Identifying Early Adopters, Enhancing Learning, and the Diffusion of Agricultural Technology

Kyle Emerick, Alain de Janvry, Elisabeth Sadoulet, and Manzoor Dar

Tufts University, University of California Berkeley,
and International Rice Research Institute

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What can be done to make agricultural technology diffuse faster?

- Lots of examples of slow diffusion:
  - Hybrid corn (Grilliches, 1957 Econometrica)
  - Tractor (Manuelli and Seshardi, 2014 AER)
  - Fertilizer in Africa (Duflo, Kremer, and Robinson, 2011 AER)
- Slow learning is one (of many) explanations
- What are policy levers to make learning faster?
  - Improved selection of entry points (Beamen et al, 2015)
  - Compensate early adopters for spreading information (BenYishay and Mobarak, 2015)

Our research question focuses on a different lever to improve learning

Research Question: Will a new seed variety diffuse faster when farmer field days are used to encourage learning from early adopters?

Methodology: 1) Introduce new seed variety to group of demonstrators in 100 villages. 2) Randomly carry out field days in 50 3) Measure adoption for next season

Short Answer: Yes, field days cause adoption to increase by 40 percent

We also considered different methods of introducing the variety

3 (random) methods of selecting demonstrators

1. With the ward member (local politician)
2. By village meetings
3. By SHG meetings (women)

Short Answers:

- Meetings reduce patronage
- Field days no more effective when meetings identify demonstrators
- No effect of meetings on adoption rates

What explains this large field day effect?

We can rule out one mechanism:

- Possible that field days inform farmers not linked to demonstrators
- i.e. field days make up for networks being incomplete
- Data don't appear compatible with this mechanism
  - No heterogeneous effect as function of either # demonstrators with same surname or # demonstrator plots close to house
  - In SHG villages, effect *larger* for households w/ SHG member

What the paper adds

- Rigorous test of one method to improve learning
  - Farmers don't fully transmit info
  - We show importance of intervening to nudge learning
  - Not many studies on how to make learning work better, most focus on establishing peer effects
- Efficacy of agricultural extension
  - Combine somewhat traditional extension technique with demonstration by peers

