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Risk preferences among small farmers in Lesotho: evidence from laboratory experiments in the field and survey data

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Noemi Pace

University Ca' Foscari of Venice and Food and Agriculture Organization (FAO) of the UN

Motivation of the study

- Complementary component of an IE of two interventions in Lesotho:

  - Child Grants Program (CGP)
  - Sustainable Poverty Reduction through Income, Nutrition and Access to Government Services (SPRINGS)

- This paper focuses on **the impact of CGP and CGP+SPRINGS on risk preferences** and on their **relationship with real-life risky choices**

Motivation of the study

- Attitude to risk is particularly important for individuals strongly affected by adverse events and lack of institutions to shield themselves against the consequences of negative events

- Many people in developing countries live under these conditions as they depend to a large extent on the volatile income from farming, have limited assets to absorb heavy shocks, and insurance supply is largely missing.

- Risk aversion contributes to weak savings efforts, low investments (e.g. in education), and hesitant technology adoption (Dercon and Christianensen, 2011; Sakha, 2019).

Motivation of the study

- Cash transfer programs provide a cushion against potential negative income shocks and should allow individuals to engage in higher-return/higher-risk activities (Guiso and Paiella, 2008; Tanaka et al. 2010; Prifti et al. 2019)

- No clear evidence whether community development programs are expected to further reduce risk aversion

- This study aims to fill the gap in the literature by providing insights on how a cash transfer program and a community development intervention can affect risk preferences

Objectives of the study

1) Investigate the CGP and CGP+SPRINGS effect on risk preferences:

- Survey instrument for the CGP+SPRINGS evaluation includes questions on subjective willingness to take risk and non-incentivized choice between pairwise lotteries

- Field-lab experiments designed to elicit risk preferences through incentivized choices between alternative prospects with varying level of riskiness and returns (Harrison et al. 2009; Charness et al. 2013; Gneezy and Imas, 2017; Charness and Viceisza, 2016)

Objectives of the study

2) Investigate whether our measures of risk preferences predict real-life risky choices (Varschoor et al. 2016):

- Perform a mediation analysis to disentangle the direct impact of the programs on real-life risky choices and the indirect impact mediated through changes in risk preferences

Theory of change

Background of the programs: Child Grants Program (CGP)

- One of the largest national social protection program in Lesotho
- It consists of cash transfers provided without explicit conditionality to poor and vulnerable households registered in the National Information System for Social Assistance (NISSA)
- It was launched in 2009 with 1,250 beneficiary households
- In 2018 the number rose to 32,100 – about one tenth of Lesotho's rural households
- The transfer size is indexed to the number of resident children – it corresponds to 20% of average household consumption per month

Background of the programs: SPRINGS

- Rural finance: Community based savings and internal lending groups, with financial education
- Homestead gardening: keyhole gardens, vegetable seeds distribution
- Nutrition training: community-led Complementary Feeding and Learning Sessions
- Access to market: market clubs for training on market access

Risk preferences: self-reported in survey

1. General framing:

“Are you in general a person who takes risk or do you try to evade risk? Please, self-grade your choice (1 – absolutely un-willing to assume risk – 10 – willing to assume all the risk)”

2. Framing “agriculture”:

“When thinking about investing in agriculture, for instance choosing between modern fertilizers and organic fertilizers, or between cultivating staple crop or cash crops, are you a person who is fully prepared to take risk or do you try and avoid taking risk? Please, self-grade your choice

3. Framing “investments”:

“When thinking about investing and borrowing are you a person who is fully prepared to take risk or do you try and avoid taking risk? Please, self-grade your choice

Risk preferences: non-incentivized choice between lotteries in survey

	Option 1	Option 2
1	100 : 0	100
2	100 : 0	75
3	100 : 0	60
4	100 : 0	50
5	100 : 0	40
6	100 : 0	30
7	100 : 0	20
8	100 : 0	10

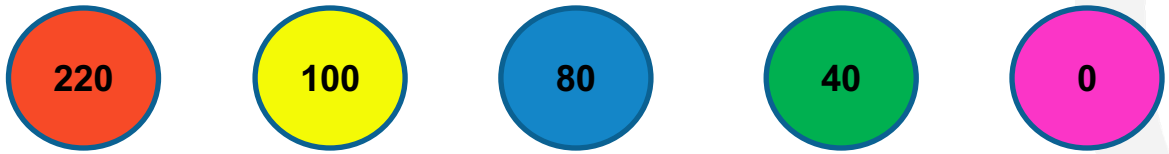
Option 1:
50:50 chance of getting 100 or 0

