Appendix for online publication

A Program, curriculum, and budget details

This section details the nature, content, and cost of the program. Table A.1 reports statistics on program attendance and choices.

Table A.1: Program attendance, performance and choices

	Sample		
Program choice or outcome	Men assigned to treatment	Men assigned to treatment who attended	Men assigned to treatment who graduated
Attended >1 day of training	74%		
# training days completed	83.74	113.03	117.63
Graduated	69%	94%	
Migrated since baseline	48%	46%	46%
Received part 1 of package	65%	88%	93%
Received part 2 of package	34%	46%	49%
Chose vegetable package			60%
Chose poultry or pigs package			28%
Chose rubber package			7%
Chose other package			5%
% that received both packages:			
Chose vegetable			67%
Chose poultry or pigs			7%
Chose rubber			70%
Chose other			48%
Sold part of packages			5%
Observations	586	433	407

A.1 Agricultural training curriculum

The syllabus for the Bong site (called the Tumutu Agricultural Training Program) has 5 major modules. The learning objectives and outcomes for each module is as follows:

1. Rice production (72 hours). After participating in all the module-training activities (both theory and practical sessions) the trainee is expected to gain broader knowledge

on the growth and development of the rice plant and the use of sustainable agricultural methods in rice production, and link rice production to household/national food security and markets for sustainable livelihoods. At the end of the six month training in rice production, the trainee should be able to:

(a) Understand and be able to produce upland and lowland rice

(b) Gain a broader knowledge of the importance of proper management of natural resources (soil and water) and the environment for sustainable rice farming

(c) Develop swamp beds for rice production

(d) Identify sources/types/quality of rice seed and the advantages of using high quality seed adapted to the local conditions

(e) Lay out, establish, and maintain a nursery

(f) Understand and implement techniques for transplanting/planting of rice seed

(g) Understand the different growth stages in rice development

(h) Maintain a rice field ensuring sustainable management of soil nutrients and optimum conditions for rice growth

(i) Develop capacity to identify diseases and pests and to implement the necessary control and or treatment measures

(j) Understand techniques for sustainable and profitable harvesting, processing, and storage of rice

(k) Understand the importance of markets in rice production systems

2. Rubber culture (72 hours). After participating in all the module-training activities (both theory and practical sessions) the trainee is expected to develop broader knowledge on sustainable rubber production through the use of sustainable agricultural methods and develop capacity to practice rubber farming and/or gain skills for

employment in the rubber industry for sustainable livelihoods. At the end of the six month training in rubber production, the trainee should be able to:

(a) Understand the importance of rubber in Liberia

(b) Techniques for bark maintenance, tapping, and latex collection

(c) Develop capacity to establish and maintain a nursery

(d) Prepare pre-germination beds

(e) Establish bud wood garden

(f) Develop techniques for budding

(g) Conduct tasking, paneling, furnishing and opening

(h) Develop sustainable tapping systems and methods

(i) Prepare and apply solution (Latex, Coagulum and Cup – Lump)

(j) Develop capacity for quality control in rubber production

(k) Understand disease and pest management in rubber production

(l) Maintain production equipment

(m) Develop skills for plantation management, product storage, marketing and post harvest management

3. Vegetable Production (72 hours). After participating in all the vegetable production module-training activities (both theory and practical sessions) the trainee is expected to develop broader knowledge on small-scale vegetable production through the use of sustainable agricultural methods and locally available resources and develop capacity to practice vegetable farming for household consumption and produce a surplus for market-ing thereby securing livelihoods income. At the end of the six month training in rubber production, the trainee should be able to:

(a) Understand the importance of vegetable production for household and national food security

(b) Understand and classify types of vegetables

(c) Develop knowledge on the proper usage and maintenance of tools in vegetable production

(d) Understand the importance of and operate records in vegetable production

(e) Understand the factors considered for vegetable production site selection and prepare selected land sites for production

(f) Establish and maintain a vegetable nursery

(g) Implement different vegetable production systems

(h) Develop capacity for sustainable disease and pest management

(i) Understand the benefits of organic manuring for sustainable natural resource management and food quality

(j) Understand compost making and manure selection and application

(k) Understand and develop capacity to harvest different types of vegetables including quality control and storage

(l) Understand the importance of markets in vegetable production.

4. Tree crops/oil palm (106 hours). After participating in all the tree crops production module-training activities (both theory and practical sessions) the trainee is expected to gain broader knowledge on how to grow oil palms through the use of sustainable agricultural methods and develop capacity to practice oil palm farming as a cash crop and be in a position to generate an income for long-term sustainable livelihoods. At the end of the six month training in oil palm farming, the trainee will be expected to:

(a) Understand the importance of oil palm as a cash crop

(b) Understand the required soil and climatic conditions

(c) Be able to select varieties best suited for their communities

(d) Lay out paths and nursery beds and put up shelters in the nursery

(e) Understand factors determining plantation site selection

(f) Carry out pegging of the plantation pattern, planting out the oil palm seedlings and fencing around the seedlings

(g) Learn how to maintain an oil palm plantation (e.g. cultivation, trimming the plants, soil nutrient and water management)

(h) Implement sustainable pest and disease management practices

(i) Understand methods of and be able to implement oil palm harvesting, processing and storage

(j) Understand the importance of markets in oil palm production and develop capacity to access and derive benefits from the market.

5. Animal husbandry (78 hours for poultry, 89 for pigs, and 55 for rabbits). The training module is designed for beginners to provide fundamental theory of tools, materials and work practices in animal production (poultry, rabbitory and piggery). After participating in all the animal husbandry production module-training activities (both theory and practical sessions) the trainee is expected to gain broader knowledge on how to keep poultry, rabbits and pigs for household food security and to be in a position to generate an income through this activity for sustainable livelihoods. At the end of the training in animal husbandry, the trainee will be expected to:

(a) Develop basic skills for poultry, rabbitory and piggery production

(b) Be able to construct required housing for poultry, rabbits and pigs through the sustainable use of locally available resources

(c) Understand the breeding and reproductive systems and requirements of poultry, rabbits and pigs and the methods used to enhance quality of breeds

(d) Develop capacity to implement disease and parasite prevention and treatment and control in poultry, pig and rabbit production

(e) Develop capacity for animal slaughter (poultry, rabbits and pigs) with an emphasis on animal welfare, quality control and hygienic standards including preservation methods

(f) Understand the importance of markets in poultry, pig and rabbit production and strengthen skills to compete profitably

A.2 Life skills curriculum

For the life skills class and on-site counseling, AoAV contracted members of the Network for Empowerment and Progressive Initiative (NEPI), a local non-profit organization. NEPI had developed and implemented previous programs in Liberia with war-affected youth and AoAV used and adapted their curriculum for this program. The stated goal was to transform the lives of participants so they may become more productive members of society. More broadly, the class and counseling is designed to help the war affected improve their coping mechanisms to trauma; and foster relationships between and amongst former fighters, conflicting parties, varying socioeconomic groups, and tribal factions; and promote peace and reconciliation principles as tools to effectively build, strengthen, and promote positive social change within communities. NEPI trainers and facilitators are largely former combatants themselves who perform social work and other social services for war-affected youth. These counsellors serve as the participants' strongest positive role models. The curriculum itself has 17 major modules:

1. Effective communication (Definition; Types; Barriers; Ways of Improving; Listening Skills)

2. Perception and role reversal (Definition; Case Study; The Way Forward)

3. Understanding conflict (Definition; Types; Causes; Effects; Tools for Conflict Management; Tools for Conflict Resolution)

4. Conflict analysis and transformation (Definition; Strategies; History; People; Tools for Conflict Analysis & Transformation)

5. Violence and its cycle (Definition; Types; Causes; Effects; Breaking the Cycle of Violence)

6. Understanding trauma and substance abuse (Effects of Trauma; Definition; Types, Causes and Effects; The Way Forward)

7. Post-traumatic stress disorder (Definition; Causes; Symptoms and Signs; Developing Coping Mechanism)

8. Career counseling (Definition; Types; Importance of Career; Career Selection; Two aspects of Career; Principles for Effective Career)

9. Self image and recovery (Definition; Types; The Building Process)

10. Early warning and early response (Definition, Group Discussion. Mechanism for Prevention & Transformation, The Way Forward

11. Community outlook (Definition; Structure; Norms; Realization & Transformation; Reintegration)

12. Community initiatives and development (Definition; Types; Ownership and Sustainability)

13. Peace building - Levels and approaches (Definition; Role of a Peace Builder; Peace Keeping; Peace Making; Peace Building)

14. Challenges of reconciliation (What is Reconciliation?; Steps to Reconciliation; Religious & Traditional Perspectives of Reconciliation; Dilemmas of Reconciliation; Sustaining Reconciliation Work)

15. Leadership styles and skills (What is leadership?; Why is it important?; Can Leadership be Learned?; Best Leader/Role model; Characteristic of Admired Leadership; Your Leadership Strengths; Seven Critical Leadership Skills; Approaches to Decision Making)

16. General review

17. Re-entry strategies (Identifying communities for the purpose of possible re-insertion of trained participants; Confidence building meetings with community leadership; Linking participants to host communities)

A.3 Example of program budget

Table A.2 reports the budget AoAV submitted (via the UNDP) to the UN Peacebuilding Fund in 2008 to funding two training courses of 400 students each at the Bong training site. The first cycle was the focus of the evaluation. Figures reflect the high cost of any operations and supplies in Liberia, as with many post-conflict regions.

Table A.2: Sample budget from Bong course site

	Cost in USD (2 courses, 800 beneficiaries)	
Expense category	Total	Per beneficiary
Personnel		
National and international staff	300,000	375
Subcontractors (counselors/life skills trainers)	10,000	13
Course costs		
Course equipment	100,000	125
Food and medical supplies	140,000	175
Other course costs	50,000	63
Reintegration packages	100,000	125
Operations expenses		
Transport, fuel and maintenance	140,000	175
Travel	50,000	63
Office, utilities and communications	110,000	138
Headquarters support	21,000	26
Sub-total	1,021,000	1,276
UNDP fee	73,500	92
Contribution to randomized evaluation	50,000	63
Total	1,144,500	1,431

B Further details on empirical strategy

B.1 Baseline covariates and balance

Table B.1 displays summary statistics for the 83 baseline covariates used in the treatment effects regressions along with baseline tests of balance. The first column reports the mean among all men, and the second column for women. Women are different in several respects: they are younger and less likely to be married or partnered—an uncommon situation for adult women in Liberia. A quarter admits to sex work, but qualitatively our sense is that this is much higher. Very few are ex-combatants and aggression is low.