Contents of the talk

1. Research question and preview of findings
2. **Details of the experiment**
3. Results
4. Conclusions

The technology we study is flood-tolerant rice called Swarna-Sub1

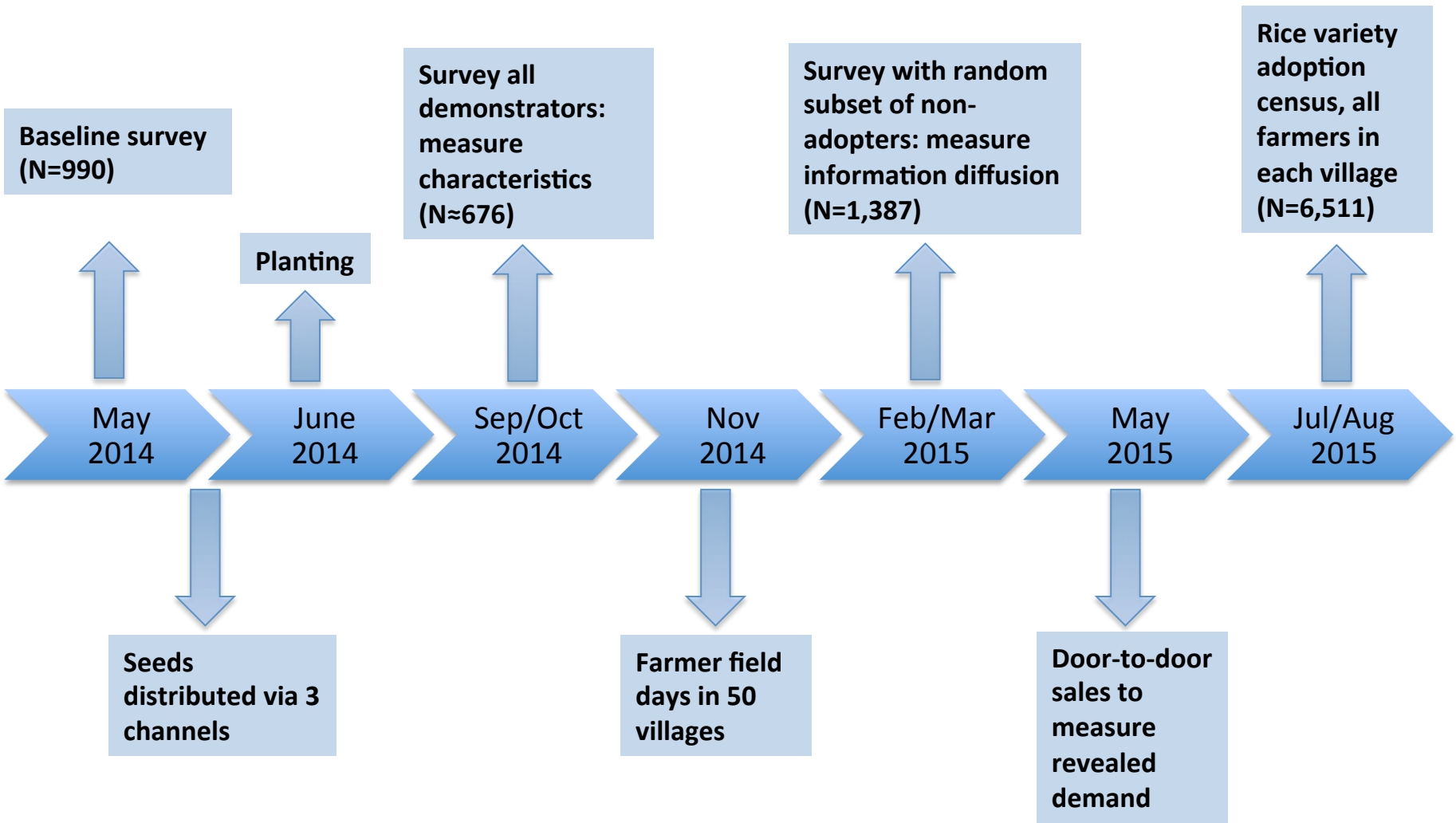
In previous work:

- Positive effect on yield during flooding, no change w/out flood
- Crowds in modern inputs and practices due to $\downarrow$ risk

Why good for study of diffusion?

- Dominates next best variety
- Should diffuse rapidly w/out constraints
- Adoption right metric because good for everybody

Timeline of experiment, in one graph



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Straightforward specifications

- ATE of field day

$$y_{ivb} = \beta_0 + \beta_1 FieldDay_{vb} + \beta_2 X_{ivb} + \alpha_b + \varepsilon_{ivb}$$

  - Where y is outcome of farmer i in village v and block b
  - Blocks are strata
  - Cluster SE's at village level

