

Time vs. State in Insurance: Experimental Evidence from Contract Farming in Kenya

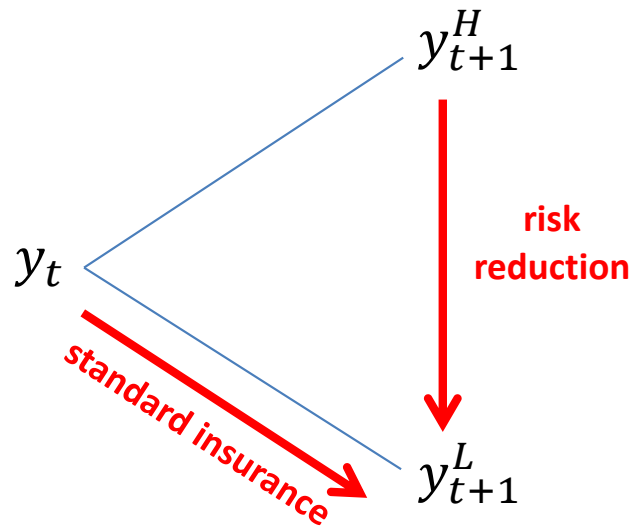
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Figures

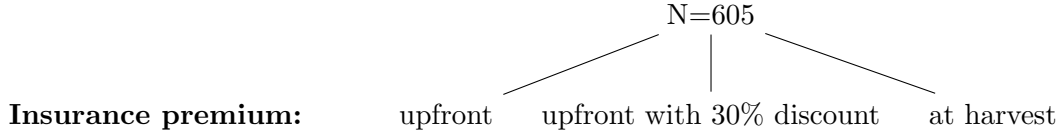
Figure 1: Insurance vs. Risk Reduction



Notes: In the textbook model, insurance offers *risk reduction*: income is transferred across states of the world, from good states to bad. In practice, however, standard insurance products also feature a *transfer of income across time*: the premium is paid upfront with certainty, and any payouts are made in the future, if a bad state occurs.

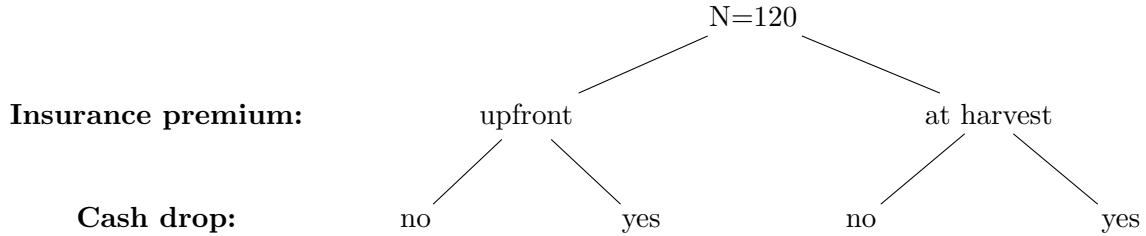
Figure 2: Experimental Design

(a) Design of the Main Experiment



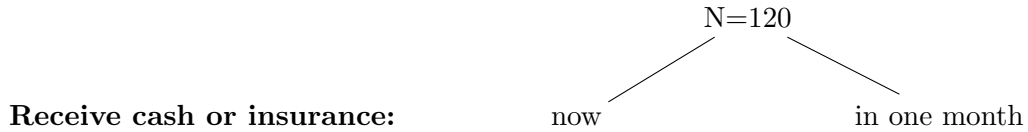
Notes: The experimental design randomized 605 farmers (approximately) equally across three treatment groups. All farmers were offered an insurance product; the only thing varied across treatment groups was the premium. In the first group (U1), farmers were required to pay the (“actuarially-fair”) premium upfront, as is standard in insurance contracts. In the second group (U2), premium payment was again required upfront, but farmers received a 30% discount relative to (U1). In the third group (H), the full-priced premium would be deducted from farmers’ revenues at (future) harvest time, including interest charged at the same rate used for the inputs the company supplies on credit (1% per month). Randomization across these treatment groups occurred at the farmer level and was stratified by Field, an administrative unit of neighboring farmers.

