The Role of Active Discussion in Learning about Uncertain Technologies

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Motivation

- Low adoption of modern technologies in subsistence farming of Global South (Jack, 2013; Suri and Udry, 2022).
- One of the leading causes: information frictions (Magruder, 2018; Mobarak and Saldanha, 2022).
- One such source of friction: uncertainty about the relative riskiness of a technology (Chavas and Nauges, 2020).
- Interventions that leverage *social learning* to improve adoption can help (Maertens and Barrett, 2012).

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- Interventions that leverage *social learning* to improve adoption can help (Maertens and Barrett, 2012).
- **What is the *mechanism* of such learning:** is it the information being shared, or the participation in sharing?

This Study

Can active discussion help in resolving information frictions in technology adoption?

- Improving cooperation about common beliefs.

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To answer:

- Artefactual field experiment with Peruvian potato farmers.
- Focus on their beliefs regarding different strategies to deal with Late Blight (LB).

Contributions

1. **Learning for technology adoption in agriculture**
Foster and Rosenzweig (1995), Conley and Udry (2010)

   - Evidence on whether active discussion can play a role in such learning.

2. **Literature on effective means of information communication**
Geana et al. (2011), Pan et al. (2021)

   - Evidence of the *backfire effect* shown in Nyhan and Reifler (2010; 2015).

3. **Role of coordination in improving technology adoption**
Abebaw and Haile (2013), Kolade and Harpham (2014)

   - Evidence on whether active discussion can be a possible mechanism of such coordination.

Background

Healthy Potatoes in Tarma, Peru

Potatoes:

- Major production crop and consumer good in Peru.
- Large number of varieties.
- Has both traditional and modern varieties.
- Production is subject to many shocks.
- Most notable shock: Late Blight

Background (continued)

Late Blight

- Identified as the primary potato disease in Peru (Barrera et al., 2016).
- Primary constraint to potato producers (Perez et al., 2022).
- Large variety of technologies available to deal with it.
- Some varieties of potatoes more susceptible to it than others.

Late Blight: *Phytophthora Infestans*

Experimental Design

Task 1: Elicit Private Beliefs - Technology Risky or Ambiguous?

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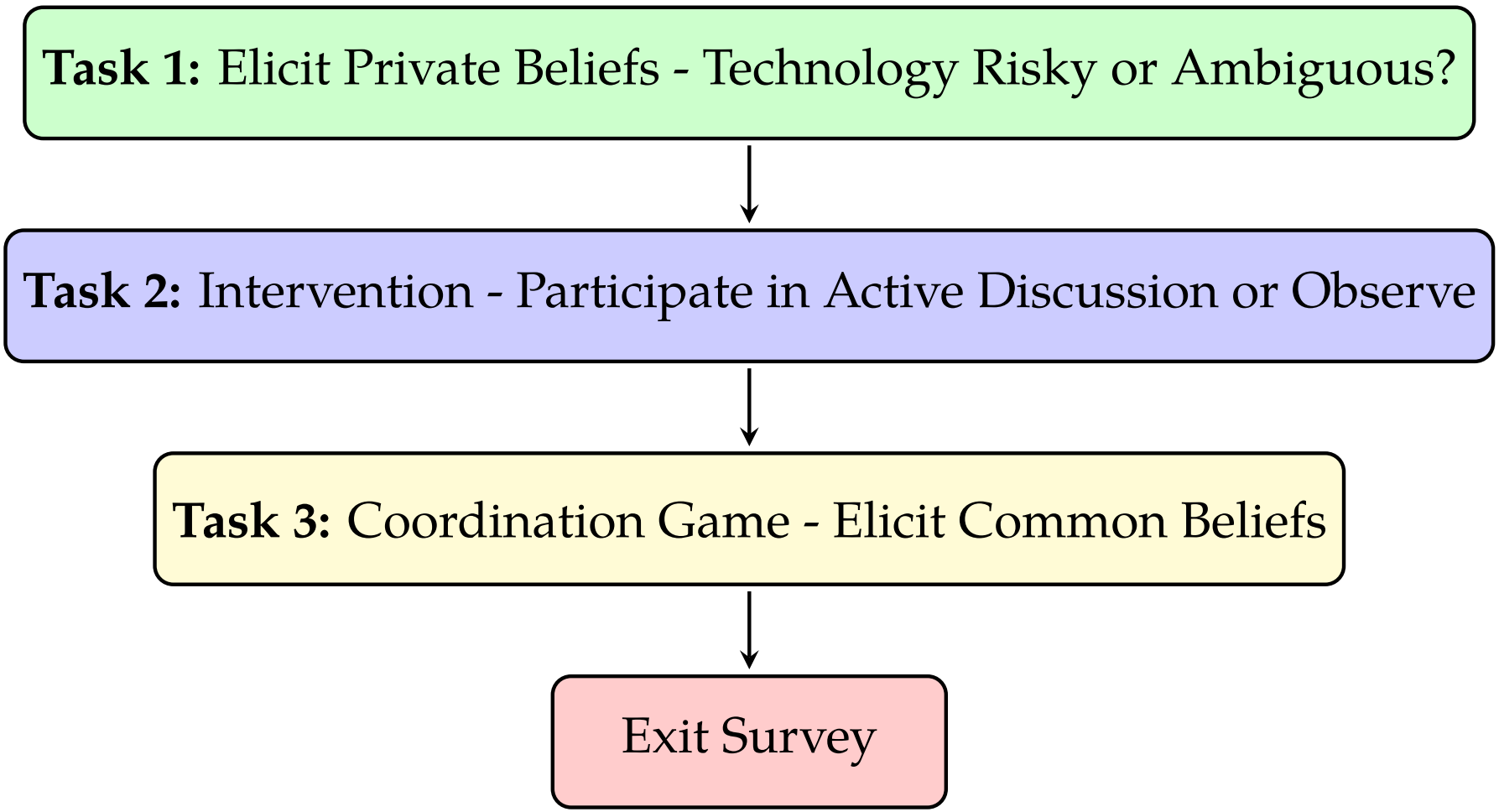
Task 3: Coordination Game - Elicit Common Beliefs

