effect would be valuable. Therefore future work that examines the spillover effects of games on take-up at the village level would therefore be worthwhile.

Conclusion:

This paper describes the observed effects of conducting field experiments on take-up rates for index insurance. Take-up for index insurance was observed to be 4.61% higher in the treatment group that played the games as compared to the control group of non-games participants, or an increase in the number of purchasers of nearly one third. There are several possible reasons as to why games participants would buy index insurance at a higher rate, such as increased cash on hand, more comfort with the products, or increased trust with project institutions.

Although games performed as a full Randomized Controlled trial are likely to be too expensive to be a cost-effective marketing treatment, related versions of the games may be cost-effective if the take-up impacts still exist when subject payments are not made. One additional effect that was observed was the increased preference for cash sales among games participants over payment in labor through the PSNP program, a perhaps desirable outcome.

Although this paper analyzes the effects of experimental games on take-up rates, we must be careful to emphasize that take-up rate in and of itself is not a useful measure of the efficacy of index insurance projects. Index insurance has great promise, but implementers should deliver products that target appropriate risk layers and focus on unlocking increased production through protection from downside risks.

References

Clarke, D. (2011) "Insurance Design for Developing Countries." Doctoral Thesis, Balliol College, University of Oxford.

Cole, S., Sampson T., and Zia B. (2011) "Prices or Knowledge? What Drives Demand for Financial Services in Emerging Markets?" *Journal of Finance*, forthcoming.

Cole S, X. Giné, J. Tobacman, P. Topalova, R. Townsend, J. Vickery (2009). Barriers to household risk management: evidence from India. Work. Pap., Fed. Res. Bank New York

Duflo, Esther, R. Glennerster, and M. Kremer. 2008. "Using Randomization in Development Economics Research: A Toolkit." Chapter 61 In Handbook of Development Economics, Volume 4:3895-3962. Elsevier. [available at http://www.sciencedirect.com/science/article/B7P5D-4RWXCH1-S/2/84fc3f476e4d45082ff40c0c4069d96f].

Guarav, S.. S. Cole, and J. Tobacman. (2011) "Marketing Complex Financial Instruments in Emerging Markets: Evidence from Rainfall Insurance in India." *Journal of Market Research*, forthcoming.

Norton, M.T. N. Peterson, E. Holthaus, M. Gebremichael, C. Mullally, T. Teh, M. Madajewicz, D. Osgood. "Investigating Demand for Weather Index Insurance: Evidence from Rural Ethiopia." Paper presentation, AAEA Conference, Pittsburgh, PA, July 25-28, 2011.

Patt A., Suarez P. and Hess U., (2010). "How do small-holder farmers understand insurance, and how much do they want it? Evidence from Africa," *Global Environmental Change* 20(1):153-161.

Schmit, T., Chung, C., Dong, D., Kaiser, H.M., Gould, B., 2001. Identifying the Extensive and Intensive Effects of Generic Advertising on the Household Demand for Fluid Milk and Cheese. National Institute for Commodity Promotion Research and Evaluation. NICPRE 01-01

Tables and Figures

Table 1: Demographic characteristics of games participants

	Mean	SD
Initial Visit		
N = 402		
Female	0.33	0.47
Age	41.31	13.09
Years of School	1.67	2.75
Rainfed Land Owned (ha)	3.43	2.47
Rainfed Land Worked (ha)	3.26	2.66
Irrigated Land Owned (ha)	0.29	0.50
Irrigated Land Worked (ha)	0.29	0.51
# Oxen Owned	0.94	0.94
Adults in HH	1.39	1.52
Children in HH	2.77	1.91
PSNP	0.49	0.50
Follow-up Visit		
N = 337	**337**	
Muslim	0.15	0.36
Finished Planting	0.37	0.48
Used Money for Fert/Seeds	0.67	0.47

Table 2: Total numbers of households by gender and kushet

Tabia (Village)	Kushet (Sub-village)	Gender of House Hold Head		
		Male	Female	Total
Adiha	Adiha	74	39	**113**
	L/Seken	202	73	**275**
	T/Seken	207	98	**305**
	Wukro	101	29	**130**
Awet Bikalsi	Beyan	*	*	*
	A/kawa	179	59	**238**

	A/tsire	255	57	**312**
	D/chako	130	44	**174**
Genete	Waekel	441	241	**682**
	Minora	422	206	**628**
	Hujira	302	139	**441**
	Gandastela	249	97	**346**
Hade Alga	K/tekli	206	81	**287**
	Endalate	303	153	**456**
	A/tela	237	48	**285**
	H/alga	392	146	**538**

*: Data not available

Table 3: List of purchasers total and by village

		Total	**By village**			
			Awet Bikalsi	**Adi Ha**	**Geneti**	**Hade Alga**
Control Group	Total households	5295	648	1075	2021	1551
	Purchaser	834	236	297	125	176
	Non-purchaser	4461	412	778	1896	1375
	Take-up Rate	15.75%	36.42%	27.63%	6.19%	11.35%
Treatment Group	Total Participants	402	107	98	98	99
	Purchaser	95	32	31	10	22
	Non-Purchaser	307	75	67	88	77
	Raw Take-up Rate	23.63%	29.91%	31.63%	10.20%	22.22%
	Total Households	5697	755	1173	2119	1650

Table 4: Estimation of Weighted Take-Up Rate for Control Group

	Total	**By**

		village			
		Awet Bikalsi	**Adi Ha**	**Geneti**	**Hade Alga**
Total Households	5697	755	1173	2119	1650
$E[Y_i^T]$	23.63%	29.91%	31.63%	10.20%	22.22%
$E[Y_i^C]$	15.75%	36.42%	27.63%	6.19%	11.35%
Difference	7.88%	-6.51%	4.00%	4.02%	10.87%
P(x = X)	1	13.25%	20.59%	37.20%	28.96%
$\{E[Y_i^T]-E[Y_i^C]\}$ P(x=X)		-0.86%	0.82%	1.49%	3.15%
$\int \{E[Y_i^T \mid x,T] - E[Y_i^C \mid x,C]\} P(X = x \mid T) dx$	4.61%				

Table 5: Comparison of Cash vs. Labor sales

		Total	**Paid in Cash**	**Paid in Labor**
Control Group	# Policies sold	835	162	673
	% of policies sold	1	19%	81%
	Mean maximum liability of policy sold (birr)	765.99	408.64	852.01
	Standard Error	12.58	25.16	12.27
Treatment Group	# Policies sold	95	34	61
	% of policies sold	1	36%	64%
	Mean maximum liability of policy sold (birr)	671.58	300	878.69
	Standard Error	39.9	32.97	39.47
T-test of differences	Difference	94.41	108.64	-26.68
	T	2.38	1.91	-0.63
	p-value	0.02	0.06	0.53