Interest-based Negotiation over Natural Resources: Experimental Evidence from Liberia

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- 2003: FAO estimates 120 mil hectares (2$\times$France) needed for food production
  Demand amplified by (expected) subsidies for biofuels and carbon storage
- **Demand concentrated** in developing countries, esp. Africa and Latin America:
  Liberia among the top 20 target countries (Nolte et al. 2016)
- **External investment** in natural resources presents an **opportunity**:
  increased productivity, market integration, formal employment, tax revenues

The World Bank's (2010) summary: "Instead of generating sustainable benefits, [many land investments] contributed to asset loss and **left local people worse off than they would have been without the investment**" (71).

Communities hosting investments report being worse off after these deals

- Negotiations focus narrowly on cash payments (e.g., surface rents)
- Payments do not compensate for lost farming and hunting/gathering, and do not offset rising prices and perceived rise in social ills (e.g., crime)

Socfin Oil Palm Concession

MALOA describes three phases:

1. **Excitement**: promises made, cash payments for land and crops
2. **Disgruntlement**: money is spent, land is gone, "realization of what has been lost"
3. **Fighting**: w/o farm income, tension builds; "A hungry man is an angry man."

(Baxter 2013: 57–9)

Two common negotiation mistakes:

1. (adversarially) maximize share along a single dimension
   $\rightsquigarrow$ not identifying options that advance both parties' interests

2. lose sight of the counterfactual (i.e., the alternative to an agreement)
   $\rightsquigarrow$ accepting deals inferior to just walking away

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Proposed correctives:

- UN Special Rapporteur: "**Negotiation capacity is vital.** And that capacity cannot be of governments alone. **Local communities must also be empowered** [...]"

- UN's HLPE on Food Security & Nutrition: "**It is vital to get a better balancing of the rights and interests of less powerful groups, in negotiation with government and investors.**"

1. **Does IBN training enable more effective negotiation?**
2. **What negotiating mistakes does IBN training correct?**

Interest-based Negotiation (IBN)

As a corrective, interest-based negotiation (IBN) stresses:

- focusing on interests and identifying positive-sum ("win-win") agreements
- preparation, assessing the best alternative to a negotiated agreement (BATNA)
- maintaining a positive relationship with one's counterpart

IBN (if successful) changes how trainees think about two questions:

1. What deals can I make? (Capacity to identify possible deals)
2. What happens if I walk away? (Appraisal of their outside option)

Trainees may (1) identify better options and/or (2) not agree to bad deals

Related Work

1. Training entrepreneurs (McKenzie et al. 2020)
   - Over $1 billion spent annually in low and middle income countries
   - Relational skills: "mind-set" or personal initiative skills
     (Campos et al. 2017; Dammert and Nansamba 2019; Ubfal et al. 2020)
     - Most (5/6) studies report statistically insignificant effects on profits
     - Meta-analysis finds 14% (marginally significant) improvement
   - Business skills: accounting, management, marketing
     (Dimitriadis and Koning 2020; Williams et al. 2020)
     - Again, most (11/17) cannot reject null of no change in profits
     - Meta-analysis finds 12% improvement

Related Work

1. Training entrepreneurs

2. Training negotiators
   - Negotiation training taught to more than 200k MBAs in the US and at over 16k business schools worldwide (Ashraf et al. 2020)

   But limited evidence:
   - Ashraf et al. (2020) find that IBN for 8th-grade girls in Zambia increases school attendance by 8–10%. Participating girls can better convey to parents that further education can be a "win-win"
   - Blattman et al. (2014) and Hartman et al. (2021) show that training in alternative dispute resolution — which involves elements of IBN — reduces violence
   - Other work on negotiation focuses on sellers' endowments, not skills (Hardy et al. 2021)

Intervention

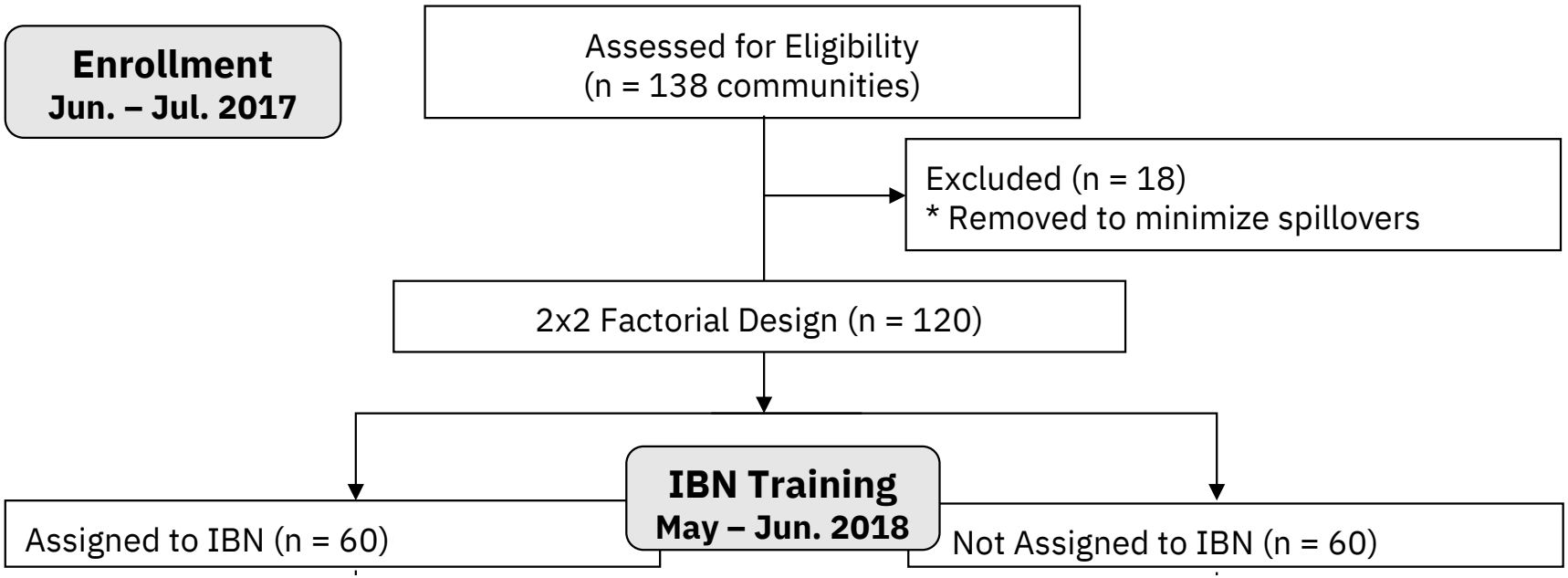
Intensive 12-hour training based on courses offered in MBA/MPP programs