The third and fourth columns display the mean difference between control and treatment men, based on an OLS regression of each baseline covariate on an indicator for treatment assignment, controlling for block fixed effects only (with standard errors clustered at the

village level). 6 of the 83 covariates (7%) have a p-value less than 0.10, which is no more than would be expected at random.

Two of the 83 baseline covariates do show significant imbalance: savings and months spent in a faction. A joint test of significance of all 83 baseline covariates has a p-value of .41 excluding these two covariates, but is <.01 including them. Other variables related to wealth, debts, armed group activity, and violence have little association with treatment.

Table B.1: Baseline descriptive statistics and test of randomization balance

	Means		Balance test (men only)	
Baseline covariate	All men (n=1123)	All women (n=151)	Difference (Control - Treatment)	p-value
Missing baseline data	0.01	0.07	-0.00	0.54
Age	30.28	26.17	-0.62	0.26
Muslim	0.15	0.13	-0.00	0.97
Gola tribe	0.05	0.07	-0.01	0.38
Kpelle tribe	0.34	0.38	0.01	0.80
Kru tribe	0.09	0.02	0.00	0.75
Mano tribe	0.11	0.18	0.01	0.60
Sapo tribe	0.11	0.01	-0.01	0.54
Lives with spouse/partner	0.71	0.51	-0.03	0.22
Number of children	2.34	1.68	-0.21	0.15
Currently pregnant		0.04		
Disabled	0.06	0.05	0.00	0.89
Injured	0.23	0.20	-0.02	0.39
Seriously ill	0.14	0.21	0.01	0.52
# days drank alcohol in the past week	1.00	0.37	-0.09	0.38
Index of risk seeking (0-3)	0.33	0.33	0.04	0.37
Index of patience (0-4)	2.96	3.17	0.01	0.83
Said would attend program if selected	0.99	0.99	0.00	0.62
Index of wealth (z-score)	0.01	-0.38	-0.01	0.91
Monthly cash earnings (USD)	47.42	29.33	-4.19	0.33
Stock of savings (USD)	45.79	17.70	-13.07	0.02
Saves monthly	0.25	0.16	-0.01	0.75
Debt stock (USD)	7.45	2.83	-0.57	0.59
Main income source:				
Farming and animal-raising	0.32	0.24	0.04	0.21
Non-agricultural labor or business	0.29	0.58	-0.03	0.36
Sale of hunted meat	0.04	0.02	0.01	0.46
Potentially illicit activities	0.33	0.03	0.00	0.94
Firewood/charcoal sales	0.02	0.01	0.01	0.24
Mining	0.11	0.01	-0.01	0.53

	Means		Balance test (men only)	
Baseline covariate	All men (n=1123)	All women (n=151)	Difference (Control - Treatment)	p-value
Rubber	0.12	0.00	-0.00	0.89
Other	0.08	0.14	-0.01	0.76
Days of employment in past week	5.97	4.64	-0.11	0.30
Farming and animal-raising	2.75	1.63	-0.11	0.50
Skilled work	1.12	0.40	0.00	1.00
Petty business	1.03	1.87	-0.07	0.51
Casual work	2.16	0.83	-0.16	0.28
Rubber tapping	0.48	0.00	-0.03	0.72
Mining	0.63	0.03	-0.06	0.56
Logging	0.32	0.03	-0.01	0.90
Hunting	0.59	0.19	-0.09	0.25
Other	1.26	0.49	0.01	0.95
Any illicit activities in past week	0.32	0.03	0.01	0.70
Engaged in paid sex in past year		0.25		
Very interested in farming in the future	0.87	0.81	-0.01	0.56
Prefers ag. training to other skills	0.28	0.25	-0.01	0.68
Can access 10 acres farmland	0.90	0.91	0.03	0.21
Months of agricultural training	0.56	0.11	-0.00	0.99
# Years has raised animals	2.91	1.81	-0.26	0.36
# Years has farmed	4.76	1.79	-0.13	0.75
Times has sold crops	6.50	3.27	-0.32	0.71
Largest land ever farmed (acres)	20.50	16.85	-0.75	0.44
Educational attainment	5.88	3.77	0.21	0.36
Has very basic literacy	0.44	0.34	-0.02	0.49
Literate	0.27	0.12	0.03	0.31
Math questions correct (0-5)	2.33	1.50	0.19	0.04
Total months of training (including agricultural training)	3.02	1.74	0.01	0.99
Distress symptoms (0-3)	1.16	1.36	0.02	0.54
Post-traumatic stress symptoms (0-3)	0.93	1.13	0.05	0.11
Index of family relations (0-18)	13.59	11.93	0.27	0.17
Index of aggressive behaviors (0-12)	1.29	1.71	0.12	0.25
Dispute with authorities in past year	0.05	0.03	-0.01	0.34
Dispute with neighbor in past year	0.14	0.26	-0.01	0.67
Reports a physical fight in the past year	0.09	0.09	0.00	0.90
Fought with weapons in the past year	0.02	0.01	0.00	0.64
Ex-combatant	0.74	0.13	-0.01	0.83
Was on front lines of battle	0.17	0.05	-0.00	0.90
Months in a faction	27.4	6.95	5.73	0.00
Violent acts committed (0-3)	0.54	0.26	0.06	0.34
Violent acts experienced (0-9)	4.82	3.64	-0.01	0.94
Violent acts experienced by family (0-9)	4.64	4.68	0.02	0.82
Feels life better now than during war	0.98	0.99	0.02	0.05
Regrets wartime actions	0.56	0.36	0.08	0.01
Problems reintegrating with family	0.44	0.22	-0.13	0.06

	Means		Balance test (men only)	
Baseline covariate	All men (n=1123)	All women (n=151)	Difference (Control - Treatment)	p-value
Problems reintegrating with neighbors	0.36	0.15	-0.05	0.38
Faction caused trouble for own family	0.76	0.80	0.00	0.98
Faction caused trouble for hometown	0.95	1.06	-0.02	0.79
Faction caused trouble for current town	0.82	0.74	-0.08	0.26
Commander(s) gives support/jobs	0.05	0.02	-0.02	0.17
Has close relations with a commander	0.13	0.03	-0.01	0.62
Reports to a commander	0.02	0.01	-0.02	0.14
Index of ex-combatant relations (0-10)	5.48	3.11	0.03	0.84
Believes war will come again in Liberia	0.01	0.01	0.00	0.87
Would become fighter again	0.02	0.01	0.00	0.85
Would consider fighting in war elsewhere	0.01	0.01	-0.00	0.71

Notes: The third and fourth columns report the mean difference between the treatment and control groups, calculated using an OLS regression of baseline characteristics on an indicator for random program assignment plus block (village) fixed effects. USD variables are censored at the 99th percentile. Missing baseline data imputed at the median.

Estimating potential bias from imbalance. One way to assess potential bias from this imbalance is to use all available baseline covariates to predict the main outcomes. "Treatment effects" on these predicted outcomes can approximate the amount of bias we might expect from randomization imbalance. We report these results in Table B.3 for six major outcome families.

Table B.3: "Treatment effects" on predicted outcomes using baseline covariates

Outcome	Full sample	Non-attritors
Interest in agriculture index (z-score)	-0.013	-0.016
	[.014]	[.014]
Income index (z-score)	-0.018	-0.020
	[.020]	[.021]
Hours in potentially illicit activities	0.132	0.136
	[.310]	[.335]
Average weekly hours in legal activities	-0.277	-0.221
	[.464]	[.480]
Relationships with commanders (z-score)	-0.027	-0.023
	[.013]**	[.014]
Mobilization risk (z-score)	-0.005	-.008
	[.015]	[.015]

Notes: Each outcome is regressed on the baseline variables in Table 1 as well as randomization block dummies. Then the fitted value is regressed on assignment to treatment and strata dummies.

In general the treatment-control difference is small (e.g. $<.02$ standard deviations in agricultural interest or income). The sign is also such that the predicted bias leads us to underreport treatment effects. The exception is relationships with commanders, where the predicted bias is negative and statistically significant (probably because of the length of time in a faction variable). As we will see, we see only a weak negative treatment effect on relations with commanders, and already treated this decline with caution, concluding there is little evidence of an effect of treatment on this variable. These predicted bias results only bolster this conclusion.

B.2 Assessing potential bias from endline survey timing

Roughly two-thirds of the sample was found in the first 10 weeks. The remaining third took three months to track. To reduce bias from the timing of their survey, we first tracked a random half of the unfound, adding the second half after two months.

In principle, this long survey period could introduce bias if late respondents are systematically different and have seasonal or other time-varying outcome responses. For two reasons

this does not appear to be the case in our sample.

First, there is little difference between those found in the first 10 weeks and those who had migrated and hence took longer to survey and track, implying that timing of the survey is not too systematically selective. A test of balance between those found before and after 10 weeks (not shown, but available on request) shows that those found after 10 weeks were a year younger, were 15 percentage points less likely to be married, and were 2 percentage points less like to be an ex-combatant, but there is no statistically significant difference in baseline wealth, education, health, occupation, income, aggression, or war experiences.

Second, if we compare treatment effects between men found before and after the 10 weeks, or between the two random groups of unfound men, we see generally the same sign and magnitude of treatment effects. Results are not displayed but are available on request.

B.3 Attrition

Table B.4 presents results from an ordinary least squares (OLS) regression of attrition (being unfound) on treatment assignment, covariates, and block fixed effects.