(b) Design of the *Cash Drop* Experiment



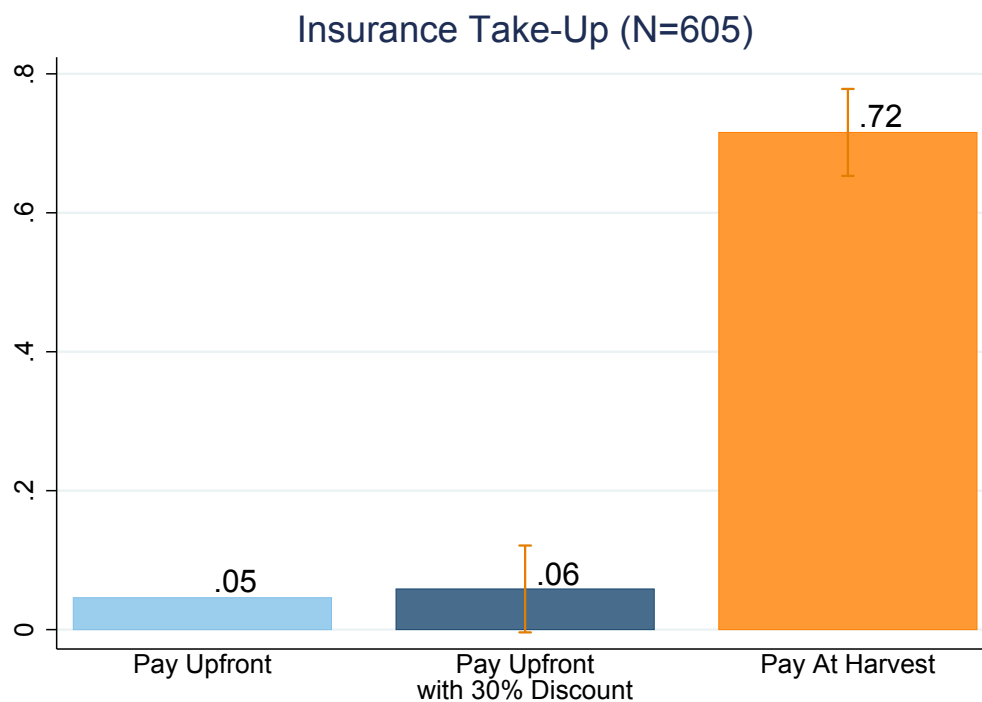
Notes: The experimental design randomized 120 farmers (approximately) equally across four treatment groups. The design cross-cut two treatments: pay-upfront vs. pay-at-harvest insurance, as in the main experiment, and a cash drop. At the beginning of individual meetings with farmers, those selected to receive cash were given an amount which was slightly larger than the insurance premium, and then at the end of the meetings farmers were offered the insurance product. Randomization across these treatment groups occurred at the farmer level and was stratified by Field.