Curriculum:

1. **Preparing to Negotiate**
   - Determine your interests
   - Identify other stakeholders' interests
   - Define your best alternative (BATNA)
2. **Identifying and Assessing Possible Agreements**
   - Identify potential agreements
   - Enlist friends, identify difficult people
   - Evaluate potential agreements
3. Building and Maintaining a Positive Relationship
   - Be honest and persuasive
   - Build a positive relationship

- Trainer to student ratio: 12:1
- Language and examples tailored to local context

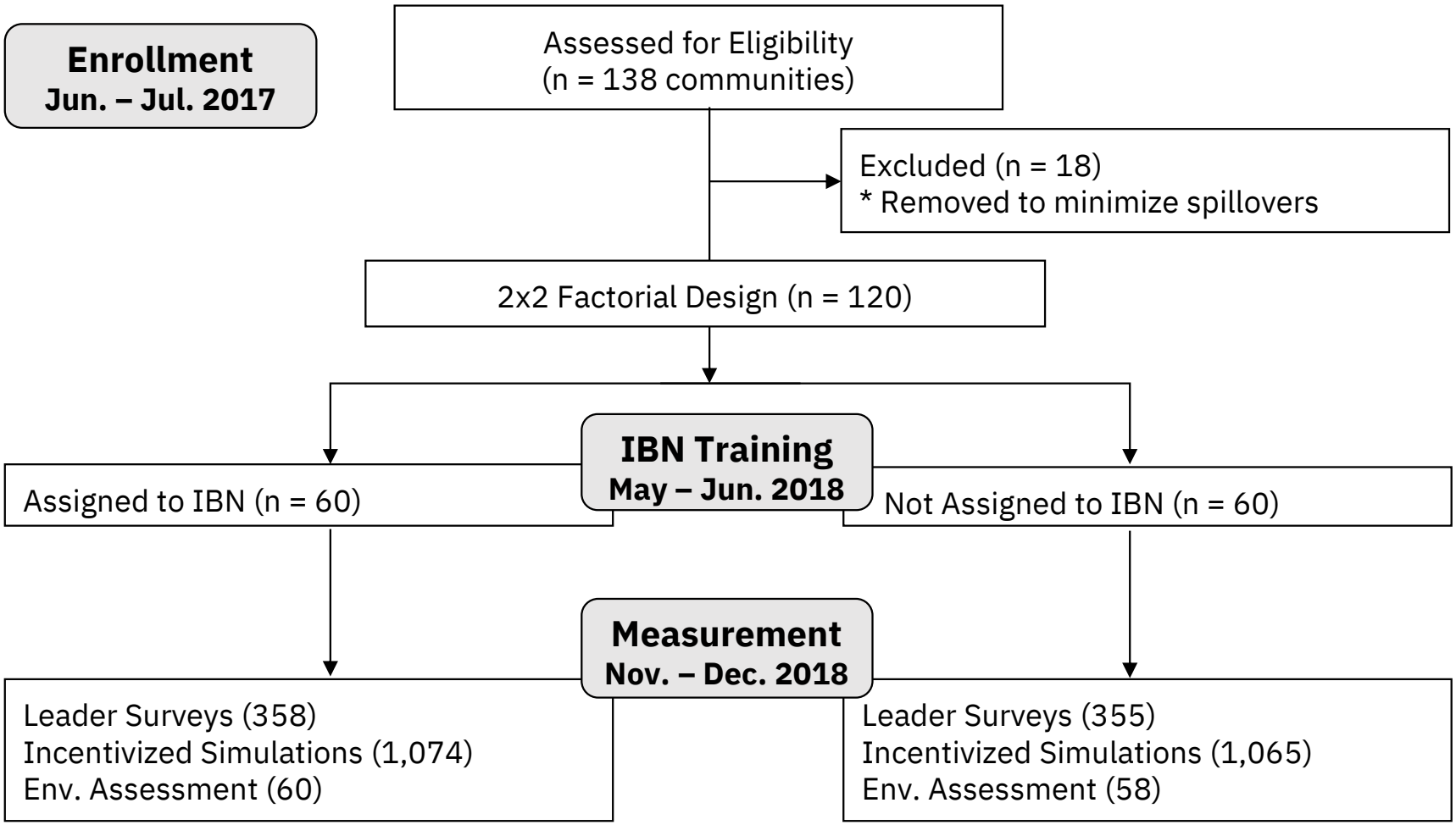
Research Design



Lacking baseline data...

- Use ancillary data (e.g., climate, road access, forest loss) to ensure that candidate randomizations satisfy balance criterion (Bruhn and McKenzie 2009)
- Check that treatment-invariant characteristics (e.g., age, gender, education, position) do not predict assignment (p-value from omnibus test > 0.3)

Research Design



Sampling

Goals:

1. target individuals who could represent the community in negotiations
2. achieve some gender diversity among participants

In **program** communities:

- Trainees recruited from the following roles: Town Chief, Women's Leader, Midwife, Youth Leader, Chief Elder, Landlord, Hunter Leader, or Teacher

In **control** communities:

- Respondents recruited from the same community roles

Position	Control	IBN
Town Chief	16%	17%
Women's Leader	16%	16%
Midwife	17%	16%
Youth Leader	16%	15%
Chief Elder	17%	18%
Landlord	15%	16%
	97%	98%

Measurement

Instruments:

1. Trainee surveys (713)
2. Environmental assessments (118)
3. **Incentivized simulations** (2,139)

All measured **6 months after training**

Measurement

Negotiation Simulations:

- Comprehension check
- Max of 10 mins. with reminder: "you can always walk away"
- Simulation order was randomized

Example Simulation

Script:

You own property that is 4 lots in total. 1 of those lots is not good for farming. There is a rocky hill on this lot where nothing grows. You make 100 USD per year growing crops on the part of the property you can use for farming.