Option 2:
Certain amount

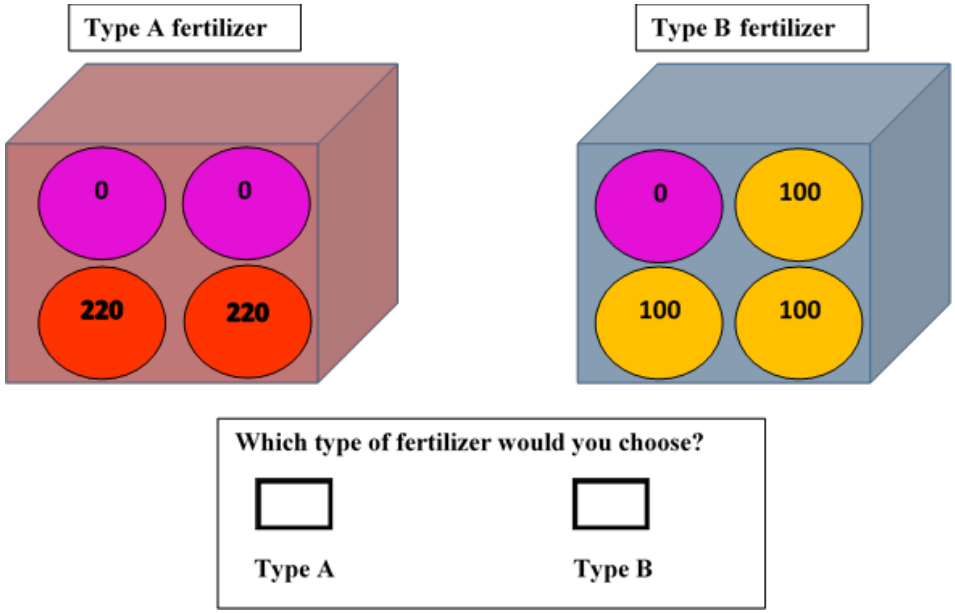
Values in LSL (Lesotho currency)

Risk preferences: field-lab experiment

- A group of community members (7-30 at a time) were gathered to play game
- Each person was given a decision problem consisting of choosing between two different prospects, "**lottery A - red**" or "**lottery B - blue**", containing 4 BALLS of different colours
- Each colour was associated with a potential monetary reward:



Example decision problem (8 in total)



Decision problems

Risk preferences: field-lab experiment

- Payment:

After responding to all the decision problems, each individual participant did two random extractions:

1) Random extraction of a number from 1 to 8 from a small bag
- this defined the decision problem to be considered for the payment;
- the choice of the lottery for that specific decision problem (for instance – lottery A) defined the lottery to be played for real

2) Random extraction of a ball from the red box, corresponding to lottery A

Risk preferences: field-lab experiment

- Data from 456 individuals (363 households):

- 155 comparison; 150 CGP-only; 151 CGP+SPRINGS
- Already interviewed as part of the main survey

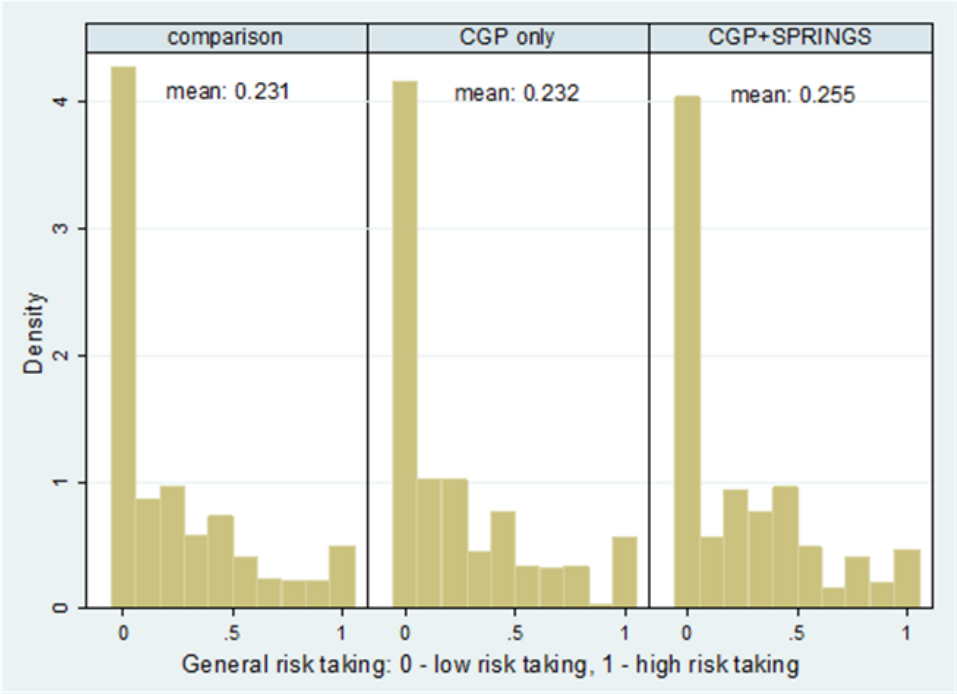
- Two framings: risk choices in agriculture, risky choices in investment and borrowing

- CRRA utility function: $U(x)=x^{(1-r)}/(1-r)$

- The risk index is defined as (1-r)
  Risk index=0 low risk-taking
  Risk index=1 high risk-taking