(c) Design of the *Intertemporal Preferences* Experiment



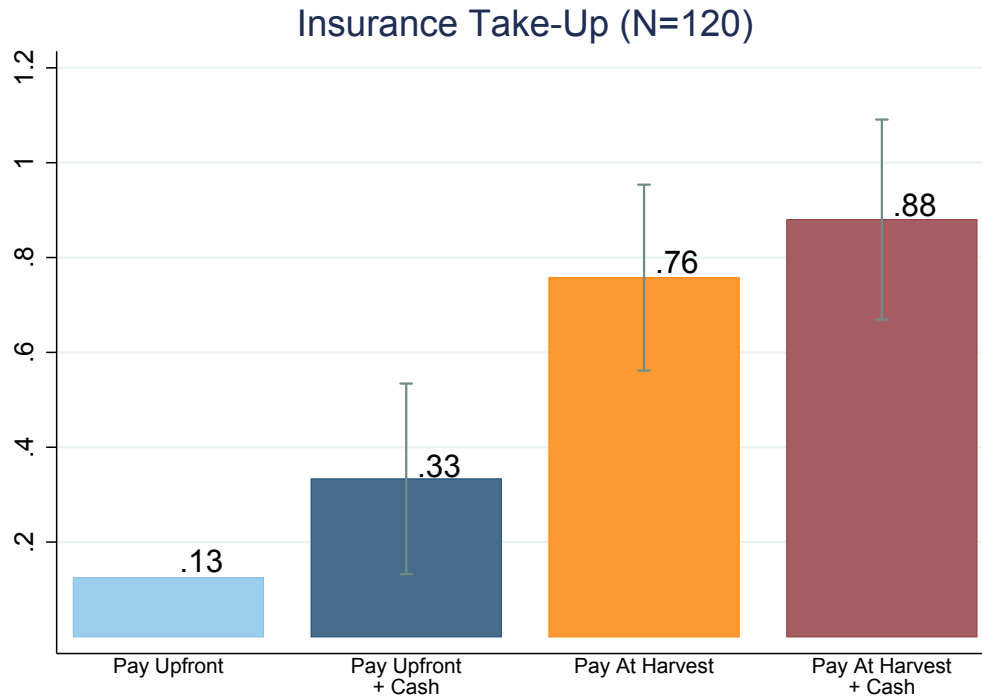
Notes: The experimental design randomized 120 farmers (approximately) equally across two treatment groups. Farmers in both groups were offered a choice between either a cash payment, equal to the “full-priced” insurance premium, or free enrollment in the insurance. Both groups had to make the choice during the meeting, but there was a difference in when it would be delivered. In the first treatment group, the *Receive Choice Now* group, farmers were told that they would receive their choice immediately. In the second group, the *Receive Choice in One Month* group, farmers were told that they would receive their choice in one month’s time (the cash payment offered to farmers in this case included an additional month’s interest). Randomization across these treatment groups occurred at the farmer level and was stratified by Field.

Figure 3: Main Experiment: Insurance Take-Up by Treatment Group



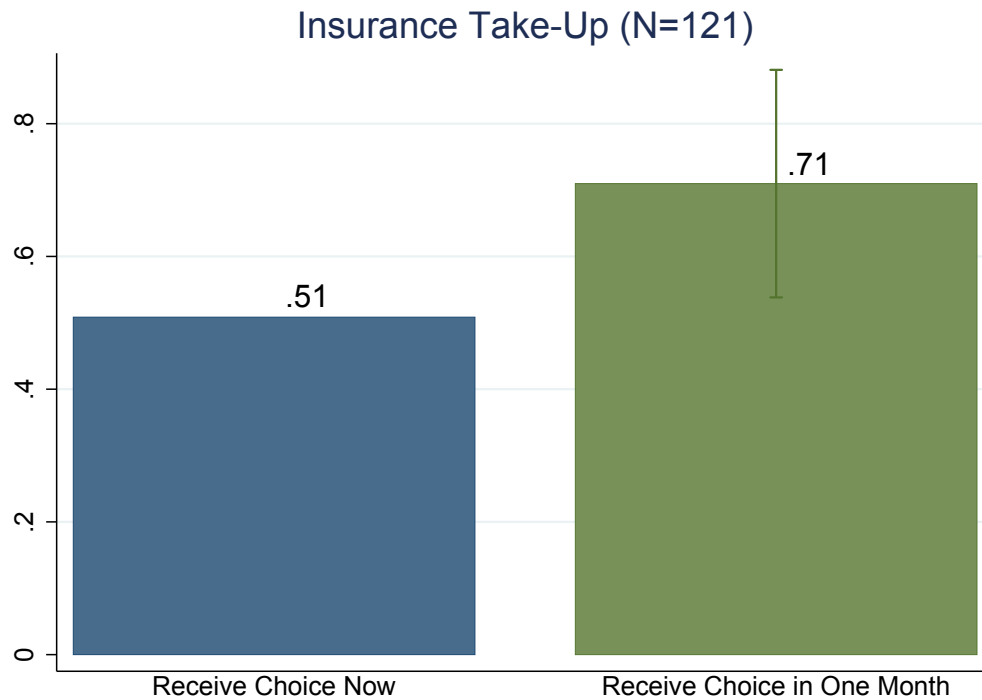
Notes: The figure shows insurance take-up rates across the three treatment groups in the main experiment. In the *Pay Upfront* group, farmers had to pay the full-price premium when signing up to the insurance. In the *Pay Upfront + 30% Discount* group, farmers also had to pay the premium at sign-up, but received a 30% price reduction. In the *Pay At Harvest* group, if farmers signed up to the insurance, then the premium (including accrued interest at 1% per month) would be deducted from their revenues at (future) harvest time. The bars report 95% confidence intervals from a regression of takeup on dummies for the treatment groups.