Gbarnga Telecom Company (GTC) has been leasing land to construct new cell phone towers to improve their network coverage. A cell phone tower takes up one lot. GTC approaches you about leasing your land to build a new tower. You agree to meet with them to discuss this situation.

If you can reach an agreement that leaves you better off, you will earn a small bonus. You have 10 mins. You can always walk away from a bad deal.

Enumerator's (Buyer's) Instructions:

- Never offer more than $60 USD for the lease.
- You only need 1 lot and will pay $60 USD for that 1 lot.
- You do not offer information about your needs unless directly asked.

Example Simulation

Script:

> *You own property that is 4 lots in total. 1 of those lots is not good for farming. There is a rocky hill on this lot where nothing grows. You make 100 USD per year growing crops on the part of the property you can use for farming.*
>
> *Gbarnga Telecom Company (GTC) has been leasing land to construct new cell phone towers to improve their network coverage. A cell phone tower takes up one lot. GTC approaches you about leasing your land to build a new tower. You agree to meet with them to discuss this situation.*
>
> *If you can reach an agreement that leaves you better off, you will earn a small bonus. You have 10 mins. You can always walk away from a bad deal.*

- Max Loss: $-\$40$ = Lease payment $-$ BATNA
- Max Gain: \$160 = Lease payment $+$ \$100 in crop sales
- Enumerators also record whether respondent asked questions (e.g., uncovering that the telecom only needs one lot) and/or displayed anger

Estimation and Inference

Centered-interaction specification per Lin (2013):

$$
\begin{aligned}
Y_{sibc} = \alpha + \overbrace{\beta}^{\text{ATE}} \mathbb{1}(\text{IBN})_{bc} & \\
+ \phi_1 \tilde{\mathbb{1}}(\text{CM})_{bc} + \phi_2 \mathbb{1}(\text{IBN})_{bc} \times \tilde{\mathbb{1}}(\text{CM})_{bc} & \quad \text{(Crossed Treatment)} \\
+ \sum_{b=1}^{B-1} [\phi_{3b} \tilde{\mathbb{1}}_b + \phi_{4b} \mathbb{1}(\text{IBN})_{bc} \times \tilde{\mathbb{1}}_b] & \quad \text{(Block FEs)} \\
+ \sum_{s=1}^{2} [\phi_{5s} \tilde{\mathbb{1}}_s + \phi_{6s} \mathbb{1}(\text{IBN})_{bc} \times \tilde{\mathbb{1}}_s] & \quad \text{(Simulation FEs)} \\
+ \sum_{k}^{K} [\phi_{7k} \tilde{X}_{k,ibc} + \phi_{8k} \mathbb{1}(\text{IBN}) \times \tilde{X}_{k,ibc}] + \varepsilon_{sibc} & \quad \text{(Covariates)}
\end{aligned}
$$

- Y_{sibc}: outcome for simulation s for individual i in block b and community c
- $\mathbf{X}_{ibc}$: education, age, gender, position, $\mathbb{1}$(pf first), and enumerator
- Standard errors clustered on community, which is unit of randomization

$\star$ Pre-specified and registered with EGAP

1. **Does IBN training enable more effective negotiation?**
2. What negotiating mistakes does IBN training correct?

Knowledge and Deployment of IBN Skills

Outcome	ATE	Std. Error	p	N
MNP: Manipulation Checks*	11.637	(0.252)	0.00	705
Attended Negotiation Training$^\circ$	0.916	(0.021)	0.00	705
H1: Knowledge of Negotiation Skills*	0.335	(0.068)	0.00	705
Correctly Defines IBN$^\circ$	0.128	(0.031)	0.00	705
Recognizes Potential for Win-Win$^\circ$	0.125	(0.035)	0.00	705
H2: Knowledge of Inter-personal Skills*	-0.082	(0.076)	0.28	705
H3: Deployment of IBN Skills*	0.214	(0.084)	0.01	705
H4: Deployment of Inter-personal Skills	0.025	(0.014)	0.06	2115

$*$: Mean-effects index; $\circ$: Selected components of mean-effects index.

$+$ Excellent treatment compliance

$+$ Improvements in knowledge and deployment of IBN skills (0.2–0.3 SDs)

$\sim$ No/negligible change in inter-personal skills

Success Negotiating

In control:

- 27% of individuals have a negative average surplus
- 47% of individuals do not earn a positive surplus in *any* simulation

Outcome	ATE	Std. Error	p	N
H5: Positive Surplus	0.060	(0.023)	0.01	2115
H6: Total Surplus	2.742	(1.472)	0.07	2115

+ 6 p.p. (27%) increase in probability of achieving a positive surplus
+ $2.74 (42%) increase total surplus

Success Negotiating

Higher surplus could simply reflect more trainees walking away (extensive margin).

Also estimate the effect of agreeing conditional on treatment (intensive margin):

$$\text{Surplus}_{sibc} = \alpha + \beta_1 \mathbb{1}(\text{IBN})_{bc} + \beta_2 \mathbb{1}(\text{Agree})_{sibc} + \underbrace{\beta_3}_{\text{QOI}} \mathbb{1}(\text{IBN})_{bc} \times \mathbb{1}(\text{Agree})_{sibc} + [\ldots] + \varepsilon_{sibc}$$

Outcome		Std. Error	p	N
Effect of IBN on Agreement*	0.072	(0.03)	0.02	2115
H7: Differential Effect of Agreement on Surplus for Trainees	4.845	(2.41)	0.05	2115

$\star$: not pre-registered given theoretical ambiguity

+ Conditional on agreeing, trainees' surplus is \$4.85 (37%) larger than the average surplus of control individuals who also reach agreements
- Treatment does not affect the types of people who reach agreements in terms of gender, age, education, or position.