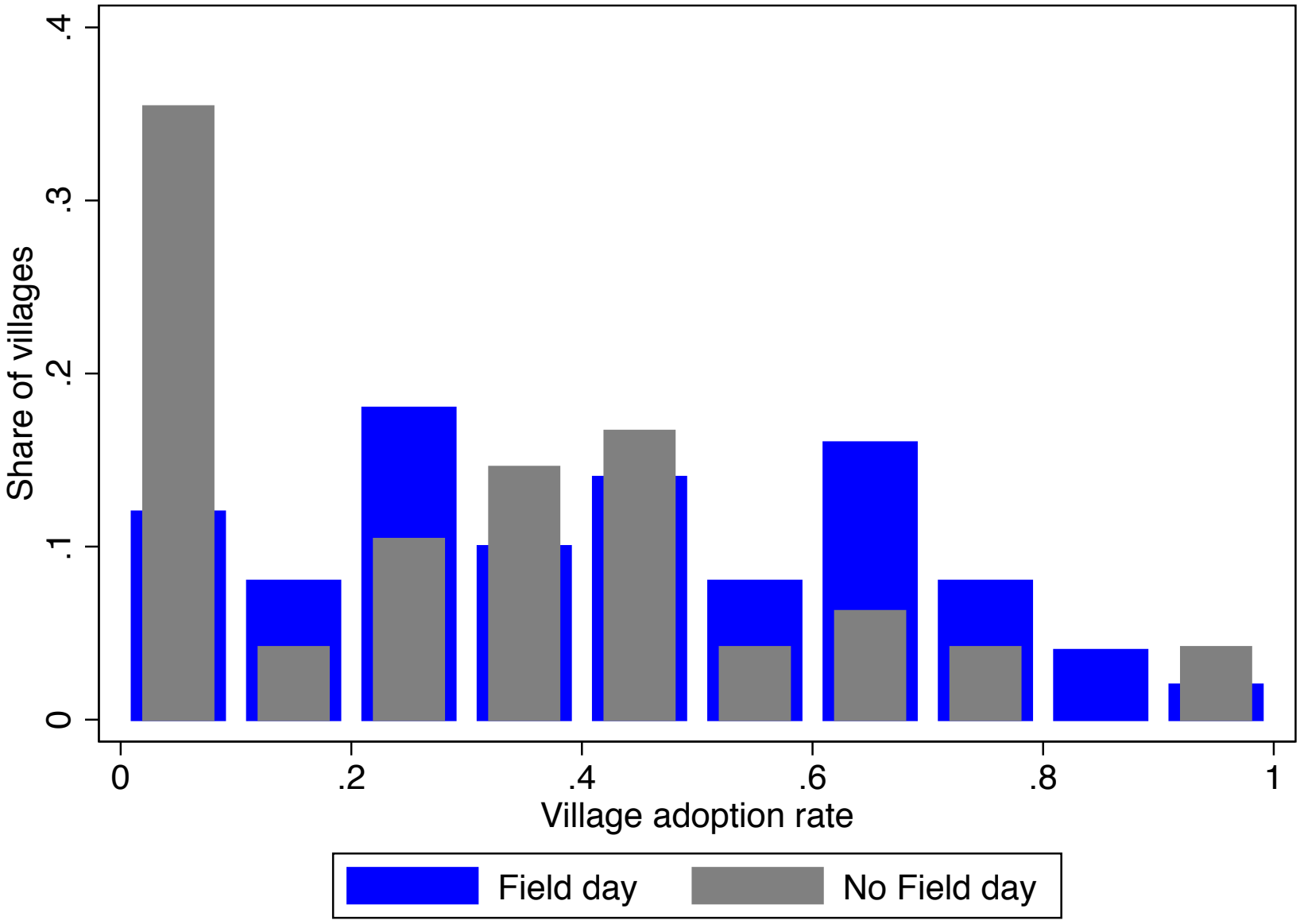
- How effect varies with meetings to identify demonstrators:

$$\begin{aligned} y_{ivb} = \beta_0 &+ \beta_1 FieldDay_{vb} + \beta_2 FieldDay_{vb} * Meet_{vb} \\ &+ \beta_3 FieldDay_{vb} * SHG_{vb} + \beta_4 Meet_{vb} + \beta_5 SHG_{vb} \\ &+ \beta_6 X_{ivb} + \alpha_b + \varepsilon_{ivb} \end{aligned}$$

Some modest effects on knowledge

	(1) Ever heard of	(2) Number talked to	(3) Diff. with Swarna	(4) Max survival flood	(5) Best land type	(6) Length grow cycle
Field day	0.060*	0.116*	-0.037	0.133***	0.057	0.070**
	(0.031)	(0.065)	(0.042)	(0.045)	(0.038)	(0.034)
Mean in control villages	0.794	0.572	0.431	0.243	0.725	0.819
Number of Observations	1385	1369	1387	1387	1387	1387
R squared	0.071	0.025	0.109	0.133	0.081	0.127