Figure 4: Cash Drop Experiment: Insurance Take-Up by Treatment Group



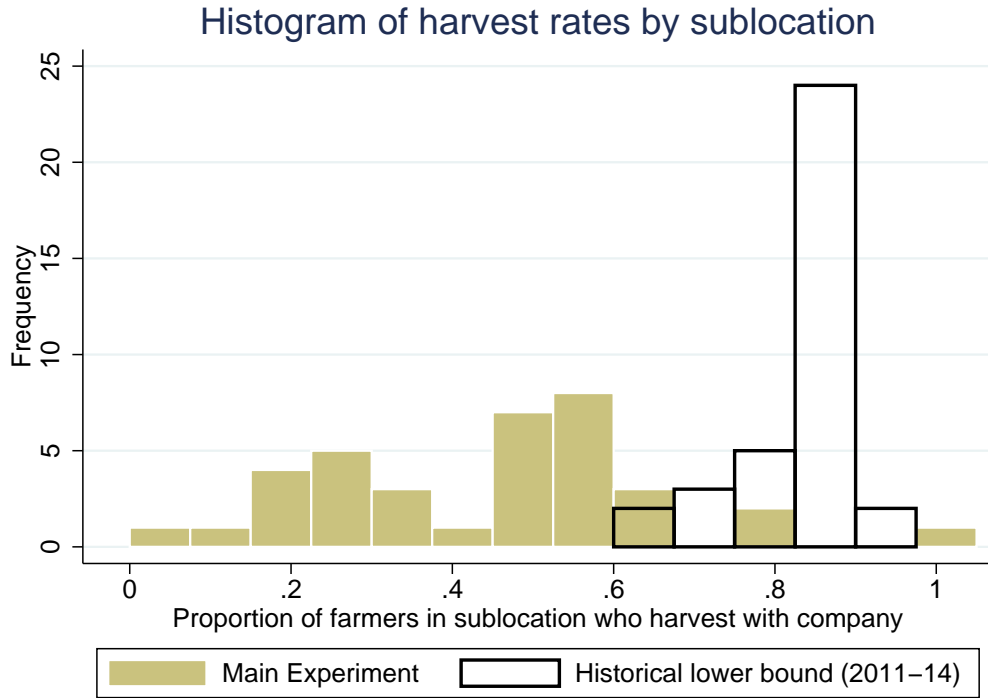
Notes: The figure shows insurance take-up rates across the four treatment groups in the Cash Drop experiment. In the *Pay Upfront* group, farmers had to pay the premium when signing up for the insurance. In the *Pay Upfront + Cash* group, farmers were given a cash drop slightly larger than the cost of the premium, and had to pay the premium at sign-up. In the *Pay At Harvest* group, if farmers signed up for the insurance then the premium (including accrued interest at 1% per month) would be deducted from their revenues at (future) harvest time. In the *Pay At Harvest + Cash* group, farmers were given a cash drop equal to the cost of the premium and premium payment was again through deduction from harvest revenues. The bars report 95% confidence intervals from a regression of takeup on dummies for the treatment groups.