Effects on Community Forest Use at Endline

Outcome	ATE	Std. Error	p	N
Forest Use by External Actors*	-0.265	(0.135)	0.052	705
External Forest Use (EA)$^\circ$	-0.455	(0.284)	0.115	693
Benefits from External Forest Use*	0.054	(0.136)	0.691	705
Engagement around Forest Use				
Neighbors Consulted about Forest in Last Week	0.850	(0.497)	0.090	677
Rule in Community against Logging w/o Permission	0.091	(0.029)	0.002	703
Preferences around Forest Use				
Does *Not* Want to Reduce Logging Activity	0.031	(0.020)	0.136	705
Price Demanded to Clear Forest (logged)	0.151	(0.264)	0.568	705

Exploratory analysis. $*$: Mean-effects index; $\circ$: Selected components of mean-effects index.

- Reduction in external forest use
  (back-of-the-envelope: $\sim$\$6k per community in conserved timber)
- No change in associated material benefits
- Increased engagement around and regulation of forest use
- Trainees not more opposed to logging...
  but say they would demand 15% more to clear their forest (not significant)

Within-Community Spillovers

We randomly sampled four households (non-trainees) in each community

Outcome	ATE	Std. Error	p	N
Benefits from External Forest Use*	0.073	(0.167)	0.662	476
Satisfaction with Leadership				
Overall satisfaction	-0.028	(0.040)	0.434	476
Satisfaction related to the community forest	-0.013	(0.033)	0.690	476

Exploratory analysis. $*$: Mean-effects index.

- Changes in material benefits from external forest use are similar to trainees
- No change in satisfaction with leadership:
  - In control communities, 10.5% of HHs report being unsatisfied with leadership
  - In communities with IBN trainees, 11.6% of HHs

1. Does IBN training enable more effective negotiation?
2. **What negotiating mistakes does IBN training correct?**

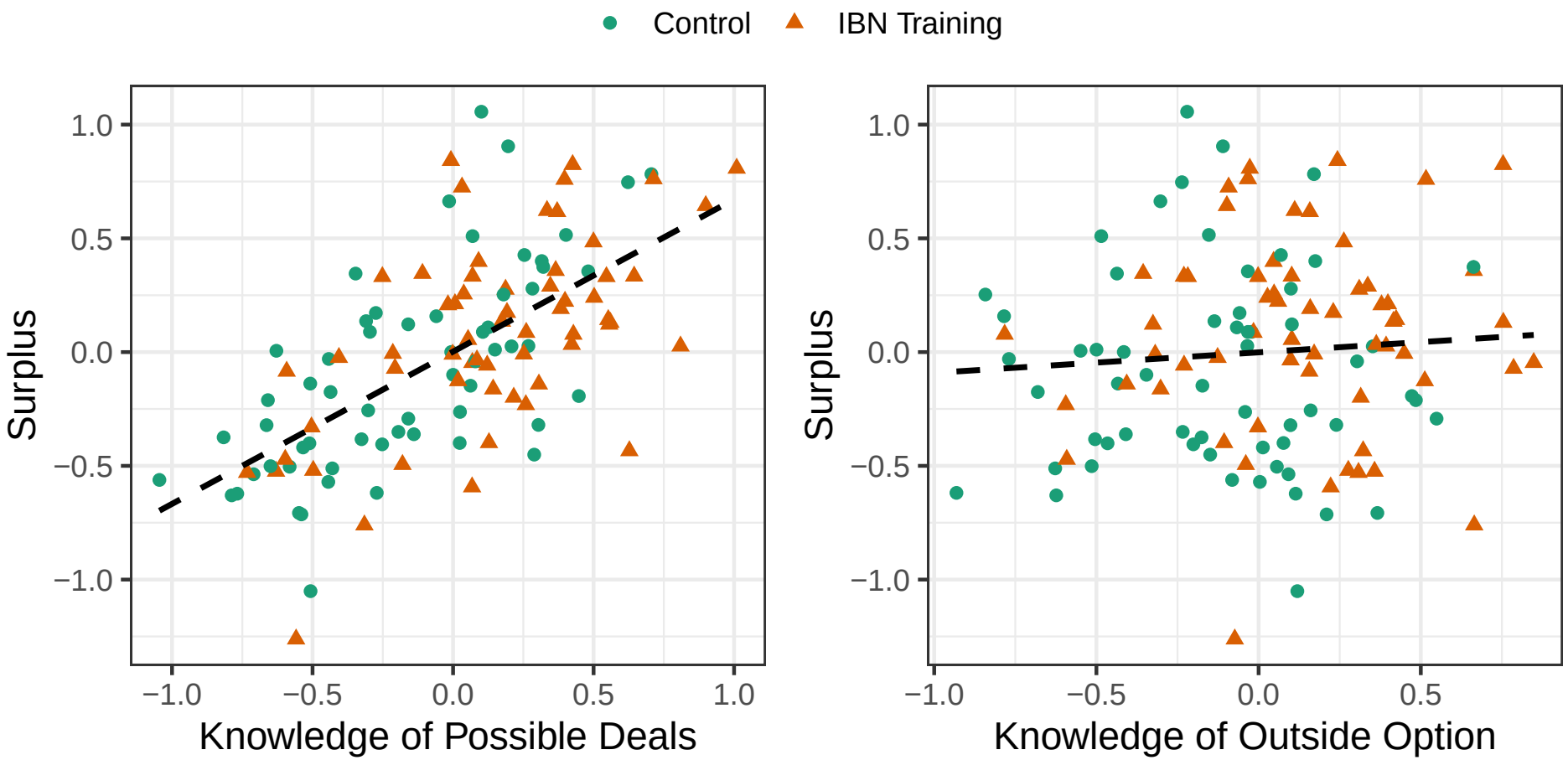
Measuring Capacity and Appraisal Skills

- Two questions IBN training addresses:
  1. What deals can I make? (Capacity to identify possible deals)
  2. What happens if I walk away? (Appraisal of one's outside option)