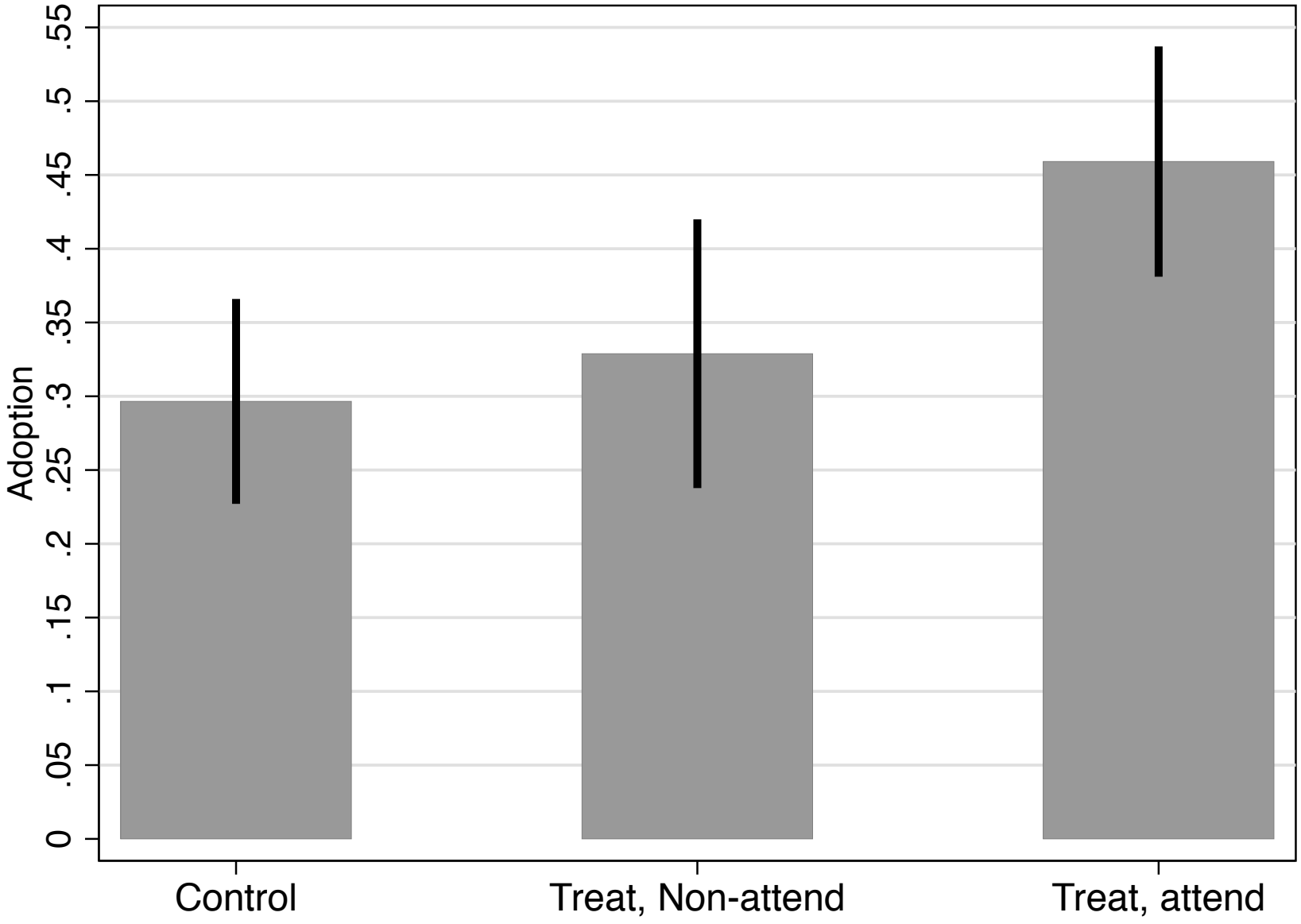
Main result: farmer field days increased adoption



Effect particularly strong on purchasing just one package

	Buy:					
	(1) Any	(2) 5 KG	(3) 10 KG	(4) Any	(5) 5 KG	(6) 10 KG
Field day	0.122**	0.086**	0.036	0.121**	0.083**	0.038
	(0.048)	(0.043)	(0.032)	(0.047)	(0.042)	(0.032)
HH Controls	No	No	No	Yes	Yes	Yes
Strata FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean in control villages	0.297	0.147	0.150	0.297	0.147	0.150
Number of Observations	1384	1384	1384	1384	1384	1384
R squared	0.042	0.028	0.012	0.062	0.043	0.028