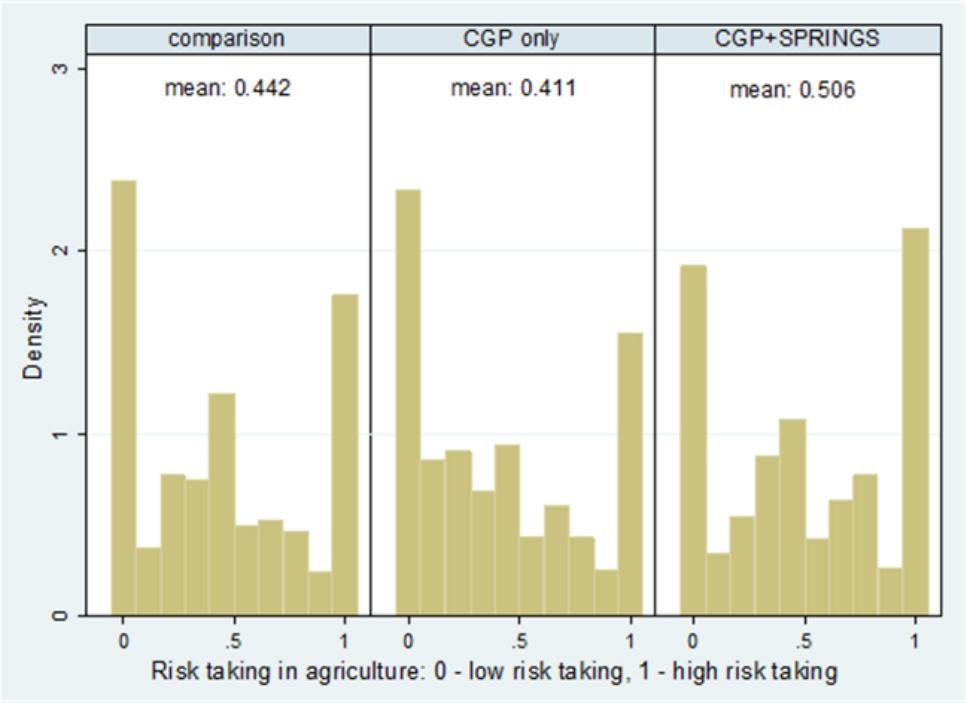
Survey data:

General framing - no differences between treatment arms



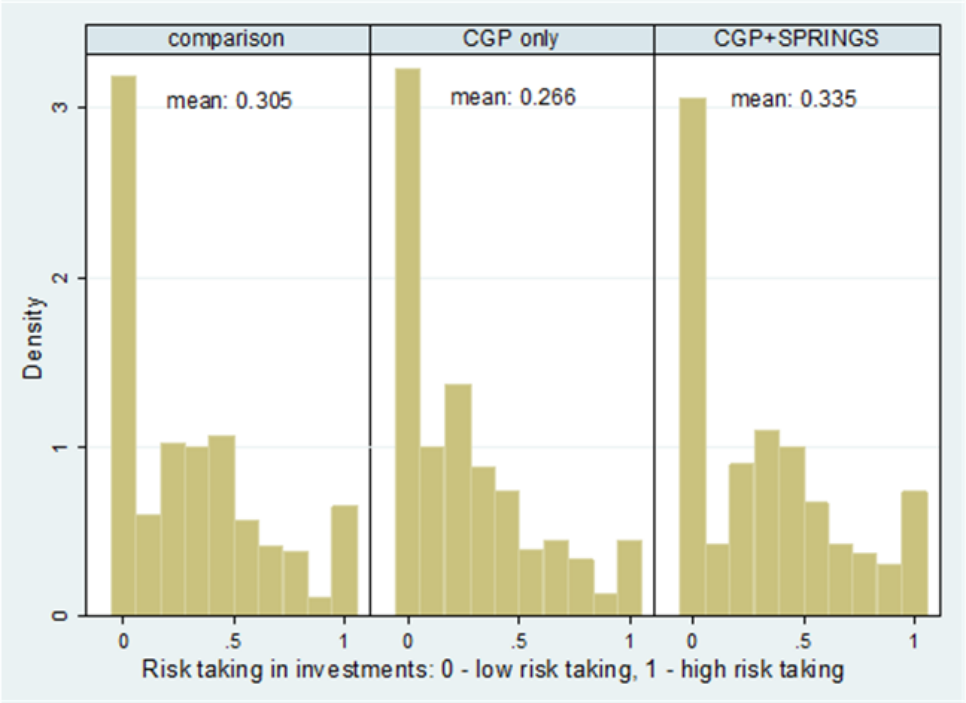
Survey data:

Framing agriculture - willingness to take risk significantly greater in CGP+SPRINGS