- Re-group variables to create two knowledge indexes:
  1. knowledge of possible deals (e.g., recognizing the potential for a win-win)
  2. knowledge of outside option (e.g., invoking one's bottom line)

Mediation

- Residualize using pre-specified covariates
- Compute community-level averages



Mediation

Mediation Analysis	Effect of IBN on Knowledge Indexes		
	Possible Deals	Outside Option	
	0.31	0.25	
	(0.07)	(0.06)	
	Indirect Effects of Knowledge Index on Surplus		Direct Effect
	0.15	0.02	-0.01
	(0.04)	(0.01)	(0.07)

- IBN training had a positive effect on both knowledge indexes: $\sim$0.3 SD
- Knowledge of possible deals mediates most (90%) of the total effect
  The indirect effect of the second index is many times smaller
- Increasing knowledge of outside option does not improve negotiation outcomes
  - because trainees cannot apply this knowledge when negotiating
  - because knowledge is noisily measured $\rightsquigarrow$ attenuation bias

Decision-theoretic Model

Setup:

- Let $D_i \in \{0, 1\}$ indicate whether an individual received the IBN training
- Individuals differ in the deals they can negotiate: $\theta_i(D_i) = \theta_i + D_i k$
  And vary in how they value the outside option: $\beta + u_i(D_i)$, where $u_i(D_i) \sim F_D(\cdot)$

Decision Rule:

- They agree to the negotiated deal iff the value exceeds their outside option:

$$\begin{aligned} \text{In the control group:} \quad & \theta_i \geq \beta + u_i(0) \\ \text{In the treated group:} \quad & \theta_i + k \geq \beta + u_i(1) \end{aligned}$$

- IBN training can affect their **capacity** to negotiate a better deal through k
  or it can affect their **appraisal** of their outside option through $u_i(D_i)$

Capacity

- $\theta_i(D_i)$ is the best deal an individual can negotiate, regardless of agreement
- We use the rules of the simulation (which we set) to determine the best deal a seller could have made given their negotiation tactics, even if they walk away
- k is the ATE on this outcome which we estimate using earlier specification

Appraisal

- Assume $u_i(D_i) \sim \mathcal{N}(-\delta_0 + \delta_1 D_i, \sigma^2)$
- Accepting a deal can be expressed with a latent-index model:

$$\text{Agree}_i = \mathbb{1}\left\{\theta_i(D_i) - \beta \geq \sigma u_i - \delta_0 + \delta_1 D_i\right\}$$

- We observe:
  - $\mathbb{1}$(Agree) — whether they agree
  - $\theta_i(D_i)$ — the best deal a seller could have made given their tactics
  - β — value of outside option conveyed in the simulation script
- We estimate δ_1 with a probit model
- $\widehat{\delta_1}$ will be positive if, when facing deals of equivalent value, trainees are less likely to agree and instead take their outside option

Structural Estimates

Mediation Analysis	Indirect Effects of Knowledge Index on Surplus		Direct Effect
	0.15 (0.04)	0.02 (0.01)	-0.01 (0.07)
Structural Estimates	**Effect of IBN on Model Parameters**		
	Capacity ($\widehat{k}$)	Appraisal ($\widehat{\delta_1}$)	
	3.49 (1.77)	-0.11 (0.08)	

- IBN training increases capacity, but has no significant effect on appraisal
- Reinforces our mediation analysis; this null finding on appraisal cannot be attributed to measurement error in the mediators
- Trainees can identify more valuable deals
  They are not *altogether* more choosy about the deals they accept

Structural Estimates

	Control Communities			$\widehat{\delta_1}$	
	N	Enagement	Influence		
Chiefs					
Men with Education	6	0.80	0.00	0.01	(0.31)
Men without Education	24	0.90	0.17	0.12	(0.23)
Women	3	-0.06	0.19	0.47	(1.35)
Youth Leaders					
Men with Education	19	1.74	0.04	0.12	(0.24)
Men without Education	11	-0.58	-0.16	-0.45	(0.40)
Womens Leaders					
Women	29	-1.18	-0.16	-0.15	(0.20)
Other					
Men without Education	2	-0.17	0.08		
Women	30	-1.31	-0.04	-0.14	(0.19)
All	184	0.00	0.00	-0.11	(0.08)

- Negative $\widehat{\delta_1}$ driven by sub-groups with low levels of engagement and influence
- Among chiefs and educated youth leaders, positive (if noisy) effects on appraisal
- IBN training improves appraisal among those making deals, which reconciles effects on our simulation-based and real-world outcomes