Figure 5: Intertemporal Preferences Experiment: Insurance Take-Up by Treatment Group



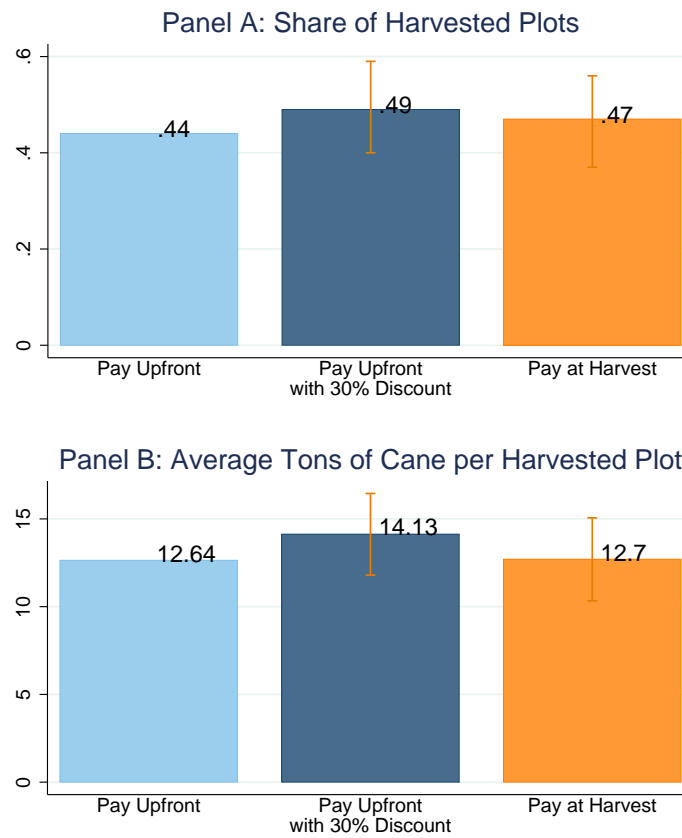
Notes: The figure shows insurance take-up rates across the two treatment groups in the Intertemporal Preferences experiment. In the *Receive Now* group, farmers chose between an amount of money equal to the premium and free subscription to the insurance, knowing that they would receive their choice straight away. In the *Receive in One Month* group, farmers made the same choice, but knowing that they would receive whatever they chose *one month later*. The bars report 95% confidence intervals from a regression of takeup on dummies for the treatment groups.

Figure 6: Main Experiment: Histogram of Harvesting With Company, by Sublocation



Notes: The histogram shows the proportion of farmers who harvested with the company in the sublocations in which we undertook the main experiment. The data is by sublocation and we plot separate histograms for the main experiment (which is just for the farmers in our sample, who were due to harvest approximately twelve months after our experiment) and for the three year period prior to the experiment, from 2011 to 2014 (which is for all farmers in the sublocations). The historical measure is a lower bound on the harvest rate, since it is calculated as the proportion who harvested in the previous cycle who do not harvest this cycle, some of whom will not have grown cane this cycle. We note two things from the histograms. First, harvesting with the company is much lower during the experiment than historically, in line with the financial troubles at the company. Second, there is a large amount of geographic variation in the harvesting rate among farmers in our sample.

Figure 7: Main Experiment: Harvesting with the Company



Notes: The figure shows harvesting outcomes in the main experiment, by treatment group. Panel A reports the proportion of farmers from the main experiment who subsequently harvested with the company, as agreed under the contract. Panel B reports harvest weight (in tons), conditional on harvesting with the company. The bars report 95% confidence intervals from a regression of harvesting rates on dummies for the treatment groups.