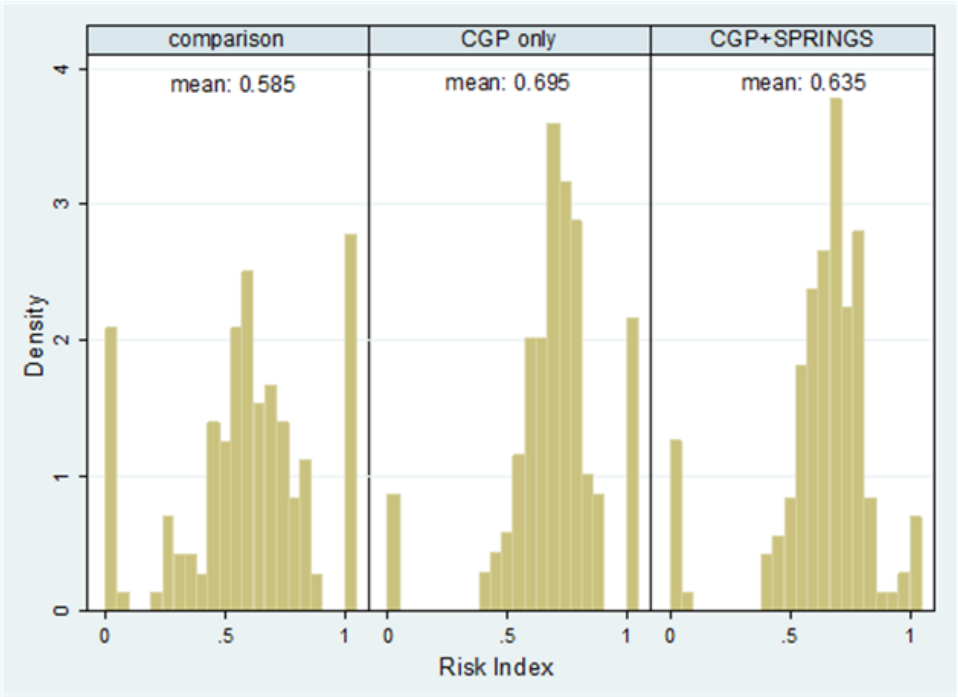
Survey data:

Framing investment - willingness to take risk significantly greater in CGP+SPRINGS



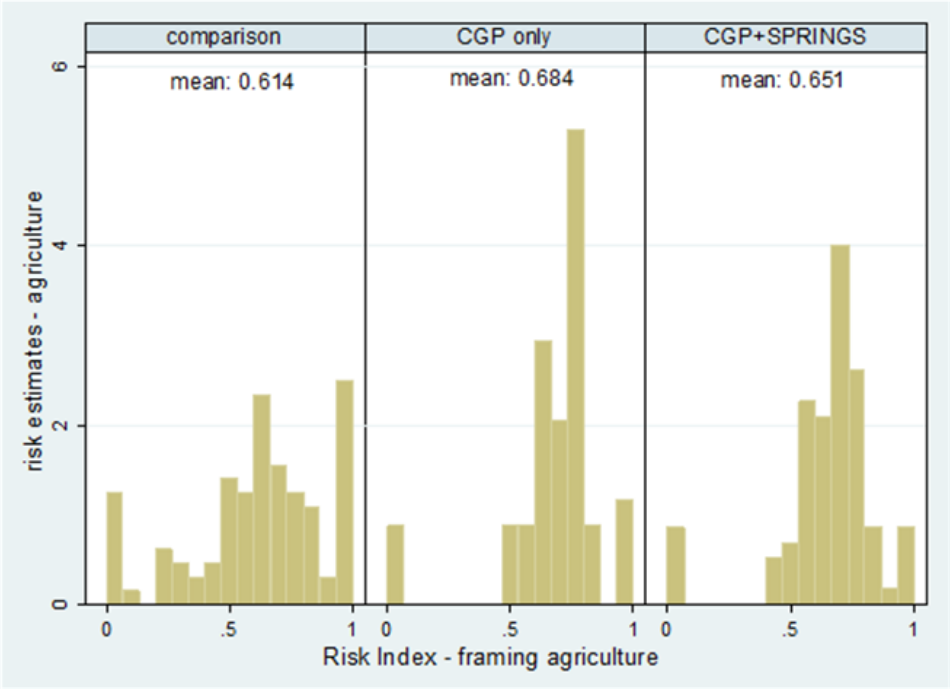
Field lab data:

All data combined - risk index significantly greater in both CGP and CGP+SPRINGS



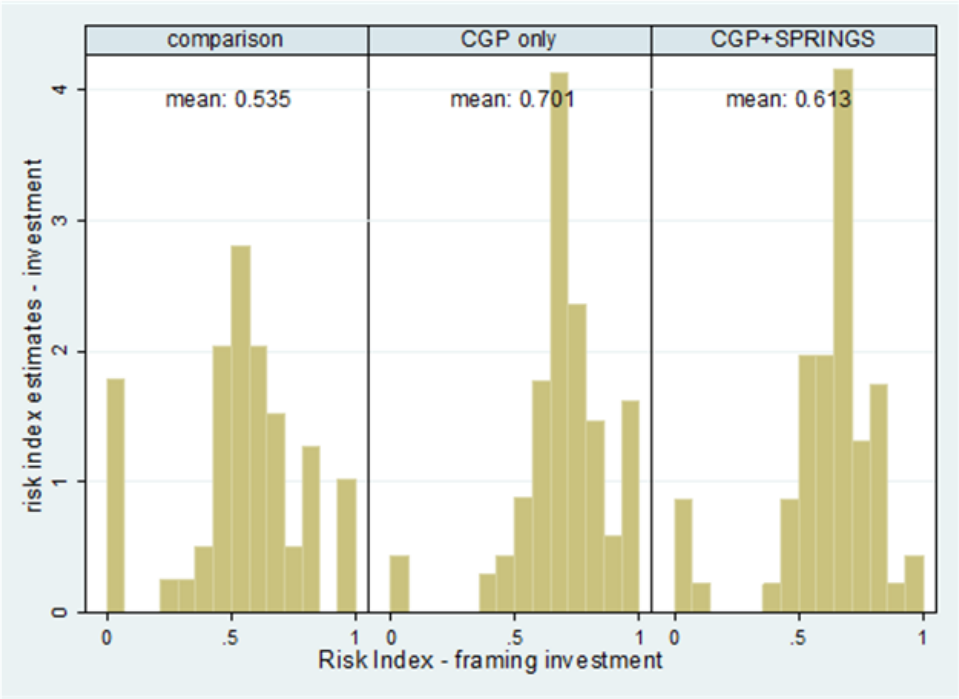
Field lab data:

Framing agriculture - risk index significantly greater in CGP



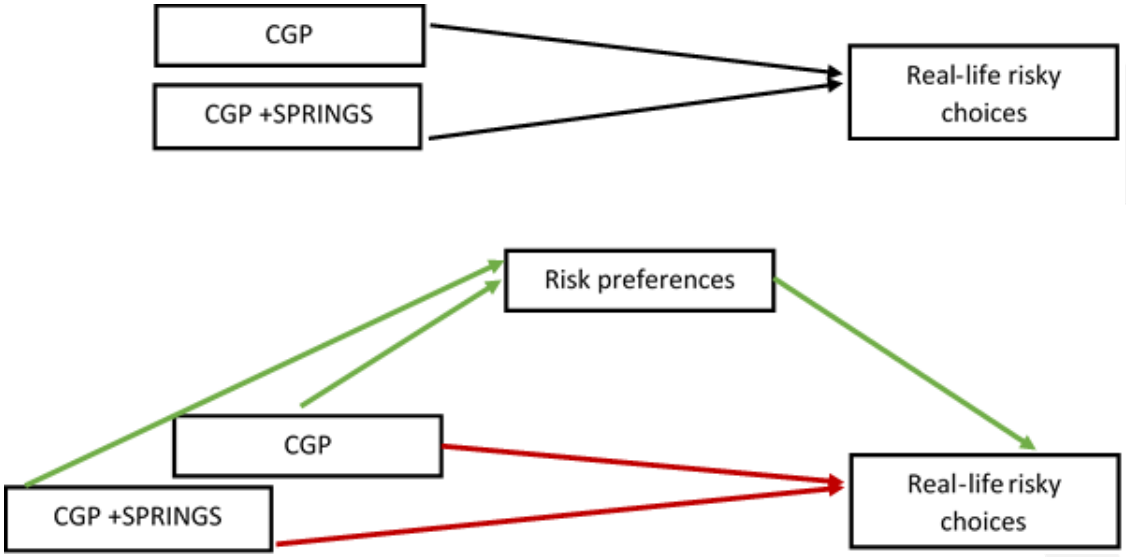
Field lab data:

Framing investment - risk index significantly greater in both CGP and CGP+SPRINGS



Risk-taking behavior in real life

- Causal mediation analysis following Keele et al. (2015)



Risk-taking behavior in real life

- We consider a two-equation structural form model:

$$(1) \qquad Riskatt_i = \alpha_1 + \beta_1 d_CGP_i + \beta_2 d_CGP\&SPRINGS_i + \vartheta_1^T X_i + \varepsilon_{i1}$$

$$(2) \qquad Y_i = \alpha_2 + \beta_3 d_CGP_i + \beta_4 d_CGP\&SPRINGS_i + \gamma Riskatt_i + \vartheta_2^T X_i + \varepsilon_{i2}$$

- The direct effects: β_3 for CGP and β_4 for CGP+SPRINGS

- The indirect effects: impact of the programs on the mediator from equation (1) (β_1 for CGP and β_2 for CGP+SPRINGS) multiplied by the impact of the mediator on Y (γ from equation (2)).

Risk-taking behavior in real life

- Domain agriculture:

➢ Fertilizer purchase (binary variable)
➢ Expenses for fertilizer

- Domain other investment:

➢ Household engagement in non-farm business (binary variable)
➢ Household borrowed money in the past 12 months for purposes other than consumption
➢ Amount borrowed in the past 12 months

Results risk-taking behavior in real life: domain agriculture

- Survey measures of risk preferences explain approximately between 6 to 17 percent of the total impact on outcomes

- Results using field-lab experiment data show that there is only a direct impact of the programs on the outcome variable. The indirect effect is null.