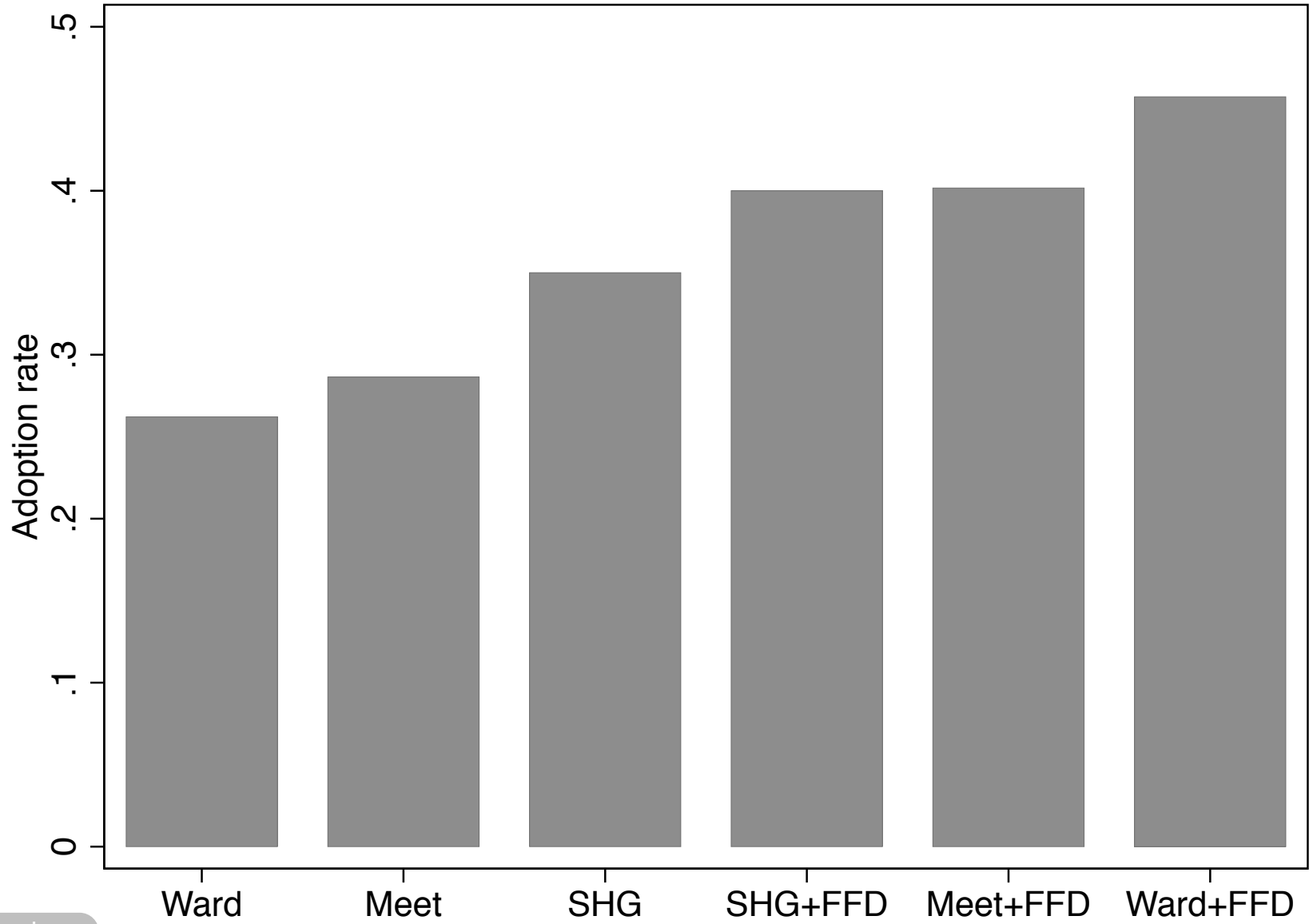
Effect strongly **associated** with attendance