Experimental Design



Elicitation Instrument

"What are the chances your potato production will be affected by Late Blight if you...:"

- Strategy 1: Do nothing
- Strategy 2: Apply agrochemical products
- Strategy 3: Receive technical assistance
- Strategy 4: Practice crop rotation
- Strategy 5: Avoid harvesting on rainy days

Possible answers:

1. Small
2. 50/50
3. Large
4. Not sure: Could be small or 50/50
5. Not sure: Could be 50/50 or large
6. Not sure: Could be small or large

Figure 1: Instrument for Eliciting Risk and Ambiguity Perception

Execution: Three Regions

Figure 2: Map of Peru and Field Sites

Execution: Discussions

Figure 3: Room Configuration of Discussions

▸ Randomization Balance Test

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Conjecture 2: Subjects with ambiguous private beliefs are more likely to report risky common beliefs if they participate in the discussion instead of observing it.
↪ As participants with ambiguous beliefs can learn from participants with risky beliefs.

Descriptive Statistics

Table 2: Descriptive Statistics: Sample Farming Practices

Variable	Full sample	Huánuco	Junín	Lima
Potato is main crop	0.83	0.98	0.99	0.57
Number of potato varieties	3.31	3.92	3.56	2.55
	(1.52)	(1.66)	(1.42)	(1.11)
Experienced late blight in past	0.95	0.99	0.97	0.89
Proportion of crop lost to blight				
None	0.03	0.01	0.00	0.07
A little	0.59	0.55	0.56	0.67
Half	0.25	0.29	0.28	0.20
A lot	0.09	0.09	0.13	0.06
All of it	0.03	0.07	0.03	0.00
Use the following strategies against late blight				
Use more resistant varieties	0.46	0.39	0.53	0.46
Use healthy potato seeds	0.64	0.48	0.77	0.67
Hilling	0.52	0.39	0.48	0.66
Avoid harvesting on rainy days	0.46	0.45	0.56	0.39
Technical assistance	0.47	0.26	0.27	0.83
Use agrochemical products	0.99	0.98	0.99	1.00
Number of strategies	3.54	2.95	3.60	4.01
	(1.68)	(1.78)	(1.57)	(1.53)
Land size (hectares)	5.27	5.66	4.72	5.43
	(7.30)	(10.16)	(6.57)	(4.47)
No. of Observations	295	92	97	106

Descriptive Statistics: Private Beliefs

Table 3a: Private Beliefs for the Chances of Late Blight Affecting Crop Production

	Full Sample N=295 (1)	Potato farmers N=246 (2)
If I do nothing the chances are...		
Risky	89%	90%
Ambiguous	11%	10%
If I apply agrochemicals the chances are...		
Risky	88%	88%
Ambiguous	12%	12%
If I receive technical assistance the chances are...		
Risky	86%	85%
Ambiguous	14%	15%
If I do crop rotation the chances are...		
Risky	76%	75%
Ambiguous	24%	25%
If I avoid harvesting on rainy days, the chances are...		
Risky	77%	75%
Ambiguous	23%	25%

Results

$$Pr(\text{Risky Common Belief}_{ijg}) = \psi_1 \times \text{Treatment}_{ijg} + \psi_2 \times \text{Ambiguous Private Belief}_{ijg} + \psi_3 \times \text{Treatment}_{ijg} \times \text{Ambiguous Private Belief}_{ijg} + X'_{ijg}\alpha + \Theta'_{ijg}\lambda + G'_g\delta + \mathfrak{D}_j + \mu_{ijg}.$$

Table 6: Common Beliefs reported to be Risky (as opposed to Ambiguous)