Results risk-taking behavior in real life: domain investment

- Survey measures of risk preferences explain approximately between 2 to 11 percent of the total impact on outcomes

- Results using field-lab experiment data show that there is only a direct impact of the programs on the outcome variable. The indirect effect is null.

Conclusions

Risk preferences elicited through the survey data:

- Are affected by CGP+SPRINGS
- Are correlated with real-life risky choices in both the domain agriculture and investment and mediate the impact of the interventions

Risk preferences elicited through the field-lab experiment:

- Are affected by both CGP only and CGP+SPRINGS
- Does not seem to be correlated with real-life risky choices

Discussion

- Why survey measures are only affected by CGP+SPRINGS while lab measures by both CGP and CGP+SPRINGS?

- Why risk preferences elicited from field-lab do not mirror real-life risky choices?

➢ At individual level the two samples are slightly different (field-lab sample is younger).

➢ Possibly the field-lab elicit well risk-taking behavior in real life, but then decisions are taken by head of the household or spouse

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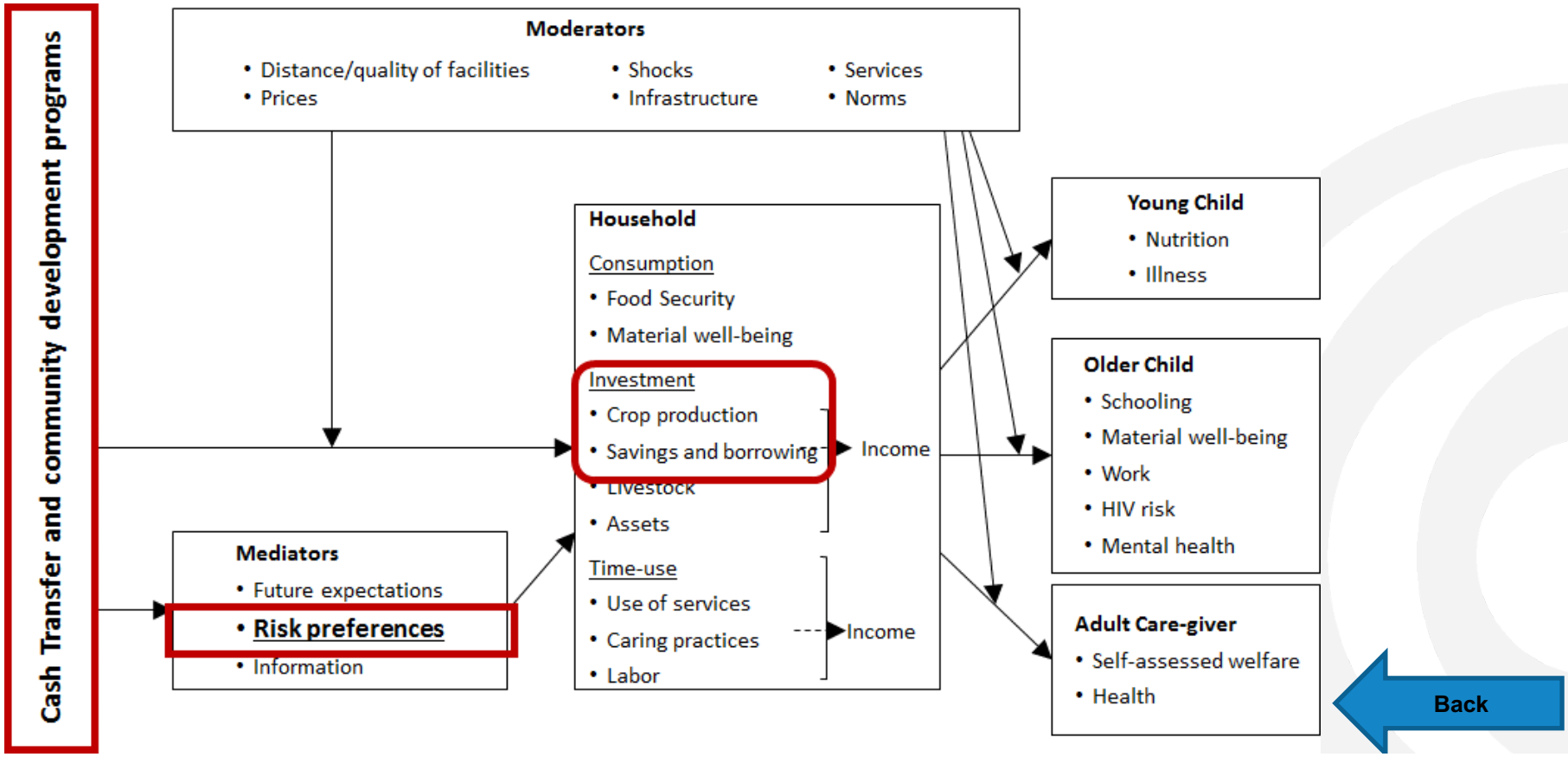
Cash Transfer and community development programs
Moderators
• Distance/quality of facilities
• Prices
• Shocks
• Infrastructure
• Services
• Norms
Household
Consumption
• Food Security
• Material well-being
Investment
• Crop production
• Savings and borrowing
• Livestock
• Assets
Income
Time-use
• Use of services
• Caring practices
• Labor
Income
Mediators
• Future expectations
• Risk preferences
• Information
Young Child
• Nutrition
• Illness
Older Child
• Schooling
• Material well-being
• Work
• HIV risk
• Mental health
Adult Care-giver
• Self-assessed welfare
• Health
Back

