Watchman Field Experiment – Pre Analysis Plan

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Abstract

This document describes the analysis plan for a field experiment in crime and property security in rural Kenya. I create randomised variation in farm security by matching randomly selected Kenyan smallholding farmers with subsidized Maasai watchmen to protect farms during the main agricultural season. I explore the effect of theft and property crime by testing whether farmers engage in different types of production when their farms are more secure against theft. I further explore how social networks are used to substitute for imperfect protection of property in an environment where state institutions are unable to fully protect farms, and how theft is used to sanction those who neglect social obligations. Finally, I test whether improved security and reduced fear of crime decrease the degree of ethnic ingroup-outgroup parochialism and political preference for authoritarian, 'strongman' leaders.

Keywords: theft, crime, institutions, agriculture

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1 Introduction

This paper studies the consequences of theft from farms in central Kenya, where smallholding farming is the primary economic activity and where formal institutions imperfectly protects property rights. In this context, farm theft is a pervasive form of property crime that can distort production decisions away from high-risk crops towards less easily stolen staples. In addition, the risk of theft incentivises the formation of strong ingroup relationships to ensure mutual protection of farms and as a consequence of perceptions that 'others' are responsible for theft. This is also a context where public provision of property rights can readily be replaced by private protections, allowing households to avoid relying on public institutions. It is, however, difficult to identify causal mechanisms from observational data, as culture, institutional quality and production decisions are determined simultaneously. To understand how theft influences social outcomes and production decisions, I conduct a novel randomised experiment in protection against property crime. I randomly assign high-quality private protection of farms through an intervention facilitating the hiring of highly trusted Maasai watchmen, by matching households with watchmen and through targeted subsidies for wages and up-front payment of travel costs.

2 Intervention

The intervention in this project is matching farming households to high-quality, trusted Maasai watchmen at a heavily subsidized rate. The intention of this intervention is to cause variation in the security of farms during the long rainy season. Watchmen are recruited with the assistance of partners from the Maasai Education Research and Conservation Centre (MERC) in Maasailand in January and early February. After information sessions with farmers and the collection of supplementary baseline information, farmers will be informed of their treatment status by telephone before the end of February, giving them time to adjust planting decisions. After being informed of their treatment status and given the contact information of the watchman they have been matched to, I schedule times for farmers to be expect a phone call from a watchman, so they can arrange the time of employment and other details. The wage rate paid by farmers and the subsidy are set in advance, so the treatment is uniform across the sample. The duration of the treatment is also set at a constant six weeks of watchman employment, at a time set by farmers to coincide with when they anticipate their crops will be at risk.

3 Research Questions

My main research question is:

i. Does theft constrain the type of economic activities farmers engage in? Does an intervention to improve farm security cause farmers to invest more in theft-risky production?

My secondary research questions are:

i. Does an intervention to improve private protection of property influence the shape of social networks? Are smaller, deeper networks a way of substituting for imperfect property protection? Does an intervention to improve property protection cause people to form broader, more shallow networks?

ii. Does an intervention improving private protection of property cause substitution away from public institutions charged with protection property? If so, does the existence of private protection substituting for public institutions lead to an erosion in trust in and legitimacy of the substituted institutions?

iii. Does insecurity of property lead to more stereotyping along ethnic group lines? Does property insecurity cause farmers to prefer more authoritarian political leaders?

4 Experimental Design

4.1 Sampling and Recruitment

This experiment consists of a core sample, answering the main research questions, and a supplementary spillover sample that will be used to estimate the spillovers of a crime intervention.

4.1.1 Main Sample

The main sample of farmers for this experiment was drawn from the sample of farmers who participated in the RCT impact evaluation of Kickstart irrigation pumps. Treatment status in the irrigation RCT is used as a source of variation in agricultural productivity, and especially productivity in high-value fruits and vegetables. By using this sample I am also able to incorporate two rounds of baseline information prior to this experimental intervention.

The full sample of 837 farming households that participated in the endline of the irrigation RCT was filtered to facilitate the geographic cluster randomization described below. All households who were the only sampled household in their village were removed, as were all households for whom geographic location data was inaccurate. This left 735 farmers from whom the main sample was recruited.