Effect stronger for the poor

	Buy:					
	(1) Any	(2) 5 KG	(3) 10 KG	(4) Any	(5) 5 KG	(6) 10 KG
Field day	0.083	0.046	0.036	0.073	0.022	0.051
	(0.050)	(0.048)	(0.039)	(0.062)	(0.057)	(0.039)
Field day * ST or SC	0.118	0.114*	0.004			
	(0.079)	(0.065)	(0.055)			
Field day * BPL card				0.079	0.101*	-0.022
				(0.059)	(0.055)	(0.044)
HH Controls	Yes	Yes	Yes	Yes	Yes	Yes
Strata FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean in non-field day villages	0.297	0.147	0.150	0.297	0.147	0.150
Number of Observations	1384	1384	1384	1384	1384	1384
R squared	0.066	0.047	0.028	0.064	0.047	0.028

Field days no more effective when meetings identify demonstrators

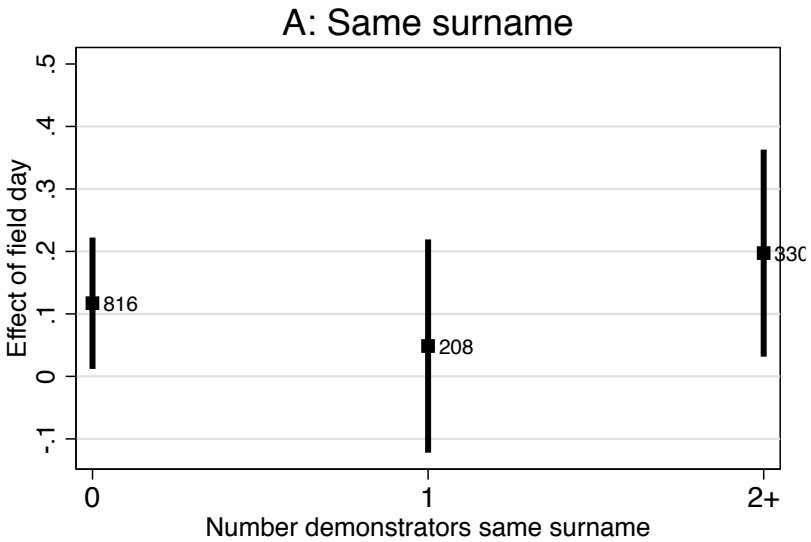


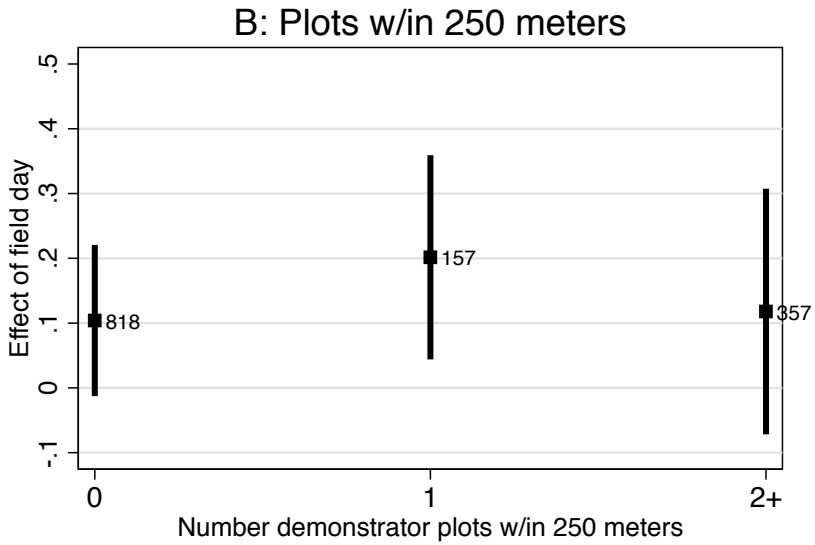
regressions

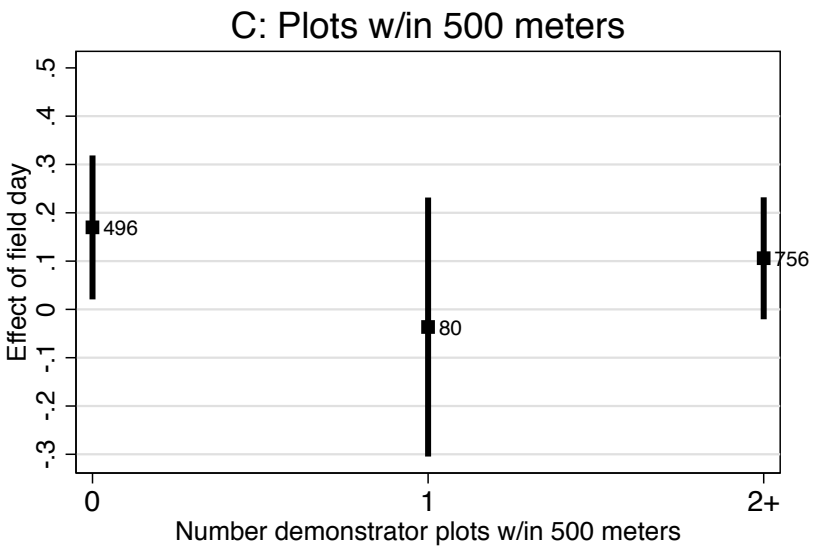
Average effect of meetings close to 0

	(1) Buy	(2) Buy 5 KG	(3) Buy 10 KG
Village or SHG meeting	-0.005	0.007	-0.012
	(0.047)	(0.041)	(0.031)
Field day	0.123**	0.086**	0.037
	(0.047)	(0.042)	(0.032)
Strata FE	Yes	Yes	Yes
Mean in non-field day villages	0.297	0.147	0.150
Mean in Ward villages	0.357	0.185	0.172
Number of Observations	1384	1384	1384
R squared	0.043	0.028	0.013

Results don't appear to be driven by "incomplete networks" mechanism







Seems more like field days enhance learning amongst people closer to demonstrators

	SHG villages only	
	(1) SHG member	(2) Friend/family of SHG president
Field day	-0.025	-0.023
	(0.116)	(0.099)
Interaction with Field day	0.147	0.204*
	(0.118)	(0.101)
Level term	0.032	-0.074
	(0.083)	(0.082)
Strata FE	Yes	Yes