Note that the program appears to have had only a small effect on migration at the time of the endline. 45% of both the treatment and control group changed villages since baseline, and 37% moved within the six months before the survey. The control group was slightly less likely to change their county than treated men: 14% of controls changed their county and this is 5.7 percentage points higher among treated men, perhaps because they chose to relocate to more central agricultural markets. 74% of control men also express an interest in staying in their current community and this settledness is 7.8 percentage points (11%) higher among treated men.

B.4 Compliance

Table B.4 analyzes the correlates of compliance (attending at least one day). Also, among those who attend at least one day, it analyzes the correlates of who quits or is dismissed.

Table B.4: Correlates of attrition, compliance, and package selection

	Dependent variable (and sample)			
	Unfound at endline (full sample)		Attended ≥1 day (if assigned to treatment)	
Baseline covariate	Coeff.	Std. Err.	Coeff.	Std. Err.
Assigned to treatment	-0.020	[.016]		
Age	0.000	[.002]	-0.006	[.004]
Lives with spouse/partner	0.000	[.023]	-0.090	[.036]**
Number of children	-0.006	[.004]	0.008	[.012]
Disabled, injured, or ill	-0.003	[.016]	-0.062	[.042]
Years of schooling	0.001	[.002]	-0.007	[.004]*
Said would attend if selected	0.114	[.057]**	0.007	[.190]
Durable assets (z-score)	0.000	[.010]	-0.002	[.017]
Stock of savings (USD)	0.000	[0000]	0.000	[0000]
Debt stock (USD)	-0.001	[0000]**	-0.003	[.001]***
Agricultural experience (z-score)	0.001	[.008]	0.068	[.020]***
Aggressive behaviors (0-12)	0.016	[.006]***	0.004	[.009]
Main income: Illicit resources	-0.006	[.020]	0.071	[.046]
Main income: Nonfarm work	0.026	[.021]	0.014	[.038]
Very interested in farming	0.012	[.022]	0.097	[.056]*
Ex-combatant	0.071	[.019]***	0.077	[.050]
Months in a faction	0.000	[0000]	0.000	[0000]
Ex-commander relations (z-score)	-0.017	[.010]*	-0.025	[.024]
Patience index (0-4)	-0.002	[.010]	-0.009	[.019]
Risk affinity index (0-3)	0.003	[.018]	-0.007	[.032]
Observations	1,123		586	
Dependent variable mean	0.077		0.422	
R-squared	0.11		0.15	

Notes: All columns are calculated via OLS regression with block fixed effects. Missing baseline data are imputed at the median. The F-test is on all covariates excluding block and region dummies. Robust standard errors are in brackets, clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1

B.5 Accounting for potential spillover effects

Hotspot communities were limited, and we could not randomize at the community level. It is possible there are unobserved spillover effects from the treatment group to controls.

For instance, the departure of a small number of high risk men from each community could reduce the local labor supply and increase wages for illicit work. It could also break down armed social networks and the power basis of local strongmen, or increase state and UN presence in the community, thus reducing the returns to illicit work. When the trainees return, agricultural knowledge could be passed to the control group, increasing their productivity. Or successful socialization could influence disutility from illicit labor through peer effects.

Accurate population figures do not exist, but we estimate treated men typically represent only 1 to 5% of the adult workforce in these villages. Also, roughly half of both the treatment and control group changed communities between baseline and endline. Moreover, while transport costs are high in Liberia, there is considerable migration by this population for work, especially in mining and local labor supply is highly elastic (implying that we should not be affected by the departure of a few men). As a result, we expect within-community spillovers to the control group to be minor. Finally, agricultural hours increase just 20% for a handful of men per community, and so general equilibrium effects of output on prices seem extremely unlikely.

Moreover, even if present, the spillovers discussed above should not lead us to overstate treatment effects. To the extent that the control group become more productive in agriculture, or are influenced by positive peer effects, our estimated treatment effects towards zero will understate the true program impacts on occupational choice. Any impact on illicit wages will affect the incentives for both treatment and control group members (although control group members would be more affected by an increase in w than someone who received inputs and training).

In principle, individuals who are not assigned to treatment may feel discouraged and

thus reduce the hours they devote to agriculture, but we see no such trend. Alternatively, returning farmers could have a negative impact on the control group by crowding them out of agriculture or if increased output lowered local prices, but qualitatively our assessment is that production was too small to affect local prices. We do not, however, have the data or identification to test this formally.

C A model of illegal occupational choice

C.1 Setup

The utility function $U(c, l, \sigma L^m)$ has the standard assumptions that $U_c^{'} \geq 0$, $U_l^{'} \geq 0$, $U_{\sigma L^m}^{'} \leq 0$ and $U_{cc}^{''} < 0$, $U_{ll}^{''} < 0$, $\partial^2 U / \partial L_m^2 \leq 0$.[39] The production function $F(\theta, L_t^a, X_{t-1})$ also follows standard assumptions that $F_\theta^{'} \geq 0$, $F_L^{'} \geq 0$, $F_X^{'} \geq 0$, $F_{\theta\theta}^{''} < 0$, $F_{LL}^{''} < 0$, $F_{XX}^{''} < 0$, and $F_{\theta L}^{''} \geq 0$, $F_{\theta X}^{''} \geq 0$, $F_{LX}^{''} \geq 0$.[40]

We begin by ignoring uncertainty and risk aversion. Then we introduce uncertainty in the form of prices, wages, and productivities following independent stochastic processes. Uncertainty in prices can reflect variation in general supply and market conditions, uncertainty in wages can reflect the fact that labor returns are typically conditional on output (e.g. a minimum wage plus a payment proportional to gold or diamonds discovered or battles won), and uncertainty in productivity is a simple way of capturing uncertainty in output due to weather and other unexpected shocks. We keep the assumption that input investment decisions are made one period ahead of production, however we add a new assumption that decision on hours in both sectors L_t^a and L_t^m are made at time $t-1$, one period before all

[39] Examples of utility functions that satisfy these assumptions are $U(c, l, \sigma L^m) = u(c, l) - \sigma L^m$ and $U(c, l, \sigma L^m) = u(c, l) - \sigma (L^m)^2$.

[40] For ease of analysis, we also assume that marginal product of labor in agriculture is zero when there is no input; but as long as there is some level of input, marginal product of labor for the first unit of labor will be infinity: $F_L^{'}(\theta, L^a, 0) \equiv 0$, but $\lim_{L^a \downarrow 0} F_L^{'}(\theta, L^a, X) = +\infty$ as long as $X > 0$. This assumption guarantees that as long as there is positive investment in inputs, hours in agricultural labor will be positive. We also assume that returns to inputs is non-negative but bounded above $0 \leq F_X^{'}(\theta, L^a, X) \leq \theta M$ (which is likely the case in agriculture production).

prices and productivity levels are realized.

C.2 Benchmark case: Perfect financial markets and no uncertainty

We begin with the case where there are no financial market imperfections. The person's problem is

$$\max_{c_t>0, 0\leq l_t\leq \bar{L}, X_t, L_t^m, L_t^a} \sum_{t=0}^{\infty} \delta^t \left[U(c_t, l_t, \sigma L_t^m)\right]$$

$$\begin{aligned} s.t.\ \ c_t + a_{t+1} + q_t X_t &= y_t + (1+r)a_t \quad for\ each\ t \\ a_0 &\qquad given \end{aligned}$$

where $y_t \equiv p_t F(\theta, L_t^a, X_{t-1}) + w_t L_t^m - \rho f L_{t-1}^m$ and $L_t^a + L_t^m + l_t \equiv \bar{L}$.

The first order conditions are as follows:

$$\frac{U_l'(t)}{U_c'(t)} = p_t F_{L^a}'(t) \quad if\ L_t^a > 0 \tag{1}$$

$$\frac{U_l'(t)}{U_c'(t)} - \sigma \frac{U_{\sigma L^m}'(t)}{U_c'(t)} = w_t - \frac{\rho f}{1+r} \qquad if\ L_t^m > 0 \tag{2}$$

$$\frac{U_c'(t)}{U_c'(t+1)} = \delta \frac{p_{t+1}}{q_t} F_X'(t+1) \quad if\ X_t > 0 \tag{3}$$

$$\frac{U_c'(t)}{U_c'(t+1)} = \delta(1+r) \tag{4}$$

$$c_t + a_{t+1} + q_t X_t = p_t F(\theta, L_t^a, X_{t-1}) + w_t L_t^m - \rho f L_{t-1}^m + (1+r)a_t \tag{5}$$

where for ease of notation we use $U(t)$ to denote $U(c_t, l_t, \sigma L_t^m)$ and $F(t)$ to denote $F(\theta, L_t^a, X_{t-1})$.

Occupational choice

To find the conditions for engaging in each sector, first consider the case where illicit activity is not feasible. In this case the decision to engage in agricultural production depends on his productivity θ, the output-input price ratio p_{t+1}/q_t, his wealth level and the returns on other financial assets r. We use c^{aa}, L^{aa} and X^{aa} to denote consumption, labor and input

choices in this scenario. In each period t the person chooses L_t^{aa} to satisfy $\frac{U_l^{'}(c_t^{aa},\bar{L}-L_t^{aa},0)}{U_c^{'}(c_t^{aa},\bar{L}-L_t^{aa},0)} = p_t F_L^{'}(\theta, L_t^{aa}, X_{t-1}^{aa})$ taking X_{t-1}^{aa} as given, and he chooses agricultural investment X_t^{aa} to satisfy $\frac{p_{t+1}}{q_t} F_X^{'}(\theta, L_{t+1}^{aa}, X_t^{aa}) = 1 + r$, taking expected p_{t+1} and L_{t+1}^{aa} as given.

