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 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 Nyanza Province, Kenya, where smallholding farming is the primary economic activity and where formal institutions imperfectly protect 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 August-December planting 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 the field coordinator in early June, giving them time to adjust planting decisions and input purchases. 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.

To ensure all farmers in the sample have the same access to information and crop inputs, all farmers in the sample receive the exact same notification by SMS of information and training sessions hosted by the local KALRO affiliate organization, Community Action for Rural Development (CARD). These extension programs are the exact same program currently offered by CARD in this region and is accessible to all farmers in the region, and is typical of the agricultural extension services that are prevalent in rural areas of less-developed countries in general. Access and invitation to these sessions is completely even across treatment and control groups.

3   Research Questions

My main research question is:

i. Does perceived insecurity 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 are drawn from the field networks of the Kenyan Agricultural and Livestock Research Organization (KALRO) in Migori county. The local KALRO affiliate in Migori County is the organization Community Action for Rural Development (CARD) who maintains connections with farmers through a grassroots Farmer Research Network (FRN) which empowers farmers to undertake grassroots research projects where the community chooses research topics. This region was selected for lack of ethnic hostility towards Maasai as well as proximity to Maasailand, meaning transport is feasible.

The agricultural conditions in Migori allow for planting of high-value crops in addition to local staples, and is a reasonable distance from urban centres giving an opportunity for farmers to seek off-farm employment during this planting season.

A sample of ten farmers was selected in sixty villages for a total of 600 farmers in the core sample. This sample was recruited using the farmer networks maintained by the Kenya Agriculture and Livestock Research Organization (KALRO). This recruitment procedure was designed to mimic the standard mobilization procedures used by KALRO in their regular agricultural extension programming. After sixty villages in three sub-counties (Suna East, Suna West and Uriri) near Migori town were identified, information meetings explaining the project and intervention were conducted with leadership of the farmer's group in each village.[1] Ten farmers were selected at each meeting within the village's farmers' group, who were then invited to a session where they signed consent forms and baseline data was collected. The consent and survey sessions with individual farmers take place from May 29th to June 5th.

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[1]See Appendix for information session script.

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.[2] Following 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. Within this constraint of six villages per stratum, I plan to stratify on the following variables:

i. **Sub-County**. I first stratify by the three sub-counties (Suna East, Suna West and Uriri) included in the sample. This is to control for geographic endowments and the type of agriculture practiced, along with other regional differences.

ii. **Village Mean WTP For Watchman**. Self-reported willingness to pay for a watchman acts as an aggregate measure of how important security is in a particular village, so is an important variable for stratification.

In order to stratify by another variable and maintain at least 6 in each strata, it will be possibly to stratify by sub-county then by above/below median on self-reported WTP only with a sample of 60 villages. Stratifying by these variables partitions will divide the sample into 6 strata. This stratification will be implemented and

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[2]Random Seed: 69052039. Generated from https://www.random.org/ on May 19, 2018.

deal with misfits by the within-stratum approach, as described by Carril (2017) and Bruhn and McKenzie (2011).

4.3   Characteristics & Power

Given the sample size of 600 in approximately 60 clusters of 10 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.

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 as exit surveys after the consent & information sessions.[3]

Spillover data will be collected for randomly selected villages by enumerators in the villages. Respondents will visit all households in the main sample in the given villages to record their position by GPS. Enumerators then sampled neighbours and other 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.

4.4.1   Demand for Agricultural Extension

As mentioned above, CARD offers training sessions open to farmers in this area to learn techniques for planting crops and get information about accessing inputs. All farmers in this experiment will receive the same SMS invites to these sessions, and attendance will be taken at sessions and later matched to watchman treatment status. This data provides another way to test to test if improved security increases

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[3]See Appendix for full supplementary survey instrument.

the demand for information on new crops and improved inputs, and which crops they become interested in.

4.5   Risk and Treatment of Attrition

Attrition is not a significant concern in this study due to the good relationship between the KALRO field coordinator and the farmers. 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   Data

I will use a number of data source to classify crops as being theft-risky or not. First, high theft-risk is defined subjectively as being the crops mentioned in qualitative interviews as being theft risk. This will be supplemented with an expert survey of a small sample of local agricultural experts. This will be supplemented by an objective measure of theft-risk based on the following categories that qualitative evidence suggest are important for theft-riskiness:

- Price per KG (reflective of resale value, and also local preferences over theft for consumption)

- Time to harvest (easy-to-pick crops are perceived as being a bigger risk than those where a great deal of labour is required to harvest)

- Sold in open local markets or consumed locally (crops such as unprocessed tea or tobacco are only sold to processing plants, not consumed locally, and are perceived as low-risk for theft)

- Time of harvest relative to most common local staple (the incentive to steal is higher for crops that are mature when food is more scarce prior to the harvest of the main staple)

- Length of Maturity Window (crops that mature all at the same time such as avocadoes or sorghum are perceived to be higher risk than bananas or passionfruit, which mature at staggered times)

- Baseline share of farmers growing this crop (risk to each individual farmer is perceived to decrease in number of farmers growing that crop)

6 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.