Respondents were recruited by telephone in January 2018.[1] Respondents were asked if they were interested in participating in an experiment in property security where they may be matched with a farm watchman at a heavily subsidised rate. Respondents were asked if there would be any overt hostility or threat to the safety of a Maasai watchman coming to work in their community. Respondents were ineligible if they responded that they perceived there to be a threat. The sample was then trimmed further to those who said they would be able and willing to hire a watchman at the subsidized rate.[2]

The proposed sample is six hundred households from the 735 households in the restricted irrigation RCT sample.

4.1.2 Spillover Sample

In order to estimate the spillover effects of the intervention on the research questions, a supplementary spillover sample will be recruited. From the original sample of small geographic clusters, twenty treated clusters and ten control clusters will be selected by stratified randomisation. In each of those clusters, enumerators will be sent into the villages to record the GPS locations of the treated households. Enumerators will then conduct a convenience sample of other farming households in the village at varying distances to the households in the main sample. In total the spillover sample will include three hundred households.

4.2 Randomization Units & Method

The unit of randomization will be the village. This is motivated by the potential for interaction between treated and control, and to ensure that at least two watchmen are assigned to each village and that no watchman has to travel alone to a new place.

Clusters will be assigned to treatment using stratified randomization. Following

[1] Recruitment phone script available in full in Appendix C.

[2] Exact phrasing of question: *"If a Maasai watchman were available for 700 KSH a week, would you be able and willing to hire them?"*

Athey & Imbens, the ideal is to stratify as much as possible while ensuring that there are at least two treatment and two control units, so that variances can be estimated. In my case, where the share treatment is one-third, this means that to have two treated in each stratum requires six village units per stratum. I will stratify on the following variables:

i. **District:** My sample is in three districts with suitability for different crops, which will be important for the main outcome of crop choice.

ii. **Above/Below Median Unit Size:** The number of sampled households varies, so to ensure the ratio of treated households to control is correct, I will randomize within units of similar size.

iii. **Above/Below Median Village Avg. Irrigation Status:** Irrigation is a key factor in the agricultural decisionmaking of interest here, as it increases productivity overall and especially increases productivity in growing vegetables and other high-value crops.

In order to stratify by another variable and maintain at least 6 in each strata will require at least 144 clusters[3] in the sample, which is unlikely. However, in that case, the additional variable I will stratify on is:

i. **Above/Below Median Village Average WTP for Watchman:** During recruitment, respondents were asked for their willingness to pay for a watchman. As this valuation of a watchman reflects the perceived productivity of watchmen, this is an important catch-all indicator of a number of factors that influence the effectiveness of watchmen including predicted gain from altering crop choices and investment decisions, perceived trustworthiness of others in village, quality of local institutions, etc.

Stratifying by the first three partitions will divide the sample into 12 strata. This stratification will be implemented and deal with misfits with within-stratum, as described by Carril (2017) and Bruhn and McKenzie (2011).

[3]District divides the sample in thirds, and each of the two other partitions divides in half by definition, as they are by median. To partition by median again keeping a minimum of 12 in each strata would therefore require $6 * (3 * 2 * 2 * 2) = 144$ clusters.

4.3 Characteristics & Power

Given the sample size of 600 in approximately 100 clusters of 6 respondents each, the power calculations for my main outcomes, relating to the choice to plant theft-risky crops, are as follows. This design will be able to detect a 4% increase, corresponding to 0.26 standard deviations, in land allocated to high theft-risk crops relative to the district-level average, where high theft-risk crops are designated using objective characteristics of crops. This outcome is demeaned at the district level to account for geographic variation in crop suitability. I will also be able to detect a 3% increase in land allocated to high theft-risk crops, where high theft-risk is defined subjectively as being the crops mentioned in qualitative interviews as being theft risk. This will be supplemented with a more rigorously collected subjective theft-riskiness classification, with a supplementary sample of farmers rating crops on their perceived likelihood of being stolen[4], and an expert survey of a small sample of agronomists.

4.4 Data Collection Methods and Instruments

Data collection will be conducted using the SurveyCTO platform on Android tablets used by survey enumerators. The exact survey instrument text is uploaded as a supporting document with this Pre-Analysis Plan.