Now, taking levels of c^{aa}, L^{aa} and X^{aa} as given, we can look at people' decision to engage in illicit activities. People will engage in illicit activities if and only if

$$w_t - \frac{\rho f}{1+r} \geq \frac{U_l^{'}(c_t^{aa}, \bar{L} - L_t^{aa}, 0)}{U_c^{'}(c_t^{aa}, \bar{L} - L_t^{aa}, 0)} + \sigma \frac{-U_{\sigma L^m}^{'}(c_t^{aa}, \bar{L} - L_t^{aa}, 0)}{U_c^{'}(c_t^{aa}, \bar{L} - L_t^{aa}, 0)}. \tag{6}$$

which says the expected returns from illicit activities (wage minus the present value of expected punishment) must be higher than the highest possible marginal rate of substitution between leisure and consumption the person can achieve without engaging in illicit activities. Since $-U_{\sigma L^m}^{'}/U_c^{'} > 0$, a rise in σ means more people will drop out of illicit activities.

If condition 6 is satisfied and if $X_{t-1} > 0$, the person then chooses L_t^m and L_t^a such that the marginal product of labor in agriculture equals his net marginal gains from illicit activities, which also equals his marginal rate of substitution between leisure and consumption: i.e. conditions 1 and 2 will be satisfied. Notice that L_t^m may not always be positive. People will not engage in illicit activities if any or all three of the following happens: (1) w_t is very low relative to price level p_t and potential punishment ρf; (2) productivity in agriculture θ is very high; and (3) the degree of aversion to illicit activities σ is very high.

Now we come back to the level of X_t. People choose inputs for period $t+1$ at time t with the correct expectation of next period's prices and wages. Each person chooses X_t such that investment returns in agriculture and alternative assets are equalized: i.e. condition 3 $\frac{p_{t+1}}{q_t} F_X^{'}(\theta, L_{t+1}^{a}, X_t) = 1 + r$ will be satisfied.

Comparative Statics

First, we define the elasticities of illicit labor to the parameters or variables most likely to be affected by the intervention, θ, X, ρf and σ: $\varepsilon_\theta = \frac{dL_m}{d\theta}/\frac{L_m}{\theta}$, $\varepsilon_X = \frac{dL_m}{dX}/\frac{L_m}{X}$, $\varepsilon_{\rho f} = \frac{dL_m}{d\rho f}/\frac{L_m}{\rho f}$,

, $\varepsilon_\sigma = \frac{dL_m}{d\sigma} / \frac{L_m}{\sigma}$. We are also interested in the responsiveness of labor supply to the illicit wage.

w_t

We focus on the case where, as wages w_t or the marginal product of labor $p_t F_L^{'}(t)$ increases, the substitution effect is greater than the income effect on hours (a reasonable assumption when both wealth and income are relatively low). If the illicit wage rises, people will engage in illicit activities as w_t surpasses their threshold wage level defined in inequality (6). For those who already engage in both activities, L_t^m rises and L_t^a falls so that equations (1) and 2 are satisfied. The ratio $\frac{L^m}{L^m+L^a}$ rises–people are more inclined to engage in illicit activities as w rises. Then the right hand side of (3) falls (since labor and other inputs are complements), which means the optimal level of X_{t-1} must fall in order to satisfy equations (3) and (4). Since we assumed substitution effects always dominate income effects, total hours $L_t^a + L_t^m$ should rise. Total earnings $y_t \equiv p_t F(\theta, L_t^a, X_{t-1}) + w_t L_t^m$ would rise as w_t rises because equilibrium returns to both sectors are now higher. Therefore, $\frac{\partial L_t^a}{\partial w_t} < 0$, $\frac{\partial L_t^m}{\partial w_t} > 0$, $\frac{\partial X_{t-1}}{\partial w_t} < 0$, $\frac{\partial l_t}{\partial w_t} < 0$ and $\frac{\partial y_t}{\partial w_t} > 0$. It's worth noting that because of equations (3) and (4) the returns to investment in inputs will not change as w_t changes, despite the changes in L^a and X.

ρf

In the absence or risk and uncertainty the effect of an increase in ρf will be the same as the effect of a fall in w_t. Future punishment essentially acts as a monetary penalty to wages in the illicit sector. Therefore, an increase in ρf will increase agricultural hours and earnings from agriculture, but reduce hours in illicit activities, total hours, and total earnings: , $\frac{\partial L_t^a}{\partial \rho f} > 0$, $\frac{\partial L_t^m}{\partial \rho f} < 0$ (i.e. $\varepsilon_{\rho f} < 0$), $\frac{\partial X_{t-1}}{\partial \rho f} > 0$, $\frac{\partial l_t}{\partial \rho f} > 0$ and $\frac{\partial y_t}{\partial \rho f} < 0$.

σ

As σ rises, we will see a change in illicit work on the extensive margin: fewer people will engage in these activities since a higher σ implies a higher right hand side in inequality (6). For those who already engage in both activities, to keep equation (2) an identity, the optimal level of L_t^m must fall and L_t^a must rise. The ratio $\frac{L^m}{L^m+L^a}$ falls–people take time away from illicit activities and put more time into agriculture production. X_{t-1} then rises because of the rise in L_t^a . The effect on hours and total earnings is less obvious. But holding everything else constant (i.e. marginal utility of consumption and leisure, wages, prices and productivity), an increase in σ will lead to a fall in $w_t + \sigma \frac{U'_{\sigma L^m}(t)}{U'_c(t)}$, which means a lower level of both $\frac{U'_l(t)}{U'_c(t)}$ and marginal productivity of labor $p_t F'_L(t)$ in equilibrium. Even though earnings from agriculture will be higher, the first order effect of σ on L_t^m dominates its effects on L_t^a , which means c_t and y_t will be lower in equilibrium, and l_t higher. Therefore, $\frac{\partial L_t^a}{\partial \sigma} > 0$, $\frac{\partial L_t^m}{\partial \sigma} < 0$, $\varepsilon_\sigma < 0$, $\frac{\partial X_{t-1}}{\partial \sigma} > 0$, $\frac{\partial l_t}{\partial \sigma} > 0$ *and* $\frac{\partial y_t}{\partial \sigma} < 0$.

θ

Now we consider the effect of an increase in the available agricultural technology θ. On the extensive margin, fewer people will engage in illicit activities and more will engage in agriculture activities.[41]

On the intensive margin, for those who already engage in both activities, the effect of a rise in productivity level θ is ambiguous. Because of equations (3) and (4), the returns to investment in inputs will not change (at least so long as we don't have any financial constraints or risk). Input level X would rise and labor-input ratio $\frac{L^a}{X}$ will fall. However, the direction of change in L^a depends on the shape of production and utility functions as well as the person's wealth level. So do the effects on leisure and hours in illicit activities. Both

[41] A higher θ leads to a relatively large increase in c^{aa} and an ambiguous but relatively small change in l^{aa}, which together implies a higher right hand side in inequality (6).This is intuitive: as productivity rises, agriculture alone can provide high levels of consumption and leisure for the person such that illicit activities do not seem attractive any more.

earnings in agriculture and total earnings y will rise. Consumption will rise. If agricultural production is very labor intensive (which is likely the case), then a rise in θ will lead to a rise in both L^a and $p_t F_L^{'}(t)$, which means a higher level of $\frac{U_l^{'}(t)}{U_c^{'}(t)}$ in equilibrium, and therefore a lower level of leisure. The effect on L^m depends on the sign of $U_{\sigma L^m}^{'}$. To sum up, $\frac{\partial X_{t-1}}{\partial \theta} > 0$, $\frac{\partial y_t}{\partial \theta} < 0$ for certain, and $\frac{\partial L_t^a}{\partial \theta} > 0$ and $\frac{\partial l_t}{\partial \theta} < 0$ if agriculture production is labor intensive and ambiguous otherwise.

Averaging the effect on both margins, a rise in θ leads to a fall in average L^m and arise in L^a. Therefore, $\frac{L^m}{L^m+L^a}$ falls and $\varepsilon_\theta < 0$. Note that an increase in p_t (or decrease in q_t) would have similar effects as an increase in θ.

X_t

Since input X_t is a choice variable and there are no financial market imperfections, any intervention that provides X_t will only have effects in the short-term: reducing returns in agriculture production to a level below $1 + r$, increasing consumption and total earnings, and reducing hours in illicit activities. The short-term effects on L^a and l will depend on the labor intensity of the production function and how important leisure is in the utility function. However, in the long run, this capital will be divested and everything will go back to equilibrium levels. In the short run, $\frac{L^m}{L^m+L^a}$ falls and $\varepsilon_X < 0$; in the long run, $\frac{L^m}{L^m+L^a}$ returns to its normal level and $\varepsilon_X = 0$.

C.3 The case of credit constraints without uncertainty

We consider the simplest case of credit constraints where there is no borrowing whatsoever: $a_t \geq 0$. Equation (4) becomes $\frac{U_c^{'}(t)}{U_c^{'}(t+1)} = \delta(1+r)$ if $a_t > 0$ and $\frac{U_c^{'}(t)}{U_c^{'}(t+1)} > \delta(1+r)$ if $a_t = 0$. Combining this with(3), we have

$$\frac{p_{t+1}}{q_t} F_X^{'}(\theta, L_{t+1}^a, X_t) = max\{1 + r, \frac{1}{\delta}\} \tag{7}$$

This implies that fewer people with low wealth will engage in agriculture, and those that do will invest less in inputs if the credit constraint binds. Unlike the benchmark model, patience now matters for input decisions: the impatient will now under-invest in agriculture.

In a low wealth sample like ours, compared to the benchmark case, the credit constraint leads to a lower level of investment X for the impatient types whose $\delta < \frac{1}{1+r}$, fewer hours in agriculture (lower L^a), but more hours in illicit activities (higher L^m). Some low patience people will have to give up agriculture altogether because of the credit constraints. On average, $\frac{L^m}{L^a+L^m}$ will be higher than in the benchmark case.

Interventions in θ and σ will have similar effects as in the benchmark case; ε_θ and ε_σ will have the same signs as in the benchmark case. However, the magnitude of the effects change. A rise in θ will now have a smaller effect than in the benchmark case, because the credit constraint makes it harder for everyone to increase their investment in agriculture. On the contrary, a rise in σ will now have a bigger effect than in the benchmark case, because the credit constraint makes illicit activities more attractive than in the benchmark case.