Conclusion

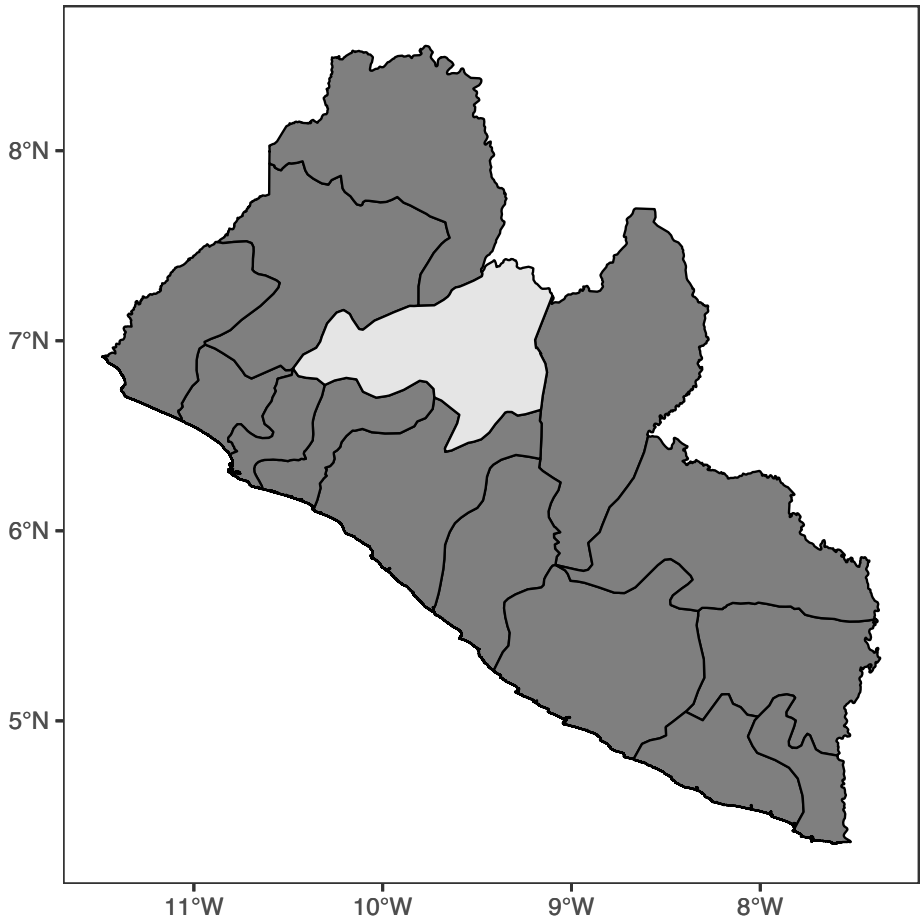
1. **Does IBN training enable more effective negotiation?**
   - 12-hour IBN introduces concepts that individuals recall and deploy 6 months later.
   - Trainees are 27% more likely to realize beneficial agreements.
     When they conclude deals, those agreements deliver a payoff that is 37% larger.
   - Exploratory analysis uncovers evidence of community-level changes:
     reductions in logging, increased regulation of forestland

2. **What negotiating mistakes does IBN training correct?**
   - Overall trainees' improvements attributable to improved capacity to identify valuable deals but not an ability to better appraisal their outside option
   - Noisy sub-group analysis suggests improvements in appraisal among those most engaged and influential in decision-making about natural resources

3. **How should the training be amended?**
   - $\exists$ win-win $\not\Rightarrow$ all deals are worth making

Appendix

Sample Map


8°N
7°N
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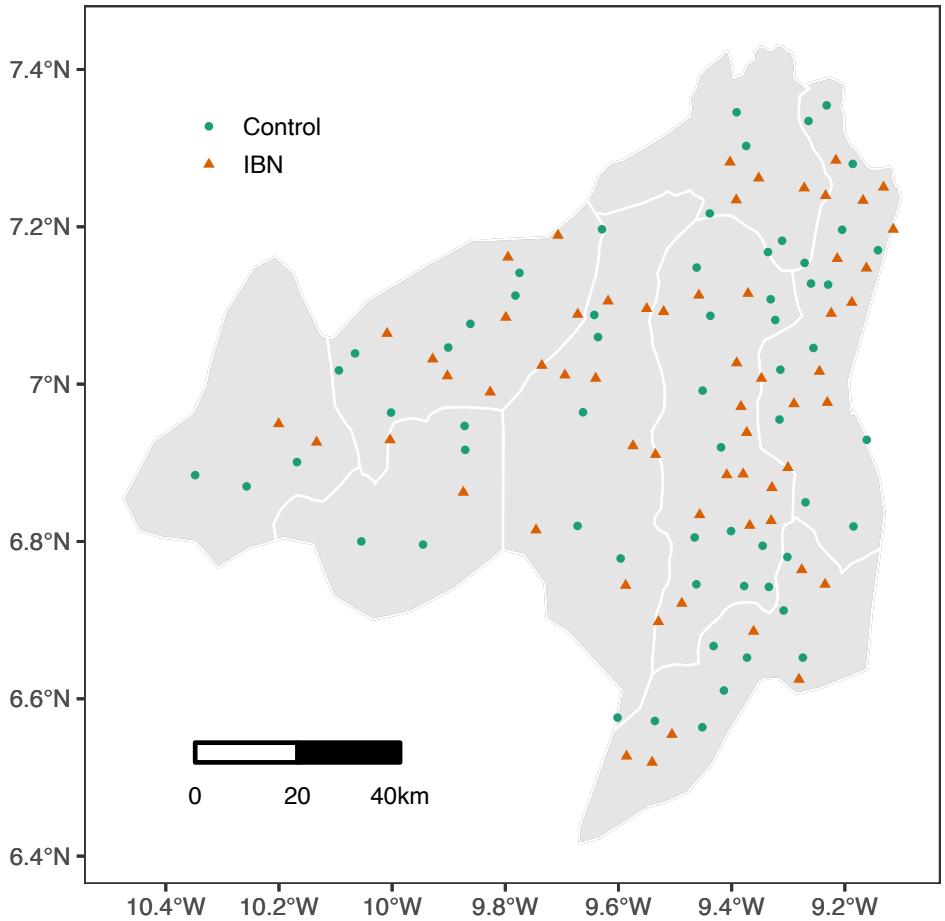
5°N
11°W
10°W
9°W
8°W


Control
IBN
0
20
40km
7.4°N
7.2°N
7°N
6.8°N
6.6°N
6.4°N
10.4°W
10.2°W
10°W
9.8°W
9.6°W
9.4°W
9.2°W

Community Characteristics (2008 Census)