Tables

Table 1: Main Experiment: Balance Table, Baseline Variables

	Upfront [U1]	Upfront-30% [U2]	Harvest [H]	P-value [U1-U2]	P-value [U1-H]	P-value [U2-H]	P-value [U-H]	N
Plot Size (Acres)	.309 (.128)	.340 (.147)	.319 (.133)	.012**	.187	.219	.219	605
Previous Yield	53.9 (17.2)	56.8 (18.0)	55.7 (17.7)	.23	.112	.67	.67	605
Man	.670 (.471)	.734 (.442)	.671 (.470)	.082*	.732	.387	.387	573
Age	48.3 (13.5)	48.3 (14.3)	45.4 (11.7)	.979	.06*	.02**	.02**	570
Land Cultivated (Acres)	2.79 (3.34)	3.13 (4.01)	2.81 (2.98)	.576	.421	.254	.254	562
Own Cow(s)	.762 (.426)	.805 (.397)	.803 (.398)	.289	.25	.908	.908	569
Portion of Income from Cane	3.30 (1.09)	3.38 (1.09)	3.23 (1.18)	.451	.817	.089*	.089*	569
Savings for Sh1,000	.284 (.452)	.282 (.451)	.333 (.472)	.979	.273	.44	.44	566
Savings for Sh5,000	.089 (.286)	.138 (.346)	.130 (.338)	.198	.345	.829	.829	565
Expected Yield	72.5 (100.)	70.4 (31.0)	66.8 (49.4)	.686	.522	.547	.547	573
Expected Yield in Good Year	83.5 (47.8)	85.4 (30.8)	83.1 (56.0)	.814	.852	.908	.908	572
Expected Yield in Bad Year	53.4 (40.6)	54.0 (21.5)	52.3 (47.2)	.935	.889	.986	.986	571
Good Relationship with Company	.362 (.482)	.343 (.476)	.300 (.459)	.919	.357	.933	.933	570
Trust Company Field Assistants	3.02 (1.01)	2.84 (1.01)	2.80 (1.09)	.245	.11	.786	.786	569
Trust Company Managers	2.46 (1.11)	2.35 (1.06)	2.44 (1.12)	.449	.999	.598	.598	567

Notes: The table presents the baseline balance for the Main Experiment. *Plot Size* and *Previous Yield* are from the administrative data of the partner company and are available for each of the 605 farmers in our sample. The rest of the variables are from the baseline survey. These are missing for 32 farmers who denied consent to the survey. In addition, a handful of other values for specific variables is missing because of enumerator mistakes or because the respondent did not know the answer or refused to provide an answer. *Previous Yield* is measured as tons of cane per hectare harvested in the cycle before the intervention. *Man* is a binary indicator equal to one if the person in charge of the sugarcane plot is male. *Own Cow(s)* is a binary indicator equal to one if the household owns any cows. *Portion of Income from Cane* takes value between 1 (“None”) to 6 (“All”). *Savings for Sh 1,000 (Sh 5,000)* is a binary indicator that equals one if the respondent says she would be able to use household savings to deal with an emergency requiring an expense of Sh 1,000 (Sh 5,000). 1 USD= 95 Sh. *Good Relationship with the Company* is a binary indicator that equals one if the respondent says she has a “good” or “very good” relationship with the company (as opposed to “bad” or “very bad”). *Trust Company Field Assistants* and *Trust Company Managers* are defined on a scale 1 (“Not at all”) to 4 (“Completely”). P-values are based on specifications which include field fixed effects (since randomization was stratified at the field level). *p<0.1, **p<0.05, ***p<0.01.

Table 2: Main Experiment: Treatment Effects on Take-Up

	(1)	(2)	(3)	(4)	(5)
Pay Upfront with 30% Discount	0.004 [0.033]		0.013 [0.033]	0.003 [0.032]	0.015 [0.033]
Pay At Harvest	0.675*** [0.033]	0.673*** [0.028]	0.680*** [0.033]	0.686*** [0.032]	0.694*** [0.032]
Plot Controls	N	N	Y	N	Y
Farmer Controls	N	N	N	Y	Y
Mean dep. var. (Pay Upfront group)	0.046	0.052	0.046	0.046	0.046
Observations	605	605	605	605	605

Notes: The table presents the results of the Main Experiment. The dependent variable is a binary indicator equal to one if the farmer took-up the insurance. Specification (2) bundles together treatment groups U1 (Pay Upfront) and U2 (Pay Upfront with 30% discount) as baseline group. *Plot Controls* are *Plot Size* and *Previous Yield*. *Farmer Controls* are all of the other controls reported in the balance table, Table 1. For each of the plot controls, we also include a dummy equal to one if there is a missing value (and recode missing values to an arbitrary value), so to keep the number of observations unchanged. *Mean dep. var. (Pay Upfront group)* reports the mean of the dependent variable in the *Pay Upfront* group. All columns include field fixed effects. *p<0.1, **p<0.05, ***p<0.01.