Perhaps most importantly, interventions in X_t will now have long-term effects: inducing people to engage in agriculture activities, and increasing input investments for those who were credit constrained. $\varepsilon_X < 0$ both in the long and in the short run. It is worth noting that in this case giving people ΔX_t amount of inputs should have the exact same effect as giving them a cash transfer of $q_t \Delta X_t$.

In other words, $\epsilon_\sigma < 0$, $\varepsilon_\theta < 0$ and $\varepsilon_X < 0$; the magnitude of ε_θ and ε_σ are lower than in the benchmark case; while ε_X is higher.

C.4 The case of credit constraints with uncertainty and incomplete insurance

We now turn to credit constraints in the presence of uncertainty and risk aversion. For simplicity we assume there is no insurance market, and that the riskless asset remains riskless.

The first order conditions now become

$$
\begin{aligned}
\mathbb{E}_{t-1}\left[U_l^{'}(t)\right] &= \mathbb{E}_{t-1}\left[U_c^{'}(t)p_t F_L^{'}(t)\right] \qquad if\ L_t^a > 0 \\
\mathbb{E}_{t-1}\left[U_l^{'}(t)\right] - \mathbb{E}_{t-1}\left[\sigma U_{\sigma L^m}^{'}(t)\right] &= \mathbb{E}_{t-1}\left[U_c^{'}(t)w_t\right] - \delta\mathbb{E}_t\left[U_c^{'}(t+1)\right]\rho f \quad if\ L_t^m > 0 \\
U_c^{'}(t) &= \delta\mathbb{E}_t\left[U_c^{'}(t+1)\frac{p_{t+1}}{q_t}F_X^{'}(t+1)\right] \quad if\ X_t > 0 \\
U_c^{'}(t) &= \delta(1+r)\mathbb{E}_t\left[U_c^{'}(t+1)\right] \qquad if\ a_{t+1} > 0 \\
c_t + a_{t+1} + q_t X_t &= p_t F(\theta, L_t^a, X_{t-1}) + w_t L_t^m + (1+r)a_t
\end{aligned}
$$

Inequality (6), the threshold level of w_t that people will engage in illicit activities, now becomes

$$
\begin{aligned}
&\mathbb{E}_{t-1}\left[U_c^{'}(c_t^{aa}, \bar{L} - L_t^{aa}, 0)w_t\right] - \delta\mathbb{E}_t\left[U_c^{'}(c_{t+1}^{aa}, \bar{L} - L_{t+1}^{aa}, 0)\right]\rho f \quad \geq \\
&\mathbb{E}_{t-1}\left[U_l^{'}(c_t^{aa}, \bar{L} - L_t^{aa}, 0)\right] - \mathbb{E}_{t-1}\left[\sigma U_{\sigma L^m}^{'}(c_t^{aa}, \bar{L} - L_t^{aa}, 0)\right]
\end{aligned}
$$

and we have another equation for the returns of input investments under uncertainty

$$
\mathbb{E}_t\left[\frac{p_{t+1}}{q_t}F_X^{'}(\theta_{t+1}, L_{t+1}^a, X_t)\right] - (1+r) = -(1+r)Cov_t\left(\frac{p_{t+1}}{q_t}F_X^{'}(\theta_{t+1}, L_{t+1}^a, X_t), SD_t\right) \quad (8)
$$

and

$$
(1+r)\left[1 + Cov_t\left(\frac{p_{t+1}}{q_t}\theta_{t+1}M, SD_t\right)\right] \leq \mathbb{E}_t\left[\frac{p_{t+1}}{q_t}\theta_{t+1}M\right] \quad (9)
$$

where $SD_t = \frac{\delta U_1^{'}(t+1)}{U_1^{'}(t)}$ is the stochastic discount factor.

Now input X and hours L^m and L^a all depend both on the variance of returns in the two sectors and the level of initial wealth a_0. Those with high levels of wealth a_0 will turn away from both activities by reducing X, L^m and L^a and investing instead in other riskless assets X. L^m and L^a will all be lower than both the benchmark case and the credit constraint only case.

People with low levels of wealth (i.e. our sample) will not be able to live off savings alone,

so they will have to invest more in both sectors by increasing X, L^m and L^a if both sectors are equally risky. Otherwise, if one of the sectors are less risky than the other, people will invest more time in that sector. $\frac{L^m}{L^a+L^m}$ will be higher than in the case without uncertainty only if illicit activities are less risky than agriculture.

Importantly, interventions in θ will have greater effects than in the benchmark and credit constraint case, because an increase in θ now also makes agriculture relatively less risky. A rise in σ will also have a bigger effect than without uncertainty, because risk aversion will reinforce the rise in aversion and further reduce hours in illicit activities. Inventions in X_t will have a similar long-term effect as in the credit constraint only scenario. However, for the risk averse people the effect of ΔX_t will be greater than a cash transfer $q_t \Delta X_t$. The effects increase as the level of risk aversion increases, and also as the level of risk increase. Similarly, a change in either the probability or extent of punishment will have a bigger effect on hours and earnings: an increase in ρf will make illicit activity even more unattractive, as it reduces the expected returns to illicit activity while not reducing the risk of such activities.

In other words, $\epsilon_\sigma < 0$, $\varepsilon_\theta < 0$, $\varepsilon_{\rho f} < 0$ and $\varepsilon_X < 0$; the magnitude of all four elasticities will be higher than in the credit constraint without uncertainty case.

D Additional treatment effects analysis

D.1 ITT and TOT estimates with all index components

Table D.1 reports intent-to-treat (ITT) impacts of the program on our measures of mercenary recruitment. Tables D.2 to D.7 expand the family indices that appear in the main paper. Finally, Tables D.12 and D.13 expand the number of outcomes analyzed for the marginal impact of package choice.

Table D.1: Intent to treat impacts on mercenary recruitment activities

Outcome	Control Mean (1)	ITT estimate Coeff. (2)	ITT estimate SE (3)
Mobilization activities/attitudes (z-score)	0.09	-0.156	[0.065]**
Direct recruitment activities (0-12)	0.94	-0.183	[0.097]*
Talked to a commander in last 3 months	0.45	-0.083	[0.037]**
Would go if called to fight for tribe	0.05	-0.012	[0.011]
Has been approached about going to CI	0.07	0.001	[0.017]
Would go to CI for $250	0.01	-0.005	[0.008]
Would go to CI for $500	0.03	-0.007	[0.010]
Would go to CI for $1000	0.08	-0.032	[0.016]*
Will move towards CI border area	0.10	-0.017	[0.020]
Invited to secret meeting on going to CI	0.04	0.003	[0.013]
Attended secret meeting on going to CI	0.03	-0.010	[0.009]
Was promised money to go to CI	0.03	0.001	[0.011]
Willing to fight if war breaks out in CI	0.04	-0.014	[0.012]
Has plans to go to CI in the next month	0.01	-0.009	[0.007]
Indirect recruitment measures (0-4)	1.48	-0.121	[0.062]*
Talks about the CI violence with friends	0.68	-0.035	[0.034]
Has a partisan preference in CI	0.66	-0.089	[0.034]***
Knows people who went to CI to fight	0.10	-0.016	[0.016]
Knows people given money to go to CI	0.04	0.020	[0.013]

Notes: This table includes all questions used in a "mobilization risk" survey module.Standard errors are robust and clustered at the village level.

*** p<0.01, ** p<0.05, * p<0.1

Table D.2: Economic family indices expanded

Outcome	Control Mean (1)	Treatment effect estimates (n=1025) ITT Coeff. (2)	ITT Std. Err. (3)	TOT Coeff. (4)	TOT Std. Err. (5)
Raised crops/animals in past year:					
Cleared land for themselves	0.53	0.0920	[0.033]***	0.1200	[0.039]***
Grew seedlings for themselves	0.23	0.2700	[0.034]***	0.3530	[0.038]***
Planted crops for themselves	0.44	0.1350	[0.035]***	0.1770	[0.042]***
Sold crops for themselves	0.27	0.0910	[0.031]***	0.1190	[0.037]***
Raised animals for themselves	0.26	0.0610	[0.032]*	0.0800	[0.039]**
Sold animals for themselves	0.11	0.0020	[0.023]	0.0030	[0.027]
Index of stealing/theft activity (z-score)	-0.05	0.0460	[0.064]	0.0600	[0.077]
When things are rough, do you sometimes "hustle from people" (steal)?	0.01	0.0070	[0.011]	0.0090	[0.013]
You sometimes "correct someone's mistake" (pickpocket)?	0.02	0.0130	[0.011]	0.0170	[0.013]
You sometimes "take things from behind someone" (steal, shoplift)?	0.03	0.0020	[0.011]	0.0030	[0.013]
Can you sometimes "scrape from people" (cheat or con)?	0.03	0.0050	[0.012]	0.0060	[0.014]
You sometimes "jump on people" to take their things (mug, rob)?	0.01	-0.0030	[0.005]	-0.0040	[0.006]
You "use anything when you hustling" (are you armed)?	0.01	-0.0010	[0.007]	-0.0020	[0.008]
How many times every week you can hustle (steal) from people?	0.06	0.0300	[0.035]	0.0390	[0.042]
Do you plan to continue this hustle in future?	0.01	0.0010	[0.005]	0.0010	[0.006]
Are you surviving mainly on hustling from people?	0.02	-0.0040	[0.009]	-0.0050	[0.011]
Settlement and Migration					
Changed county since baseline survey	0.14	0.044	[0.023]*	0.057	[0.027]**
Changed communities since baseline survey	0.45	0.005	[0.038]	0.007	[0.045]
Changed communities in the past 6 months	0.37	-0.006	[0.033]	-0.008	[0.040]
Interested in staying in current community	0.74	0.058	[0.030]*	0.076	[0.036]**

Notes: Columns (2) and (3) report the intent-to-treat (ITT) estimate, and columns (4) and (5) estimate the effect of treatment on the treated (TOT) via two-stage least squares, where assignment to treatment is used as an instrument for attending at least a day. All regressions include block dummies and baseline covariates. Standard errors are robust and clustered at the village level.