Baseline data was collected prior to assignment to watchmen treatment. Two rounds of baseline data were collected as part of the KickStart impact evaluation, and supplementary baseline data was collected by telephone in February 2018 prior to informing respondents of treatment status.[5] Respondents came to central locations in each of the three study districts where the surveys were conducted privately by trained and experienced enumerators. Backchecks were implemented for a subset of this sample to check the accuracy of the data.

Spillover data was collected for randomly selected villages/clusters by enumerators in the villages. Respondents visited all households in the main sample in the given villages to record their position by GPS. Enumerators then sampled random households at varying distances to the main sample households, recording both the location of the households by GPS and the approximate walking time from the nearest main sample household.

[4]See Appendix for supplementary sample crop theft-risk survey instrument

[5]See Appendix for full supplementary survey instrument.

4.5 Risk and Treatment of Attrition

Attrition is not a significant concern in this study due to Busara's previous relationship with the farmers in the sample, having surveyed them twice previously for the KickStart RCT. In addition, this study takes place over a single agricultural season, so the timeline is reasonably short and it is unlikely they will have moved by the time of the endline survey, immediately after the harvest season.

5 Econometric Specifications and Outcomes

Following the recommendations in Athey and Imbens (2017), I estimate treatment effects both at the village and individual level. Covariates are included in the form of indicator variables, so that estimates are easily interpretable as treatment effects on subpopulations. I will estimate standard errors estimated both using the Neyman randomization inference approach suggested by Athey and Imbens (2017) and regression-based robust standard errors.

Village-level covariates of interest (other than strata indicators) for agricultural production are as follows:

i. Irrigation RCT Treatment Status

ii. Baseline 2 Number Theft-Risky Crops Planted (above/below median)

iii. Baseline 2 Average Farm Size (above/below median)

iv. Baseline 1 Number Theft-Risky Crops Planted (above/below median)

v.

6 Outcomes & Expected Results

6.1 Agricultural Production

6.1.1 Theory of Change

i. Certain crops are more theft-prone than others. There are the crops that are worth the most and are physically easiest to steal. These are also the crops that are consumed locally, meaning they can be stolen for consumption, or are easily sold on unrestricted exchanges, meaning they can be stolen for resale.

ii. Institutions in Kenya provide weak security against theft. The police and chief's office are less than likely to put in enough effort to completely prevent crop theft.

iii. Farmers adjust their cropping decisions so that, given county-level suitability for different crops, they only grow theft-risky crops within a very small kitchen garden near their house that is easily guarded. This is particularly true of plots that are not near the main household plot.

iv. Theft primarily acts through *fear* of theft, where farmers adjust the theft-riskiness of their crops in anticipation of theft, even if they have not experienced it or don't know of any particular cases of theft. Theft can therefore have a strong effect even if levels of theft are low in equilibrium. An improvement in farm protection then would have little effect on observed levels of theft, as without good protection farmers adjust crop choices to reduce theft risk.

v. Subsidized farm watchmen improves subjective farm security and reduces risk of theft from planting valuable crops.

vi. If theft acts as a tax on highly-productive farmers (where theft may be excused/sanctioned by norms about sharing bumper crops) then farmers may invest more in crop inputs (fertilizer, buying water for irrigation, high-yielding seeds, etc.) when they know that theft as 'informal taxation' is not a concern.

vii. With subsidized protection, farmers change their crop decisions, planting more theft-prone and higher value crops.

viii. If farms choose to grow more high-value crops, they will buy fewer high-value fruit and vegetables. They will likely sell more of their high-value crops and buy more staples. Because staples are grown more locally, these staples will be lower price and farmers will do better.

6.1.2 Results Testing Argument

i. Table 1: Summary Stats

ii. Table 2: Establish that treatment (offer of subsidized watchmen) caused increased likelihood of having a watchman and a change in perceived property security

(a) Treatment Effect on likelihood of hiring watchman (1/0)

(b) Treatment Effect on number of weeks where farm protected by watchman

(c) TE on subjective farm security *****

(d) TE on expected likelihood of theft of high-value fruit-veg if planted *****

iii. Table 3: Having improved property security from subsidized watchmen leads farmers to change agricultural production decisions.

(a) TE on extensive margin: any theft-prone crops planted

(b) TE on intensive margin: land devoted to theft-prone crops

(c) TE on average theft-proneness of crops weighted by land share

(d) TE on average $ per kg of crops planted

iv. Table 4: Improved property security from subsidized watchmen has the largest effect where plots are further from the household.