Table 3: Main Experiment: Heterogeneous Treatment Effect by Wealth and Liquidity Constraints Proxies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Land Cultivated (Acres)	Own Cow(s)	Previous Yield	Plot Size (Acres)	Portion of Income from Cane	Savings for Sh1,000	Savings for Sh5,000
X *Pay At Harvest	-0.065** [0.033]	-0.139* [0.078]	-0.079** [0.031]	-0.001 [0.031]	0.053* [0.028]	-0.174** [0.069]	-0.131 [0.097]
X	-0.000 [0.017]	0.066 [0.044]	0.015 [0.020]	-0.022 [0.019]	-0.004 [0.016]	0.006 [0.043]	-0.016 [0.059]
Pay At Harvest	0.706*** [0.029]	0.822*** [0.068]	0.673*** [0.028]	0.672*** [0.028]	0.540*** [0.096]	0.764*** [0.035]	0.725*** [0.031]
Mean dep. var. (Pay Upfront group)	0.052	0.052	0.052	0.052	0.052	0.052	0.052
Mean heterogeneity var. (X)	0.000	0.791	0.000	-0.000	3.311	0.300	0.120
S.D. heterogeneity var. (X)	1.000	0.407	1.000	1.000	1.126	0.459	0.326
Observations	562	569	605	605	569	566	565

Notes: The table shows heterogeneous treatment effects on take-up from the Main Experiment, by different proxies for liquidity constraints and wealth. The dependent variable is a binary indicator equal to one if the farmer took-up the insurance, and in each column the relevant heterogeneity variable (X) is reported in the column title. Treatments U1 (Pay Upfront) and U2 (Pay Upfront with 30% discount) are bundled together as baseline group, as specified in the registered plan. The relevant heterogeneity variable is reported in the column title. *Mean dep. var. (Pay Upfront group)* reports the mean of the dependent variable in the *Pay Upfront* group. For each of the heterogeneity variables (X), we report their mean (*Mean heterogeneity var.*) and standard deviation (*S.D. heterogeneity var.*). *Plot Size* and *Previous Yield* are from the administrative data of the partner company and are available for each of the 605 farmers in our sample. The rest of the variables are from the baseline survey. These are missing for 32 farmers who denied consent to the survey. In addition, a handful of other values for specific variables are missing because of enumerator mistakes or because the respondent did not know the answer or refused to provide an answer. *Land cultivated* is the standardized total area of land cultivated by the household. *Own Cow(s)* is a binary indicator for whether the household owns any cows. *Previous Yield* is the standardized tons of cane per hectare harvested in the cycle before the intervention. *Plot size* is the standardized area of the sugarcane plot. *Portion of Income from Cane* takes value between 1 (“None”) to 6 (“All”). *Savings for Sh 1,000 (Sh 5,000)* is a binary indicator that equals one if the respondent says she would be able to use household savings to deal with an emergency requiring an expense of Sh 1,000 (Sh 5,000). 1 USD = 95 Sh. All columns include field fixed effects. *p<0.1, **p<0.05, ***p<0.01.

Table 4: Cash Drop Experiment: Treatment Effects on Take-Up

	(1)	(2)	(3)	(4)
Pay At Harvest	0.603*** [0.077]	0.589*** [0.078]	0.635*** [0.105]	0.635*** [0.107]
Cash	0.132* [0.079]	0.128 [0.079]	0.167 [0.110]	0.177 [0.111]
Pay At Harvest * Cash			-0.071 [0.156]	-0.100 [0.159]
Plot Controls	N	Y	N	Y
Mean dep. var. (Pay Upfront group)	0.125	0.125	0.125	0.125
P-value: Pay at Harvest = Cash	0.000	0.000	0.000	0.000
Observations	120	120	120	120

Notes: The table presents the results of the Cash Drop Experiment. The dependent variable is a binary indicator equal to one if the farmer took-up the insurance. The baseline (omitted) group is the *Pay Upfront* group, where farmers had to pay the premium upfront and did not receive a cash drop. *Mean dep. var. (Pay Upfront group)* reports the mean of the dependent variable in the *Pay Upfront* group. *Plot Controls* are *Plot Size* and *Previous Yield*. All columns include field fixed effects. *p<0.1, **p<0.05, ***p<0.01.