*** p<0.01, ** p<0.05, * p<0.1

Table D.3: Peer group index expanded

		Treatment effect estimates (N=1025)			
	Control	ITT		TOT	
Outcome	Mean	Coeff.	SE	Coeff.	SE
	(1)	(2)	(3)	(4)	(5)
Are your closest friends...?					
Interested in school	0.78	-0.002	[0.027]	-0.003	[0.032]
Participate in community meetings	0.96	-0.014	[0.015]	-0.018	[0.018]
Go to church or mosque	0.91	-0.015	[0.021]	-0.019	[0.025]
Have a business or a job	0.58	0.055	[0.030]*	0.072	[0.035]**
Save money regularly	0.77	0.043	[0.030]	0.056	[0.036]
Give you advice	0.97	-0.015	[0.012]	-0.019	[0.014]
Work hard	0.97	0.000	[0.010]	0.000	[0.013]
Share with you if they have money and you don't	0.95	-0.024	[0.016]	-0.032	[0.019]*
Make you feel better when you are feeling badly	0.90	0.032	[0.023]	0.042	[0.027]
Can be trusted to guard your valuables	0.87	0.003	[0.020]	0.003	[0.024]
Get drunk regularly	0.26	-0.004	[0.030]	-0.005	[0.036]
Beg for money from strangers	0.06	0.013	[0.017]	0.017	[0.020]
Use drugs	0.06	-0.010	[0.016]	-0.014	[0.020]
Gamble	0.06	0.001	[0.019]	0.002	[0.023]
Steal other people's property	0.03	0.003	[0.011]	0.004	[0.013]
Break and enter houses and businesses	0.01	0.004	[0.010]	0.006	[0.012]
Do armed robbery/mugging	0.00	-0.003	[0.007]	-0.003	[0.008]
Often have small conflicts with authorities	0.22	-0.011	[0.030]	-0.015	[0.035]
Often have major conflicts with the authorities	0.05	0.018	[0.014]	0.024	[0.017]

Notes: See Table D.2.

Table D.4: Social and family support family indices expanded

		Treatment effect estimates (N=1025)			
	Control	ITT		TOT	
Outcome	Mean	Coeff.	SE	Coeff.	SE
	(1)	(2)	(3)	(4)	(5)
Index of social support in last month (z-score)	-0.06	0.144	[0.072]**	0.188	[0.085]**
Anyone joked with you to make you happy?	1.41	0.142	[0.076]*	0.186	[0.092]**
Anybody help take care of your things/family?	1.71	0.062	[0.082]	0.082	[0.098]
Anybody help you with your work?	1.10	0.099	[0.063]	0.130	[0.074]*
You shared your feelings and they listened?	1.59	0.028	[0.061]	0.037	[0.073]
Anybody sat with you when you feeling lonely?	1.38	0.022	[0.068]	0.029	[0.081]
Anybody helped you to make your way through life?	0.99	0.030	[0.061]	0.039	[0.073]
Anybody lent you things beside money?	0.67	0.163	[0.062]***	0.213	[0.074]***
Anyone lent or gave you money?	0.55	0.011	[0.066]	0.014	[0.080]
Index of family relations (z-score)	-0.00	0.101	[0.062]	0.133	[0.075]*
See members of your family often?	2.06	0.114	[0.062]*	0.149	[0.076]**
Do you attend family meetings?	1.50	0.127	[0.080]	0.166	[0.097]*
Your family concerned about you?	2.40	0.029	[0.053]	0.037	[0.063]
Do they advise or encourage you?	2.22	-0.007	[0.063]	-0.010	[0.075]
Family members help you when you are stuck?	1.36	0.152	[0.071]**	0.198	[0.087]**
You have disputes in your family?	2.68	-0.027	[0.044]	-0.036	[0.053]
You caused trouble for them?	2.87	-0.017	[0.032]	-0.022	[0.038]

Notes: See Table D.2.

Table D.5: Antisocial behaviors family index expanded

		Treatment effect estimates (N=1025)			
	Control	ITT		TOT	
Outcome	Mean	Coeff.	SE	Coeff.	SE
	(1)	(2)	(3)	(4)	(5)
In the last month...					
Was unable to control your anger	0.48	0.044	[0.046]	0.058	[0.056]
Was quick to react against others	0.19	0.059	[0.042]	0.077	[0.050]
Said cruel things to other people	1.36	-0.033	[0.076]	-0.043	[0.091]
Let other people see your frustration	0.49	0.111	[0.057]*	0.146	[0.068]**
Intentionally destroyed property	0.05	-0.003	[0.020]	-0.004	[0.024]
Refused to take advice	0.14	0.022	[0.036]	0.029	[0.044]
Cheated other people	0.13	0.034	[0.037]	0.044	[0.044]
Had major arguments with others	0.07	0.000	[0.018]	0.001	[0.022]
"Held your heart" when angry	0.94	0.036	[0.068]	0.047	[0.081]
Threatened people	0.10	0.002	[0.030]	0.002	[0.035]
Took other people's things without asking	0.03	0.046	[0.019]**	0.060	[0.023]***
In the past 6 months....					
Had a fight or angry dispute	0.70	0.000	[0.115]	0.000	[0.138]
Had a confrontations with leaders or police	0.64	-0.179	[0.148]	-0.234	[0.178]

Notes: See Table D.2.

Table D.6: Approval for use of violence family index expanded

		Treatment effect estimates (N=1025)			
	Control	ITT		TOT	
Outcome	Mean	Coeff.	SE	Coeff.	SE
	(1)	(2)	(3)	(4)	(5)
Your neighbor beats the man who robbed his home	0.08	-0.025	[0.015]	-0.032	[0.018]*
Take things from home of man refusing to repay money	0.04	-0.001	[0.013]	-0.001	[0.015]
Police don't investigate the killer of a known robber	0.10	-0.012	[0.022]	-0.016	[0.027]
Chief uses trial by ordeal on a suspected thief	0.27	0.026	[0.029]	0.034	[0.035]
No one punishes shop owners who beat a market thief	0.51	0.048	[0.031]	0.063	[0.038]
No one punishes shop owners who kill a market thief	0.20	-0.030	[0.031]	-0.039	[0.036]
Chase and beat a wife who runs off with your things	0.19	-0.024	[0.025]	-0.031	[0.030]
Community destroys the property of a captured bandit	0.39	-0.001	[0.035]	-0.001	[0.042]
Your friend threatens the man trying to steal girlfriend	0.10	-0.025	[0.020]	-0.033	[0.024]
Community beats a corrupt leader	0.07	-0.004	[0.015]	-0.005	[0.019]
Husband beats a wife who challenges him in public	0.14	-0.026	[0.023]	-0.034	[0.028]
Community beats policeman bribed to release rapist	0.22	-0.032	[0.028]	-0.042	[0.033]

Notes: See Table D.2.

Table D.7: Community participation family index expanded

		Treatment effect estimates (N=1025)			
	Control	ITT		TOT	
Outcome	Mean	Coeff.	SE	Coeff.	SE
	(1)	(2)	(3)	(4)	(5)
Number of groups involved in	5.36	0.288	[0.142]**	0.376	[0.168]**
Is a group leader	0.48	0.053	[0.033]	0.069	[0.039]*
Is a community leader	0.29	-0.019	[0.028]	-0.024	[0.034]
Attended community meetings	0.94	-0.017	[0.020]	-0.022	[0.025]
Believes can do things to improve community	0.89	0.018	[0.018]	0.024	[0.021]
Volunteered for road clearing	0.78	0.007	[0.030]	0.009	[0.036]
Contributed to care of community water sources	0.67	0.021	[0.036]	0.027	[0.043]
Contributed to other public facilities	0.63	0.010	[0.035]	0.013	[0.042]
Is a "big man" in community	0.35	0.003	[0.034]	0.004	[0.041]
Organizes new groups	0.50	0.009	[0.038]	0.011	[0.045]
People often come to you for advice	0.38	0.014	[0.033]	0.018	[0.039]
Community members come to you to solve disputes	0.28	0.011	[0.033]	0.015	[0.039]
Your friends come to you to solve disputes	0.83	0.011	[0.031]	0.014	[0.038]

Notes: See Table D.2.

D.2 ITT and TOT effects on secondary outcomes

Table D.8: Other outcomes

		Treatment effect estimates (N=1025)			
	Control	ITT		TOT	
Outcome	Mean	Coeff.	SE	Coeff.	SE
	(1)	(2)	(3)	(4)	(5)
Obtained more schooling or skills training	0.207	0.021	[0.035]	0.016	[0.029]
Attention span index	5.167	-0.143	[0.116]	-0.109	[0.095]
Working memory index	2.218	-0.128	[0.138]	-0.098	[0.114]
Substance abuse index (0-3)	0.790	-0.088	[0.049]*	-0.067	[0.041]
Has partner	0.936	-0.017	[0.020]	-0.013	[0.016]
Living with partner	0.620	0.029	[0.035]	0.022	[0.029]
Risky sex index (0-4)	1.064	-0.099	[0.111]	-0.076	[0.092]
Partner abuse index (0-4)	0.718	-0.120	[0.082]	-0.092	[0.069]
Mental health issues index (0-72)	15.840	-0.329	[0.932]	-0.251	[0.778]
Standardized index of appearance at endline	0.078	-0.164	[0.079]**	-0.126	[0.066]*
Risk appetite, z-score	0.133	0.006	[0.076]	0.005	[0.063]
Self control index, z-score	-0.053	0.037	[0.075]	0.028	[0.063]

Notes: See Table D.2.

The attention span and working memory measures are constructed based on the digit recall module in the endline survey. The risk appetite and self control indices are based on self-reported attitudes and decisions in hypothetical scenarios. We did not believe that the program would change these four measures and viewed them as time-invariant characteristics. The rest of the outcomes are secondary ones measured in the endline survey.