(a) heterogeneous TE on Table 3 outcomes by distance from plot to household *****

v. Table 5: Farmers purchase a greater share of their staple crops and a lower share of their fruit and vegetables. If consumption doesn't change, then expect more market activity. If consumption does change, test if nutrition improves.

(a) share of harvest sold

(b) share of cereals consumption purchased should increase, share of vegetables consumption purchased should decrease

vi. Table 6: Establish that theft acts as a latent variable discouraging certain types of activity.

(a) TE on actual theft should be minimal: in equilibrium farmers adjust crops decisions to minimize theft

6.2 Institutional Substitution

6.2.1 Theory of Change

i. Theft from farms is a prevalent concern in rural agricultural areas, constraining what types of agricultural production are undertaken.

ii. With imperfect protection of property, farmers need to cultivate relationships with their neighbours and with local government and elders to ensure mutual protection of property.

iii. An improvement in the ability of farmers to protect their farms privately means they will no longer rely on these sources for the protection of their property.

iv. Mutual sources of protection will be superseded by private means

v. Private protection can influence relationships with neighbours, through a number of possible mechanisms:

   (a) (Mutual Protection): If farmers maintain tight relationships with neighbours to ensure that they protect each other, a watchman will mean they no longer have this incentive to maintain good relationships.

   (b) (Bribing Potential Thieves): If farmers worry their neighbours will be stealing from them, gifts may be used to bribe them into not stealing. Related Lit: Schechter

   (c) (Theft as Social Sanction): If theft is legitimised as an acceptable sanction where people have failed in some social obligation, then having a watchman means that farmers will not need to fear the punishment for not following social norms, and may have less reason to value their social obligations. Related Lit: Scott

   (d) (Resentment): If neighbours resent that the treated households receives the services of a watchman for free, this may lead to resentment and strain social relationships. Testable predictions: Neighbours must be aware of participation in experiment, and main households or neighbours would report resentment at random assignment. Related Lit: Haushofer & Shapiro, The Social Costs of Randomization.

vi. Private protection can influence relationships with state institutions (chief & police) or authority figures (village elders) through a number of possible mechanisms:

   (a) (Interaction): If institutional substitution leads to less interaction between respondent and institution, then this decreased interaction may lead to reduced trust and legitimacy. Testable predictions: negative

watchman treatment effect on trust in and legitimacy of government, negative effect on degree of interaction. Related Lit: Weigel JMP

(b) (Stereotyping / Judgment Standards): If experience with a very trustworthy and hardworking watchman gives respondents a new standard against which to judge the institutions they replaced, then they may judge these institutions more harshly in terms of competence and motivation. Testable predictions: negative watchman treatment effect on trust in and legitimacy of institutions, negative effect on perceived competence and trustworthiness. Related Lit: Shleifer Stereotyping

(c) (Attribution Bias): Less theft observed, attribute some of the credit for this to police/chief/neighbours. Testable predictions: positive treatment effect on trust & legitimacy of government, positive watchman effect on perceived competence/trustworthiness of institutions, improved trust in others.

(d) (Motivated Beliefs): Similar to Just World Hypothesis, where respondents have little option but to rely on institutions, they may prefer to have a more positive view of their competence/trustworthiness as an investment in future effectiveness. This would extend to other motivated beliefs, such as belief in bad luck as supernatural punishment of crimes. Testable predictions: negative watchman treatment effect on trust & legitimacy and negative effect on perceived competence & trustworthiness. Related Lit: Benabou & Tirole.

6.2.2 Results Testing Argument

i. Table 1: Summary Stats

ii. Table 1.A: Baseline info on institutional reliance?*****

iii. Table 2: Establish that treatment (offer of subsidized watchmen) influenced the degree to which watchmen relied on another source for protection (versus being self-reliant) and on different sources of protection:*****

   (a) chief's office

   (b) neighbours

   (c) village elders

iv. Table 3: Establish whether treatment (subsidized watchmen) influenced the degree to which farmers interact with and invest in relationships with different sources of protection:*