Feature	Mean	Median	SD	Min	Max	Missing	N
Liberia							
Population	259.40	53.00	1177.74	1.00	41182.00	0	13365
Urban	0.04	0.00	0.19	0.00	1.00	0	13365
Under 18	0.46	0.48	0.12	0.00	1.00	0	13365
Literate	0.35	0.33	0.23	0.00	1.00	0	13365
No School	0.74	0.76	0.21	0.00	1.00	0	13365
Wealth Index	0.93	0.80	0.75	0.00	2.56	0	13365
Displaced by War	0.47	0.43	0.41	0.00	1.00	0	13365
Bong County							
Population	125.04	39.00	693.58	1.00	30380.00	0	2667
Urban	0.02	0.00	0.15	0.00	1.00	0	2667
Under 18	0.46	0.48	0.11	0.00	0.80	0	2667
Literate	0.27	0.24	0.20	0.00	1.00	0	2667
No School	0.82	0.86	0.18	0.00	1.00	0	2667
Wealth Index	0.76	0.60	0.67	0.00	2.56	0	2667
Displaced by War	0.37	0.13	0.41	0.00	1.00	0	2667
Study Sample							
Population	300.04	127.75	437.27	12.50	2639.00	0	120
Urban	0.05	0.00	0.21	0.00	1.00	0	120
Under 18	0.46	0.47	0.06	0.12	0.65	0	120
Literate	0.31	0.31	0.14	0.03	0.63	0	120
No School	0.78	0.80	0.14	0.48	1.00	0	120
Wealth Index	0.73	0.59	0.49	0.00	2.41	0	120
Displaced by War	0.36	0.25	0.34	0.00	1.00	0	120

Demographics

For Negotiation Sample:

Feature	Mean	Median	SD	Min	Max	Missing	N
Female	0.35	0	0.48	0	1	8	705
Age	52.23	52	14.15	19	99	8	705
Any Edu.	0.50	0	0.50	0	1	8	705
Any Sec. Edu.	0.28	0	0.45	0	1	8	705
Born in Community	0.81	1	0.39	0	1	8	705
Owns Land	0.55	1	0.50	0	1	8	705
Christian	0.99	1	0.08	0	1	16	697
Kpelle	0.89	1	0.31	0	1	8	705
Bassa	0.06	0	0.23	0	1	8	705

For Households in Sampled Communities:

Feature	Mean	Median	SD	Min	Max	Missing	N
Female	0.26	0	0.44	0	1	0	476
Age	43.35	42	12.43	18	85	0	476
Any Edu.	0.63	1	0.48	0	1	0	476
Any Sec. Edu.	0.34	0	0.47	0	1	0	476
Born in Community	0.79	1	0.41	0	1	0	476
Owns Land	0.45	0	0.50	0	1	0	476
Christian	0.99	1	0.08	0	1	9	467
Kpelle	0.88	1	0.32	0	1	0	476
Bassa	0.05	0	0.22	0	1	0	476

Balance

- We did not conduct a baseline survey.
- We use publicly available pre-treatment data to assess balance.

Measure	Control Mean	Control SD	IBN	Standard Error	p	N
Population 2012 (Landscan)	807.68	(1510.67)	-232.51	(207.08)	0.26	120
Nightlights 2013 (NOAA)	0.11	(0.69)	-0.09	(0.1)	0.37	120
Nightlights 2012 (NOAA)	0.07	(0.53)	-0.07	(0.07)	0.33	120
Elevation (Worldclim)	249.45	(55.09)	7.16	(6.46)	0.27	120
Precipitation (Worldclim)	2140.07	(151.07)	-30.25	(18.73)	0.11	120
Temperature (Worldclim)	254.20	(5.4)	-0.64	(0.46)	0.17	120
Forest Loss (Global Forest Change)	0.14	(0.03)	-0.01	(0.01)	0.23	120
Distance to Monrovia	160.02	(32.66)	4.07	(2.9)	0.16	120
Distance to Primary Road (LISGIS)	9.97	(7.96)	1.31	(1.19)	0.27	120
Distance to Any Road (LISGIS)	2.11	(2.72)	0.82	(0.48)	**0.09**	120
Longitude	-9.53	(0.31)	0.04	(0.02)	0.12	120
Latitude	6.96	(0.21)	0.01	(0.03)	0.59	120

Estimated using community-level data.

Full PAP Analysis

Outcome	ATE	Std. Error	p	N
MNP: Manipulation Checks				
Mean-effects Index	11.637	(0.252)	0.00	705
Attended Negotiation Training	0.916	(0.021)	0.00	705
Correctly Reports Length of Training	0.930	(0.02)	0.00	705
Correctly Reports Location of Training	0.926	(0.02)	0.00	705
H1: Knowledge of IBN				
Mean-effects Index	0.335	(0.068)	0.00	705
Correctly Defines IBN	0.128	(0.031)	0.00	705
Distinguishes Interest and Position	0.039	(0.038)	0.31	705
Count of IBN Concepts Invoked	0.105	(0.04)	0.01	705
Recognizes Potential for Win-Win	0.125	(0.035)	0.00	705
H2: Knowledge of Inter-personal Skills				
Mean-effects Index	-0.082	(0.076)	0.28	705
Count of Tactics Listed to Build a Positive Relationship	0.029	(0.059)	0.62	705
Acknowledges Importance of Positive Relationship	-0.078	(0.038)	0.04	705
H3: Deployment of IBN Skills				
Mean-effects Index	0.214	(0.084)	0.01	705
Count of IBN Skills Used in Peanut-Farmer Simulation	0.135	(0.071)	0.06	705
Count of Questions asked about Buyer	0.037	(0.058)	0.52	705
Count of Solutions Discovered in Woodbuyer Simulation	0.125	(0.046)	0.01	705
H4: Deployment of Inter-personal Skills				
Does Not Display Anger or Frustration	0.025	(0.014)	0.06	2115
H5: Positive Surplus				
Achieves Surplus Greater than Zero	0.060	(0.023)	0.01	2115
H6: Total Surplus				
Surplus Achieved	2.742	(1.472)	0.07	2115
H7: Moderated-Mediator				
Differential Effect of Agreement on Surplus for Trainees	4.845	(2.41)	0.05	2115

Standard errors clustered on community.