	Do nothing	Apply agrochemicals	Seek technical assistance	Do crop rotation	Avoid harvesting on rainy days	Avoid harvesting on rainy days (no Lima)
Treatment	-0.001	-0.094	-0.051	0.090	-0.033	-0.060
(Active Discussion=1)	(0.055)	(0.058)	(0.046)	(0.058)	(0.081)	(0.107)
Private Belief	-0.026	-0.289*	-0.197	-0.442***	-0.255***	-0.284***
(Ambiguous=1)	(0.071)	(0.150)	(0.128)	(0.118)	(0.083)	(0.083)
Treatment × Private Belief	-0.590**	0.054	-0.525**	-0.045	-0.096	-0.108
	(0.230)	(0.035)	(0.246)	(0.144)	(0.137)	(0.166)
Control Mean	0.894	0.886	0.813	0.756	0.780	0.747
(SD)	(0.309)	(0.319)	(0.391)	(0.431)	(0.416)	(0.437)
Observations	244	244	244	244	244	188
Wald χ^2	630.53***	106.97***	3775.89***	577.77***	1183.90***	-
pseudo R^2	0.178	0.165	0.324	0.209	0.156	0.125

Notes: * p< 0.10, ** p< 0.05, *** p< 0.01. Probit marginal effects. Robust standard errors clustered at the session level are in parentheses. Only potato farmers that had some prior experience with LB are included in the sample. All regressions include individual characteristics, group characteristics, and department-fixed effects. Individual characteristics include the individual's age, age^2, gender, education levels (as education dummies), risk and ambiguity preferences, size of land, and whether the individual ever had late blight. Group characteristics include the total number of lines spoken in the group and the total number of lines spoken by the individual in the group (both can be positive if and only if the individual was randomly selected to participate in a discussion group).

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Results: Coordination Indices

Table 7a: Differences in Coordination Indices

	CI(Group)		
	Pre-chat Differences	Post-chat Differences	Differences in Differences
If I do nothing...	-0.019	0.006	0.026
	(0.074)	(0.072)	(0.074)
If I apply agrochemicals...	-0.052	0.065	0.117*
	(0.071)	(0.074)	(0.064)
If I receive technical assistance...	0.000	-0.003	-0.004
	(0.068)	(0.072)	(0.062)
If I do crop rotation...	-0.083	0.025	0.108
	(0.066)	(0.069)	(0.068)
If I avoid harvesting on rainy days...	0.012	0.062	0.050
	(0.057)	(0.059)	(0.058)

Notes: * p< 0.10, ** p< 0.05, *** p< 0.01. Standard errors are in parentheses. Coordination indices capture the probability of two randomly chosen subjects coordinating on a question. They are calculated at the group level. Group identity varies by treatment status at the session level. Calculation uses 26 groups that participated in the discussion and 26 groups that observed the discussions.

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If I do crop rotation...	-0.083	0.025	0.108
	(0.066)	(0.069)	(0.068)
If I avoid harvesting on rainy days...	0.012	0.062	0.050
	(0.057)	(0.059)	(0.058)

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- Artefactual field experiment with Peruvian potato farmers.
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Key Takeaway: Interventions that use active discussion to improve cooperation may not work well.

- Such interventions can provide a cost-effective mechanism of information transmission.
- Knowledge interventions needed to improve the initial information set before they can be implemented.

THANK YOU!

Randomization Balance Test

Back

Table 5: Randomization Balance Test for Stage 2

	Control	Treatment	Combined	Differences
Age	45.532	43.476	44.528	2.056
	(1.080)	(1.077)	(0.764)	(1.526)
Gender	0.221	0.204	0.213	0.017
(Female=1)	(0.034)	(0.033)	(0.024)	(0.047)
At most Primary Education completed	0.377	0.449	0.412	-0.072
	(0.039)	(0.041)	(0.028)	(0.057)
At most Secondary Education completed	0.474	0.401	0.439	0.073
	(0.040)	(0.041)	(0.029)	(0.057)
At most Post-Secondary Education completed	0.149	0.150	0.150	-0.000
	(0.029)	(0.030)	(0.021)	(0.041)
Land Size (hectares)	5.316	5.107	5.214	0.209
	(0.517)	(0.663)	(0.418)	(0.837)
Potato is main crop	0.831	0.844	0.837	-0.012
	(0.030)	(0.030)	(0.021)	(0.043)
Experienced Late Blight in past	0.935	0.959	0.947	-0.024
	(0.020)	(0.016)	(0.013)	(0.026)
Observations	154	147	301	-

Notes: * p< 0.10, ** p< 0.05, *** p< 0.01.

Coordination Indices

◂ Back

The probability of two randomly chosen subjects coordinating on question q:

$$\overline{C}^q = \sum_j \frac{m_j(m_j - 1)}{[N(N-1)]} \in [0, 1],$$

where N is the number of subjects in the session, $j \in \{1, ..., J\}$ denotes each of the $J = 6$ possible answers/choices per question, and m_j denotes the number of subjects in the session who selected the same answer/choice.