Table 5: Intertemporal Preferences Experiment: Treatment Effect on Take-Up

	(1)	(2)	(3)	(4)
Receive in One Month	0.233** [0.089]	0.237** [0.092]	0.286*** [0.107]	0.293*** [0.109]
Plot Controls	N	Y	N	Y
Farmer Controls	N	N	Y	Y
Mean dep. var. (Receive Choice Now group)	0.508	0.508	0.508	0.508
Observations	121	121	121	121

Notes: The table presents the results of the Intertemporal Preferences Experiment. The dependent variable is a binary indicator equal to one if the farmer took-up the insurance. The baseline (omitted) group is the *Receive Now* group, where farmers chose between an amount of money equal to the premium and free subscription to the insurance. In the *Receive Choice in One Month* group, farmers made the same choice, but were told that what chose would be delivered one month later (plus one month's interest if they chose cash). *Mean dep. var. (Pay Upfront group)* reports the mean of the dependent variable in the *Receive Choice Now* group. *Plot Controls* are *Plot Size* and *Previous Yield*. *Farmer Controls* are all the other controls reported in the main balance table, Table 1. For each of the plot controls, we also include a dummy equal to one if there is a missing value (and recode missing values to an arbitrary value), so to keep the number of observations unchanged. All columns include field fixed effects. *p<0.1, **p<0.05, ***p<0.01.

Table 6: Main Experiment: Heterogeneous Treatment Effect by Proxies for Expectations of Default

	(1) Good Relationship with Company	(2) Trust Company Field Assistants	(3) Trust Company Managers	(4) Past Share Plots Harvested in Field	(5) Past Share Plots Harvested in Sublocation
X *Pay At Harvest	-0.062 [0.070]	0.022 [0.029]	0.029 [0.028]	-0.228 [0.297]	0.681 [0.425]
X	0.087** [0.040]	0.034* [0.018]	0.027 [0.017]	0.000 [.]	0.000 [.]
Pay At Harvest	0.726*** [0.035]	0.654*** [0.087]	0.640*** [0.073]	0.852*** [0.261]	0.101 [0.358]
Mean dep. var. (Pay Upfront group)	0.052	0.052	0.052	0.052	0.052
Mean heterogeneity var. (X)	0.335	2.889	2.423	0.873	0.839
S.D. heterogeneity var. (X)	0.472	1.045	1.101	0.099	0.068
Observations	570	569	567	556	605

Notes: The table shows heterogeneities of the treatment effects of the pay-at-harvest premium on insurance take-up in the main experiment, by four baseline variables (Z): three different proxies for trust toward the company (col. 1-3) and the historical harvest rate in the sublocation of the plot (col. 4). The name of the heterogeneity variable (Z) is reported in the column title. The dependent variable is a binary indicator equal to one if the farmer took-up the insurance. *Upfront Payment* and *Upfront Payment with 30% discount* treatment groups are bundled together as baseline group, as outlined in the registered plan. *Mean dep. var. (Pay Upfront group)* reports the mean of the dependent variable in the *Pay Upfront* group. The relevant heterogeneity variable is reported in the column title. For each of the heterogeneity variables (X), we report their mean (*Mean heterogeneity var.*) and standard deviation (*S.D. heterogeneity var.*). The notes of Table 1 provide a definition of the trust variables used in the heterogeneity analysis. The two variables *Past Share of Plots Harvested in the Field* and *Past Share of Plots Harvested in the Sublocation* capture the share of plots that completed the harvest with the company in the field and sublocation, respectively, in the 2011-2014 period. The coefficients on the level of *Past Share of Plots Harvested in the Field* and *Past Share of Plots Harvested in the Sublocation* are missing because field fixed effects absorb them. All columns include field fixed effects. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.