Control-group Levels

Outcome	Mean	SD	Min	Max	N
H1: Knowledge of IBN					
Correctly Defines IBN	0.67	0.47	0	1	186
Distinguishes Interest and Position	0.55	0.50	0	1	186
Count of IBN Concepts Invoked	0.58	0.50	0	1	186
Recognizes Potential for Win-Win	0.63	0.48	0	1	186
H2: Knowledge of Inter-personal Skills					
Count of Tactics Listed to Build a Positive Relationship	2.14	0.78	1	5	186
Acknowledges Importance of Positive Relationship	0.47	0.50	0	1	186
H3: Deployment of IBN Skills					
Count of IBN Skills Used in Peanut-Farmer Simulation	0.97	0.81	0	4	186
Count of Questions asked about Buyer	0.56	0.65	0	2	186
Count of Solutions Discovered in Woodbuyer Simulation	0.28	0.50	0	2	186
H4: Deployment of Inter-personal Skills					
Does Not Display Anger or Frustration	0.93	0.26	0	1	558
H5: Positive Surplus					
Achieves Surplus Greater than Zero	0.22	0.41	0	1	558
H6: Total Surplus					
Surplus Achieved	6.55	26.21	-50	60	558

Full PAP Analysis without Covariate Adjustment

Outcome	ATE	Std. Error	p	N
MNP: Manipulation Checks*	11.728	(0.267)	0.00	713
H1: Knowledge of IBN*	0.385	(0.076)	0.00	713
H2: Knowledge of Inter-personal Skills*	-0.073	(0.071)	0.31	713
H3: Deployment of IBN Skills*	0.267	(0.085)	0.00	713
H4: Deployment of Inter-personal Skills	0.032	(0.014)	0.02	2139
H5: Positive Surplus	0.068	(0.023)	0.00	2139
H6: Total Surplus	3.166	(1.472)	0.03	2139
H7: Moderated-Mediator	4.578	(2.283)	0.05	2139

$*$: Mean-effects index. Standard errors clustered on community. Models estimated without pre-specified covariate adjustment.

Spatial Spillovers

- Restrict attention to control communities
- Measure distance to nearest IBN community (mean = 6.2 km)
- Estimate $Y_{sic} = \alpha_s + \beta$ Distance to IBN $+ \varepsilon_{sic}$

Outcome	Estimate ($\widehat{\beta}$)	Std. Error	p	N*
H1: Knowledge of IBN*	-0.003	(0.016)	0.87	355
H2: Knowledge of Inter-personal Skills*	0.003	(0.015)	0.84	355
H3: Deployment of IBN Skills*	0.028	(0.022)	0.24	355
H4: Deployment of Inter-personal Skills	0.003	(0.002)	0.32	6,333
H5: Positive Surplus	0.003	(0.005)	0.60	6,333
H6: Total Surplus	0.066	(0.230)	0.78	6,333
Expl: Forest Use by External Actors	-0.011	(0.028)	0.71	351

* Mean-effects index. Standard errors clustered on community.
* Sample restricted to control communities.

HTEs for Women

Outcome	ATE	HTE	SE	p	N
H1: Knowledge of IBN*	0.329	0.051	(0.147)	0.73	705
H2: Knowledge of Inter-personal Skills*	-0.081	0.314	(0.157)	0.05	705
H3: Deployment of IBN Skills*	0.208	-0.320	(0.173)	0.07	705
H4: Deployment of Inter-personal Skills	0.027	-0.053	(0.031)	0.09	2115
H5: Positive Surplus	0.058	-0.021	(0.039)	0.58	2115
H6: Total Surplus	2.626	-1.111	(2.591)	0.67	2115

$*$: Mean-effects index. Standard errors clustered on community.
Covariates: Education, Age, Gender, Buyer, Seller, Peanut-first, Simulation.

HTEs for Above Primary Education

Outcome	ATE	HTE	SE	p	N
H1: Knowledge of IBN$*$	0.335	0.018	(0.176)	0.92	705
H2: Knowledge of Inter-personal Skills$*$	-0.082	0.021	(0.18)	0.91	705
H3: Deployment of IBN Skills$*$	0.214	-0.090	(0.247)	0.72	705
H4: Deployment of Inter-personal Skills	0.025	0.015	(0.036)	0.67	2115
H5: Positive Surplus	0.060	-0.032	(0.055)	0.57	2115
H6: Total Surplus	2.742	-1.004	(3.423)	0.77	2115

$*$: Mean-effects index. Standard errors clustered on community.

Control-group Levels for Community Forest Use

Outcome	Mean	SD	Min	Max	N
Index: External Forest Use	0.00	1.00	-0.61	6.09	184
External Forest Use (EA)	1.04	1.52	0.00	7.00	184
External Forest Use (SVY)	0.00	1.00	-0.17	9.57	182
External Forest Use beyond Community Forest (SVY)	0.00	1.00	-0.54	7.10	182
Pitsawing and Investment (SVY)	0.00	1.00	-0.26	7.28	182
Benefits from External Forest Use	0.00	1.00	-0.20	5.01	184
Rule cutting trees	0.84	0.37	0.00	1.00	182
Talked about community forest	2.15	7.00	0.00	60.00	175
Does Not Want to Reduce Logging Activity	0.93	0.26	0.00	1.00	186

Analysis of Remotely Sensed Deforestation

Measurement notes:

- No formal maps of the community forest exist
- We use a circular area centered on activities detected in the EA
- We chose the area based on the distances covered in the EAs (in control)

Outcome	ATE	Std. Error	p	N
Deforestation in CF (Area = 0.79 sq km.)	-16.011	(41.915)	0.703	120
Deforestation in CF (Area = 1.85 sq km.)	-16.607	(60.515)	0.784	120

Specification includes covariates for forest stock and pre-treatment deforestation.

- Outcome is the count of deforested pixels (30 m^2 / pixel)
- Control level in mid-sized buffer = 212 $\rightsquigarrow$ 7.5% reduction (not significant)

Lee Bounds

Age$^+$	Edu$^+$	Fem	N	Lower Bound	$\widehat{k}'$	Upper Bound
All	All	All	1,070	0.62	2.43	5.88

- $\widehat{k}'$: difference in means between IBN and control individuals who reach agreements
- Lee (2009) bounds:
  1. Assume that treatment increases the rate of agreement (monotonicity)
  2. Estimate effect of treatment on the probability of agreement, q
  3. Remove share q from top and bottom of treatment group distribution and re-estimate

  Intuition: suppose the share who agree due to treatment have the best and worst observed outcomes, and then remove these observations to construct bounds