   (a) chief's office

   (b) neighbours

   (c) village elders

v. Table 4: Establish whether treatment (subsidized watchmen) influenced trust in and perceived legitimacy of institutions

vi. Table 5: Establish whether treatment (subsidized watchmen) influenced size/breadth of networks and their depth – number of common interactions and frequency of interaction

vii. Table 6: Test for possible mechanisms explaining why a change in reliance could influence legitimacy and trust. (Transactional legitimacy, motivated beliefs, information and investment in institutional effectiveness)

viii. Table 7: Test for direct evidence of interaction and knowledge of local leadership - ask if they know the name, office phone number, etc. of their chief/sub-chief and how many meetings were held, etc. This may be more reliable evidence of interaction with and reliance on government. (Would have to contact chief's office to verify numbers – not unreasonable for $\tilde{1}00$ villages)

A Supplementary Phone Survey

i. *If a thief were to try and steal from your farm, do you think they would be successful? (Please rate from 1-5, where 1 means your farm is well protected and nobody could steal, to 5 where your farm isn't secure and thieves would be successful)*

ii. *In the last long rainy season, if you had planted different crops than the other farmers in your area, how likely is it that they would have been stolen? (Please rate from 1-5, where 1 means there is no chance they would be stolen, to 5 where they definitely would have been stolen)*

iii. *In the last long rainy season, if you had planted high-value crops how likely is it that they would have been stolen? (Please rate from 1-5, where 1 means there is no chance they would be stolen, to 5 where they definitely would have been stolen)*

iv. *Do you plant vegetables outside of a protected garden near the household's dwellings? (Answer: Yes/No*

v. *Who in your community is the most important for protecting you from crime and theft? – Options: Chief, Village Elders, Neigbours, Police, Nobody, (Other/specify)*

vi. *How much do you rely on each of the following to protect you from thieves and crime? Please rate on scale 1-5, where 1 indicates that you don't rely on them at all, 5 indicates that you rely on them completely for protection.*

   (a) ... *Chief?*

   (b) ... *Village elders?*

   (c) ... *Neighbours?*

   (d) ... *Police?*

   (e) ... *Private farm watchman?*

   (f) ... *some other?, (rate out of 5 and specify)*

vii. *In the last long rainy season, did you ever give gifts to :*

   (a) ... *the chief?*

   (b) ... *your neighbours?*

   (c) ... *village elders?*

viii. *If the chief held a community meeting, how likely would it be that you attend? Please rate on scale of 1-5, with 1 being no chance of attending and 5 being definitely attend.*

ix. *Who do you think is most likely to try and steal from you?*

(a) *Strangers from outside the village*

(b) *Poor landless people*

(c) *People whose crops failed*

(d) *Other ethnic groups in your area*

(e) *Other, specify*

B Crop Theft-Risk Survey

i. *For each of the following crops, please rate on a scale from 1 to 5 the likelihood of that crop being stolen by thieves if you were to plant it during the long rainy season. [Loop over all crops included in survey.]*

C Phone Recruitment Script – Core Farming Households

Hello my name is [Enumerator Name] from Busara Center for Behavioral Economics which is a non-profit research organization based in Nairobi, Kenya. We have been in contact with you in the previous year for a kick-start project.

Am I speaking to [respondent name]? Do you have 5 minutes to talk?

(If yes, enumerator continues)

We are contacting you to ask if you would like to participate in a research project that seeks to learn about you and your household's experience with farming, protecting your property and your interactions with people in your community.

Are you interested in participating in this study? If yes we will give you further details about the project when we meet with you in person.

Also, we have further questions to ask you

i. Would there be any threat to the safety of a watchman if they came to work in your village?

ii. How much would you be willing to pay per week for a watchman to guard your farm?

iii. How much are watchmen normally paid per week?

iv. If a Maasai watchman were available for 700 KSH a week, would you be able and willing to hire them?

   - *(If respondent says no at 700ksh)* If a Maasai watchman were available for 600 KSH a week, would you be able and willing to hire them?

v. Could you confirm which village you live in? *(Enumerator checks village name against villages in cleaned list – if village not in cleaned list do follow-up questions)*

   (a) Have you moved in the last year?

   (b) Does your village go by another name?

vi. When will you start planting for this year's long rainy season?

Thanks so much for talking to us, we will reach out again to plan on when to meet you and tell you more about the project. Have a good day!

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