Mean in non-field day villages	0.350	0.350
Number of Observations	445	445
R squared	0.057	0.052

▸ placebo exercise

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Summary / implications of findings

- Field days increase adoption of good technology by **40 percent**
  - $\rightarrow$ Learning is barrier to adoption of ag. technology
  - $\rightarrow$ Suggests need for intervention to enhance learning
- Village participation in selecting demonstrators has little effect
  - $\rightarrow$ Need other ways of optimizing selection (Beamen et al, 2015)
- To leverage social learning, improved extension models could add field day to increase sharing of info.

Regressions

	Buy:		
	(1) Any	(2) 5 KG	(3) 10 KG
Field day	0.184**	0.139**	0.045
	(0.070)	(0.058)	(0.044)
Field day * SHG meeting	-0.125	-0.148	0.023
	(0.108)	(0.100)	(0.071)
Field day * Village meeting	-0.066	-0.020	-0.047
	(0.113)	(0.098)	(0.075)
SHG meeting	0.073	0.082	-0.009
	(0.082)	(0.073)	(0.042)
Village meeting	0.015	0.017	-0.002
	(0.078)	(0.055)	(0.058)
Mean in control villages	0.297	0.147	0.150
Mean in ward villages	0.357	0.185	0.172
Number of Observations	1384	1384	1384
R squared	0.046	0.035	0.015

back

Placebo in ward member and meeting villages

	(1)	(2)
Field day	0.145	0.142*
	(0.087)	(0.072)
Field day * HH has SHG member	0.004	
	(0.090)	
HH has SHG member	0.072	
	(0.054)	
Field day * Friend/family of SHG president		0.020
		(0.082)
Friend/family of SHG president		0.081
		(0.058)
Strata FE	Yes	Yes
Mean in control villages	0.273	0.273
Number of Observations	939	937
R squared	0.054	0.058

back