Decision problems: Harrison et al. 2009

Decision problems	Lottery A						Lottery B					
	Event 1		Event 2		Event 3		Event 1		Event 2		Event 3	
	Return 1	Prob 1	Return 2	Prob 2	Return 3	Prob 3	Return 1	Prob 1	Return 2	Prob 2	Return 3	Prob 3
1	100	25%	0	25%	40	50%	40	100%				
2	100	25%	0	75%			40	50%	0	50%		
3	100	75%	0	25%			100	50%	40	50%		
4	220	50%	0	50%			100	75%	0	25%		
5	100	75%	0	25%			100	50%	80	25%	0	25%
6	220	50%	0	50%			100	50%	80	25%	0	25%
7	100	75%	0	25%			100	50%	40	50%		
8	100	75%	0	25%			100	50%	80	25%	0	25%

Back

Socio-demographic characteristics and livelihoods

	household sample		
	full	lab-in-the-field	diff
# hh members	5.3	5.7	-0.4**
% hh female headed	42.3	44.9	-2.6
head of hh age	54	54.9	-0.9
% hh single head	47.6	48.8	-1.1
% hh widow head	39.5	40.8	-1.3
# hh members <=17 years old	2.4	2.6	-0.2*
# hh members >=60 years old	0.5	0.5	0
% hh with disabled members	19.8	21.2	-1.4
% dependents hh members	54.4	55.4	-0.9
% hh with orphans	33	33.6	-0.6
head of hh years of education	4.7	4.7	0
per capita monthly consumption, LSL	346.3	321.2	25.1
% food consumption on cereals	49.7	51.2	-1.5
Tropical Livestock Units owned	1.4	1.2	0.1
owned land, ha	1.4	1.3	0.2
% hh planted maize	22.1	22.3	-0.2
chemical fertilizers expenses, LSL	45.4	45.8	-0.4
% hh using tractors	10.7	11.6	-0.9
% control hh	41.9	34.7	7.2*
% CGP hh	29.6	30	-0.4
% CGP+SPRINGS hh	28.5	35.3	-6.8*
# observations	1550	363	

Back

Risk Preferences, by sample of households

	household sample		
	full	lab-in-the-field	diff
type of risk-taking			
general	3.1	3.3	-0.2
investing in agriculture	5.1	5.2	-0.1
borrowing	3.7	3.9	-0.2
% preferring certain amount over lottery			
100 LSL	91.5	89.5	2.0
75 LSL	90.8	90.1	0.8
60 LSL	89.9	89.0	0.9
50 LSL	87.5	87.3	0.2
40 LSL	84.8	85.4	-0.6
30 LSL	81.0	81.3	-0.3
20 LSL	79.3	79.1	0.2
10 LSL	78.5	78.0	0.5
# observations	1550	363	

Back

Socio-demographic characteristics and livelihoods, by sample of individuals

	individuals' sample			
	full	lab-in-the-field	diff	
age	54	47.3	6.7	***
% female	42.3	67.1	-24.8	***
% head	100	53.3	46.7	***
% disabled	7.8	6.6	1.2	
% orphans	0.3	0.7	-0.3	
% single	47.6	45.8	1.8	
% widow	39.5	27.4	12.1	***
% child	0.3	2	-1.7	***
years of schooling	4.7	5.8	-1.1	***
% completed primary school	30.6	46.3	-15.7	***
% in wage off-farm labor	8.4	2.9	5.5	***
% in casual off-farm labor	10.7	7.9	2.8	
% in any off-farm labor	19.1	10.7	8.4	***
% control	41.9	34	7.9	**
% CGP	29.6	32.9	-3.3	
% CGP+SPRINGS	28.5	33.1	-4.7	
# observations	1550	456		