D.3 Robustness and sensitivity analysis

Robustness to model choice and attrition Results in the main paper are generally robust to different models and missing data assumptions. Table D.9 reports sensitivity analysis for key outcomes. Column 1 replicates TOT estimates from Tables 3 to 7 in the main paper. Column 2 reports TOT without baseline covariates. Column 3 reports the same

TOT estimates as in Column 1 but without clustering at the village level. Column 4 uses an alternate instrument for assignment to treatment—instead of counting the first m men in each block as assigned to treatment up until the that block's quota b is filled (so that $m \geq b$), the results in Column 4 do not count the $m > b$ men as assigned to treatment (rather, they are non-compliant).[42]

In general the qualitative conclusions are the same. Omitting covariates or using the alternate instrument slightly reduces the statistical significance of some effects, as one would expect.

Columns 5 to 7 consider whether our treatment effects could be the result of selective attrition. We estimate bounds by imputing outcome values for unfound individuals at different points of the observed outcome distribution, focusing on the cases that reduce program impacts. For positive outcomes we impute the observed mean plus x standard deviations of the distribution for the control group, and for the treatment group we impute the observed treatment mean *minus* x standard deviations of the distribution. We calculate estimates for $x = 0.1$, 0.25, and 0.5. Note these imply large systematic differences between the missing treatment and control members. All treatment effects in are robust to $x = 0.1$ and the majority are still robust to $x = 0.25$. The sign on treatment is preserved when $x = 0.5$.

Robustness of mercenary recruitment index We also consider permutations of the mercenary recruitment index in Table D.10. The table shows that the TOT estimate on the full index is robust to excluding various components, or to including an indictor for being physically found by our survey at endline in a border area (which is rare). The statistical significance of the treatment effect falls if we exclude all indirect proxies and "talked to a commander" but still has a similar sign and magnitude.

[42]This increases noise and estimates a different local average treatment effect than in Column (1), but avoids the small risk that the marginal person selected into treatment assignment in each is endogenously a more compliant type. The quota was usually 50% of the men registered in the block, whereas on average 57% were assigned to treatment using our ordered assignment method. Ideally we would use this 57% average as the instrument, counting people as assigned if they were in the first 57% of the block order, but we do not have the historical ranking in every block to do so.

Table D.9: Sensitivity analysis of treatment effects to alternate models and missing data scenarios

	TOT estimate under alternative models				Sensitivity of TOT to attrition		
					Impute missing dependent variable with mean + (-) X SD for missing control (treatment) individuals		
Outcome	Result from main tables	Drop baseline covariates	Remove clustering	Assign first 50% of block to program	0.1 SD	0.25 SD	0.5 SD
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Engaged in agriculture now	0.155	0.15	0.155	0.151	0.270	0.239	0.187
	[0.036]***	[0.038]***	[0.035]***	[0.037]***	[0.080]***	[0.080]***	[0.081]***
Income index (z-score)	0.157	0.135	0.157	0.137	0.151	0.118	0.063
	[0.071]**	[0.080]*	[0.072]**	[0.082]*	[0.065]**	[0.066]*	[0.067]
Hours in illicit activities	-3.697	-3.242	-3.697	-3.814	-3.122	-2.377	-1.134
	[1.593]**	[1.554]**	[1.770]**	[1.729]**	[1.382]**	[1.385]*	[1.405]
Commander relations (z-score)	-0.154	-0.171	-0.154	-0.148	-0.125	-0.092	-0.037
	[0.100]	[0.104]	[0.084]*	[0.094]	[0.095]	[0.095]	[0.096]
Recruitment activities (0-12)	-0.239	-0.311	-0.239	-0.182	-0.215	-0.182	-0.125
	[0.118]**	[0.134]**	[0.122]**	[0.102]*	[0.078]***	[0.077]***	[0.077]***

Notes: Column (1) replicates results from Tables 3 to 7. Column (2) estimates the TOT without baseline covariates but with block fixed effects. Column (3) weights individuals by the inverse probability of assignment within each randomization block instead of controlling for block fixed effects. Column (4) changes the instrument used for attending the program: someone is assigned to treatment if their random number was in the first half of the block (rather than the last random number before the block quota was met). Block fixed effects are omitted as they are no longer need for identification (since probability of assignment does not vary by block). Columns (5) to (7) impute the mean of the control (treatment) group plus (minus) "X" standard deviations of the group's distribution (SD), for X=0.1, 0.25, 0.5. All regressions include a vector of baseline covariates, and all but .

*** p<0.01, ** p<0.05, * p<0.1

Table D.10: Program impacts on mercenary recruitment proxies

Outcome	Control Mean (1)	TOT estimate Coeff. (2)	TOT estimate SE (3)
All recruitment interest/actions (0-16)	2.41	-0.397	[0.154]***
All, excluding "talked to a commander" (0-15)	1.97	-0.289	[0.145]**
All, excluding "partisan preference" (0-15)	2.86	-0.506	[0.173]***
All, excluding "talked to a commander" and "partisan preference (0-14)	2.41	-0.397	[0.154]***
Direct only (0-12)	0.94	-0.239	[0.118]**
Direct only, including "found in border town at endline" (0-13)	0.94	-0.233	[0.117]**
Found in border town at endline	0.00	0.007	[0.006]
Direct only, excluding "talked to a commander" (0-11)	0.49	-0.131	[0.103]
Direct only, excluding "would go to CI for $1000" (0-11)	0.86	-0.198	[0.109]*

Notes: Columns (2)-(3) report the the effect of treatment on the treated (TOT) via two-stage least squares. Regressions include block dummies and baseline covariates. Standard errors are clustered at the village level. See Appendix D.1 for ITT results.

*** p<0.01, ** p<0.05, * p<0.1

Robustness of package choice estimates The estimates of the impact of in-kind inputs in the section "In-kind inputs versus an expected cash transfer" require an assumption of selection on observables (conditional unconfoundedness). We examine the sensitivity of our estimates to violations of this assumption using a technique proposed by Guido Imbens.[43] We illustrate the sensitivity in Figure D.1 for two dependent variables: the index of mercenary recruitment interest and actions, and the hours per week of illicit work. Any unobserved confounder must be correlated with both the dependent variable and treatment assignment (in this case, the choice of animals as a package). The curve in each figure represents all combinations of correlation between an unobservable variable and the outcome (vertical axis) and animal choice (horizontal axis) that would reduce the observed treatment effect by half. The axes represent the hypothetical increase in partial R-squared that would result from observing this unobserved covariate and including it in a regression with either the outcome or the treatment as the dependent variable. The curve represents a threshold. Any covariate

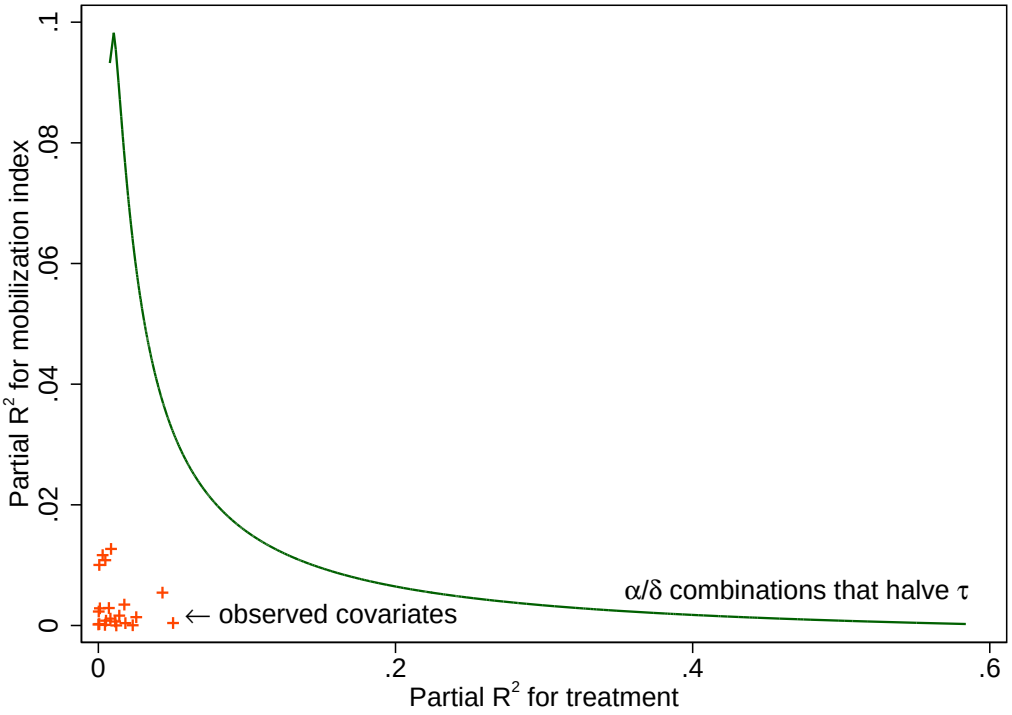
[43]Imbens, Guido W., "Sensitivity to Exogeneity Assumptions in Program Evaluation", The American Economic Review 93 (2003), pp. 126–32. 2

that laid to the right of the curve would indicate that our conditional unconfoundedness assumption is highly suspect.