Back

Fertilizer Purchase

PANEL A: RISK ATTITUDES FROM SURVEY DATA		(1) NO controls	(2) Controls w/out community level vars	(3) Controls with community level vars
Willingness to take risk from survey: framing agriculture	Direct effect CGP (β3)	0.085 ***	0.056 **	0.040 *
		[0.020]	[0.023]	[0.024]
	Direct effect CGP+SPRINGS (β4)	0.120 ***	0.092 ***	0.063 **
		[0.022]	[0.025]	[0.028]
	Mediated effect CGP (β1*γ)	-0.003	-0.001	-0.005
		[0.002]	[0.003]	[0.003]
	Mediated effect CGP+SPRINGS (β2*γ)	0.007 **	0.01 **	0.007 **
		[0.003]	[0.003]	[0.003]
	Share of CGP effect mediated by risk attitudes	-3.66%	-2.38%	-12.81%
	Share of CGP+SPRINGS effect mediated by risk attitudes	5.51% **	9.80% **	10.00% **
	Obs	1,550	1,550	1,550
PANEL B: Risk attitudes from experimental data		NO controls	Controls w/out community level	Controls with community level vars
Risk taking from experiment: framing agriculture	Direct effect CGP (β3)	0.246 **	0.099	-59.990
		[0.066]	[0.106]	[69.017]
	Direct effect CGP+SPRINGS (β4)	0.176 **	0.032	22.240
		[0.049]	[0.080]	[25.635]
	Mediated effect CGP (β1*γ)	0.007	0.002	3.676
		[0.009]	[0.013]	[6.179]
	Mediated effect CGP+SPRINGS (β2*γ)	0.003	0.002	-1.422
		[0.006]	[0.010]	[2.342]
	Share of CGP effect mediated by risk attitudes	2.58%	1.57%	-6.53%
	Share of CGP+SPRINGS effect mediated by risk attitudes	1.92%	5.55%	-6.83%
	Obs	233	233	233

Expenses for fertilizers

PANEL A: RISK ATTITUDES FROM SURVEY DATA		(1) NO controls	(2) Controls w/out community level vars	(3) Controls with community level vars
Willingness to take risk from survey: framing agriculture	Direct effect CGP (β3)	25.996 **	23.078 *	23.165
		[12.588]	[12.416]	[15.604]
	Direct effect CGP+SPRINGS (β4)	36.083 **	30.451 **	22.835
		[12.840]	[14.455]	[14.727]
	Mediated effect CGP (β1*γ)	-1.374	-0.631	-2.469
		[0.874]	[1.355]	[1.789]
	Mediated effect CGP+SPRINGS (β2*γ)	2.840 *	4.971 ***	4.019 ***
		[1.489]	[1.916]	[1.832]
	Share of CGP effect mediated by risk attitudes	-5.58%	-2.81%	-11.93%
	Share of CGP+SPRINGS effect mediated by risk attitudes	7.30% **	14.03% **	14.97% **
	Obs	1,550	1,550	1,550
PANEL B: Risk attitudes from experimental data		NO controls	Controls w/out community level vars	Controls with community level vars
Risk taking from experiment: framing agriculture	Direct effect CGP (β3)	126.442 ***	138.344 **	30402.450
		[40.803]	[66.490]	[38359.66]
	Direct effect CGP+SPRINGS (β4)	47.127 ***	50.833	-11819.020
		[11.494]	[34.822]	[14230.31]
	Mediated effect CGP (β1*γ)	6.244	-4.970	5894.973
		[4.773]	[15.906]	[5640.218]
	Mediated effect CGP+SPRINGS (β2*γ)	3.300	-5.875	-2280.385
		[3.930]	[12.508]	[2123.724]
	Share of CGP effect mediated by risk attitudes	4.71%	-3.73%	16.24%
	Share of CGP+SPRINGS effect mediated by risk attitudes	6.54%	-13.07%	16.17%
	Obs	233	233	233

HH borrowed money

PANEL A: RISK ATTITUDES FROM SURVEY DATA		(1) NO controls	(2) Controls w/out community level vars	(3) Controls with community level vars
Willingness to take risk from survey: framing investment	Direct effect CGP (β3)	0.005	-0.016	0.024
		[0.024]	[0.031]	[0.034]
	Direct effect CGP+SPRINGS (β4)	0.266 **	0.241 ***	0.243 **
		[0.028]	[0.034]	[0.038]
	Mediated effect CGP (β1*γ)	-0.006	-0.003	-0.001
		[0.003]	[0.003]	[0.004]
	Mediated effect CGP+SPRINGS (β2*γ)	0.004	0.007 *	0.008 *
		[0.003]	[0.004]	[0.005]
	Share of CGP effect mediated by risk attitudes	530.95%	14.47%	-3.14%
	Share of CGP+SPRINGS effect mediated by risk attitudes	1.65%	2.74% *	3.16% **
	Obs	1,550	1,550	1,550
PANEL B: Risk attitudes from experimental data		NO controls	Controls w/out community level vars	Controls with community level vars
Risk taking from experiment: framing investment	Direct effect CGP (β3)	0.053	-0.190	-0.279
		[0.078]	[0.131]	[0.222]
	Direct effect CGP+SPRINGS (β4)	0.340 ***	0.051	-0.313
		[0.086]	[0.146]	[0.305]
	Mediated effect CGP (β1*γ)	-0.002	0.007	0.024
		[0.024]	[0.014]	[0.053]
	Mediated effect CGP+SPRINGS (β2*γ)	-0.001	-0.001	0.018
		[0.013]	[0.013]	[0.045]
	Share of CGP effect mediated by risk attitudes	-4.35%	-3.77%	-9.39%
	Share of CGP+SPRINGS effect mediated by risk attitudes	-0.31%	-1.39%	-6.00%
	Obs	223	223	223