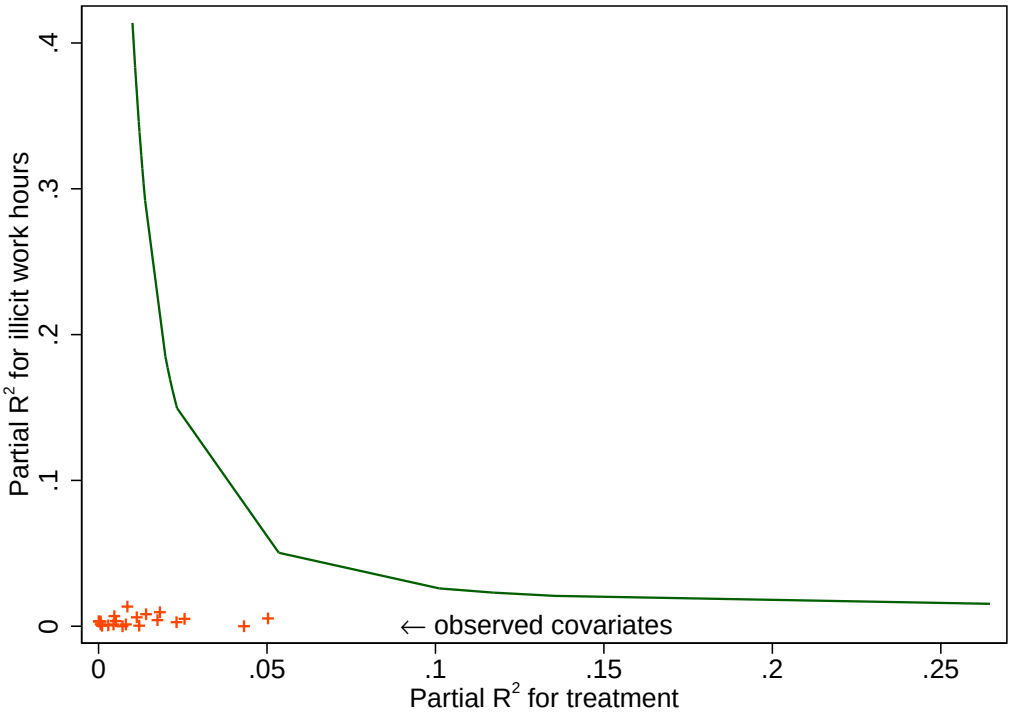
How do we know where the unobservables lie? We do not, of course, but we can benchmark them against observed covariates. The + signs indicate the partial R-squared added by our observed covariates. We focus on only a handful of key covariates, and test classes of covariates (e.g. all economic performance measures) since dropping just one of a large class (e.g. income but not assets and work hours) would by construction have a low partial R-squared. The covariates include region fixed effect.

We see that entire classes of covariates, such as regional covariates or all economic or all social variables, have little influence on our treatment effects. For an unobserved covariate to bias our results, it must be wholly unlike other covariates we observe. We judge this to be unlikely given the richness of our data.

Figure D.1: Sensitivity of the effect of animal choice to unobservables



(a) All recruitment interest/actions index



(b) Illicit hours worked per week

D.4 Heterogeneity by group affiliation/identity

As discussed in the section "In-kind inputs versus an expected cash transfer", the Krahn ethnic group was believed to be closely aligned with Gbagbo's side in the Ivoirian war. Indeed, in an OLS regression of support for Gbagbo on Krahn ethnicity and all other baseline covariates, Krahns are 34 percentage points more likely to support Gbagbo (regressions not shown). This is not the case for other groups in the Kru language family, or for ex-fighters from the Liberian armed group MODEL, which had support from Gbagbo. Similarly, we see no groups that report systematically higher support for Ouattara's side in the conflict, including Liberian Muslims and former members of the ethnically-Muslim rebel group ULIMO-K. Hence Krahn identity, though there are only 21 in our sample, is a string indicator of solidarity with Gbagbo.

In Table D.11 we interact Krahn identity with treatment and examine the effects on illicit hours and recruitment activities. We can see that the Krahn identity (the coefficient on the indicator alone) is associated with 4.1 more illicit hours per week and a one standard deviation increase in recruitment interest and action according to our index of proxies. The overall treatment effects are preserved in the full sample, though they are slightly smaller in magnitude. The coefficient on the interaction between treatment and Krahn, however, is large and negative. It effectively cancels out the heightened effect of simply being Krahn, and then some. That is, the treatment appears to neutralize the elevated levels of insecurity among Krahns especially.

Table D.11: Heterogeneity by ethnic affiliation to armed groups

Covariate	Dependent variable	
	Hours per week in illicit activities	All recruitment interest/actions, z-score
	(1)	(2)
Assigned to treatment	-2.995	-0.135
	[1.422]**	[.063]**
Assigned to treatment X Krahn ethnicity	-17.413	-1.131
	[9.000]*	[.585]*
Krahn ethnicity	4.104	1.045
	[6.847]	[.520]**
Mean of dependent variable, control group	15.57	0.09

Notes: The table displays OLS regressions of the dependent variable on the listed covariates plus all other baseline covariates and strata fixed effects (not displayed). Standard errors clustered at the community level.

*** p<0.01, ** p<0.05, * p<0.1

D.5 Heterogeneity analysis using expanded indices

Table D.12: Heterogeneity of program impacts by package choice, with expanded economic outcomes

	ITT estimates					
	Impact of assignment to program		Marginal effect of choosing animals package		Program impact on animal choosers (2+4)	
Outcome	Coeff. (1)	Std. Err. (2)	Coeff. (3)	Std. Err. (4)	Coeff. (5)	Std. Err. (6)
Agricultural engagement:						
Raising crops/animals†	0.127	[0.033]***	-0.046	[0.045]	0.081	[0.041]**
Acres under cultivation	1.148	[2.360]	2.179	[5.604]	3.327	[5.097]
Thinks farming is a good living	0.006	[0.016]	0.010	[0.028]	0.016	[.029]
Interested in farming	0.075	[0.031]**	0.083	[0.041]**	0.158	[.043]***
Interested in raising animals	0.047	[0.020]**	0.014	[0.022]	0.060	[.023]***
Hours worked/week, past month	2.502	[2.616]	-8.065	[5.190]	-5.563	[4.757]
Illicit resource extraction	-2.318	[1.406]	-2.706	[2.490]	-5.024	[2.484]**
Logging	-0.767	[0.695]	-0.842	[1.116]	-1.609	[1.07]
Mining	-1.109	[1.227]	-1.306	[1.923]	-2.415	[1.859]
Rubber tapping	-0.442	[0.567]	-0.558	[0.948]	-1.000	[1.041]
Farming and animal-raising	4.004	[1.342]***	-4.621	[2.314]**	-0.617	[2.001]
Farming	3.503	[1.198]***	-4.675	[1.884]**	-1.172	[1.571]
Animal-raising	0.501	[0.579]	0.054	[1.321]	0.555	[1.157]
Contract agricultural labor	-0.321	[0.331]	1.086	[1.188]	0.765	[1.104]
Palm, coconut, sugar cutting	0.252	[0.363]	0.066	[0.315]	0.318	[0.376]
Hunting	0.378	[0.352]	-0.862	[0.381]**	-0.484	[0.427]
Non-farm labor and business	0.178	[2.280]	-1.840	[3.196]	-1.662	[2.919]
Other activities	0.330	[0.581]	0.812	[1.079]	1.142	[1.109]
Other illicit activities:						
Any illicit resource extraction	-0.014	[0.032]	-0.057	[0.051]	-0.071	[0.056]
Sells any soft or hard drugs	-0.007	[0.012]	-0.007	[0.015]	-0.013	[0.014]
Stealing activities (z-score)†	0.054	[0.065]	-0.043	[0.082]	0.012	[0.096]

Notes: Column (1) reports the ITT coefficient of program assignment and Column (3) reports the coefficient on an interaction between program assignment and choosing poultry/pigs. Column (5) lists the sum of the coefficients in Columns (1) and (3). The regression includes baseline covariates and regional dummies are used instead of block dummies. Robust standard errors in brackets, clustered by community.

*** p<0.01, ** p<0.05, * p<0.1

Table D.13: Heterogeneity of program impacts by package choice, with expanded economic outcomes

	ITT estimates					
	Impact of assignment to program		Marginal effect of choosing animals package		Program impact on animal choosers (2+4)	
Outcome	Coeff. (1)	Std. Err. (2)	Coeff. (3)	Std. Err. (4)	Coeff. (5)	Std. Err. (6)
Direct recruitment activities (0-12)	-0.157	[0.107]	-0.138	[0.142]	-0.295	[.13]**
Direct recruitment activities excluding "Talked to a commander" (0-11)	-0.072	[0.098]	-0.150	[0.129]	-0.222	[.105]**
Talked to a commander in last 3 months	-0.085	[0.040]**	0.013	[0.068]	-0.073	[.064]
Would go if called to fight for tribe	-0.008	[0.012]	-0.017	[0.015]	-0.025	[.015]
Has been approached about going to CI	0.007	[0.019]	-0.032	[0.027]	-0.025	[.025]
Would go to CI for $250	-0.007	[0.010]	0.013	[0.012]	0.006	[.005]
Would go to CI for $500	-0.012	[0.013]	0.024	[0.019]	0.013	[.014]
Would go to CI for $1000	-0.032	[0.017]*	0.000	[0.027]	-0.031	[.026]
Will move towards CI border area	-0.008	[0.022]	-0.048	[0.027]*	-0.056	[.025]**
Invited to secret meeting on going to CI	0.007	[0.014]	-0.023	[0.020]	-0.016	[.021]
Attended secret meeting on going to CI	-0.007	[0.009]	-0.011	[0.015]	-0.019	[.015]
Was promised money to go to CI	0.008	[0.013]	-0.038	[0.016]**	-0.030	[.014]**
Willing to fight if war breaks out in CI	-0.009	[0.014]	-0.027	[0.024]	-0.036	[.018]**
Has plans to go to CI in the next month	-0.011	[0.009]	0.008	[0.013]	-0.003	[.01]
Indirect recruitment measures (0-4)	-0.080	[0.066]	-0.217	[0.091]**	-0.296	[.097]***
Talks about the CI violence with friends	-0.014	[0.036]	-0.115	[0.054]**	-0.129	[.055]**
Has a partisan preference in CI	-0.080	[0.035]**	-0.049	[0.060]	-0.129	[.06]**
Knows people who went to CI to fight	-0.011	[0.016]	-0.027	[0.027]	-0.038	[.027]
Knows people given money to go to CI	0.025	[0.014]*	-0.025	[0.025]	-0.001	[.024]

Notes: Column (1) reports the ITT coefficient of program assignment and Column (3) reports the coefficient on an interaction between program assignment and choosing poultry/pigs. Column (5) lists the sum of the coefficients in Columns (1) and (3). The regression includes baseline covariates and regional dummies are used instead of block dummies. Robust standard errors in brackets, clustered by community.

*** p<0.01, ** p<0.05, * p<0.1