My main empirical specifications will be a regression of the outcome variable on treatment status dummy, and controlling for randomization strata indicators.

In further specifications, I will include household covariates and village-level covariates.

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

i.

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

i.

7 Outcomes & Expected Results

7.1 Research Questions

- Does an improvement in property security allow farmers to plant more valuable crops? Does this freedom allow farmers to:

  - experiment and gain information improving future productivity?
  - test their beliefs about theft & security and possibly update overly mistrustful perceptions?

- How do concerns over property security constrain other types of economic activity?

  - Improved security is a concern for farmers who engage in off-farm economic activity. With improved security, will see more off-farm enterprises and work.

– Broader networks and more interactions outside own community may reduce parochialism

- How does changing one person's cost of securing property impact others? This depends on the beliefs people have about those around them and the perceived nature of crime. Two scenarios:

  – *Safety in Numbers:* Fixed/Known supply of targeting (non-random) thieves. In this scenario, the effectiveness of security interventions for one farmer depend on the number of other farmers also experimenting. If people believe that the number of thieves is fixed, then more people experimenting will mean they are spread out over more targets, reducing the risk to each farmer. In this case, property rights is a sort of coordination problem, where if everyone switched to do theft-prone agriculture the risk to each individual would be much lower.

  – *Good fences make good neighbours:* Variable supply of opportunistic/random thieves. If people perceive theft to be opportunistic by nearby people, then effectiveness of security will not depend on the intensity of treatment. In this case, security will reduce suspicion of neighbours and tensions arising from uncertain property security.

- How does the existence of effective public property rights protection, or lack thereof, shape social networks? Do people have broader and shallower social interactions when they have security?

  – If mutual security (where neighbours protect each other's property) or strong relationships and mutual support (similar to gift-giving to deter theft – see Schechter) are responses to poor security, then does decreasing the cost of securing property lead to broader relationships?

- Does the existence of private property protection substitute for public institutions, reducing their legitimacy and the degree to which they are trusted?

  – Does the existence of private alternatives to public institutions act through information and a comparison/stereotyping channel? Test this by looking at neighbours who are less likely to directly benefit from having protection, but will observe the competence of private watchmen and the different it makes. Does this raise the bar and make people more critical of public institutions?

7.2 Outline of Argument

Imperfect property security and the fear of theft constrain economic activity. Two examples of this are the planting of high-value stealable crops and taking work or starting enterprises away from the farm. An intervention to improve security of farms will therefore see increased land allocated to high-value agriculture and greater likelihood of pursuing economic activities away from the farm. The nature, or more accurately the *perceived* nature, of property insecurity is of great importance for understanding whether interventions in property security have broad spillovers. The existence of positive externalities would justify increased spending on security and state-building at the micro-level as valuable public goods, where private decisions focused only on direct personal benefits lead to sub-optimal investment.

I consider two broad types of spillovers. The first are direct benefits to the effectiveness of coordinating investments in security. One perceived explanation for crime in villages is that there is a fixed number of thieves that cause property risk. If this is the case, then as the number of farmers pursuing higher-risk strategies (either planting more valuable crops or pursuing more off-farm economic activities) increases then there are more potential targets for theft, and the risk to any individual pursuing higher-risk activities is lower.

The other type of positive externalities are potential indirect benefits to others through social learning, improved social cohesion and effects on legitimacy and trust in institutions. If improved property security leads to greater experimentation by farmers, the knowledge gained from this experimentation may spread to other farmers in their community. This could be direct knowledge about agricultural production, or it could be information about the actual risk of crime. As expectations of crime risk are mostly hypothetical, and not learned through own experience, then it is possible that the risk of crime is over-estimated. If farmers experiment with high-risk activities and find their security is less active and they face fewer theft attempts than expected, they may revise their expected frequency of theft events downwards, and this knowledge may also diffuse to other farmers. If it is indeed true that *'good fences make good neighbours'* then improved farm security may reduce disputes. Farm security may also lead to broader social networks (if it causes greater off-farm employment or gives greater incentives for intra-village trade through increased specialization) and less ethnic parochialism, if out-groups are stereotyped as being responsible for crime.

7.2.1   Logic of Argument

i. Improved security relaxes constraints on crop choices and time spent on off-farm economic activities.

    (a) Agricultural Production:

        i. Subsidized farm watchmen improve subjective farm security and reduces risk of theft from planting valuable crops

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

    (b) Off-Farm Enterprises & Employment

        i. Subsidized farm watchmen improve subjective farm security and reduces risk of leaving farm unattended to do work away from the farm

        ii. Improved security should lead to more farmers taking work off-farm and starting more off-farm enterprises.

ii. Improvements to security may have positive spillovers by enhancing the effectiveness of other investments in security

    (a) Coordination problem / safety in numbers

iii. Improvements to security may have indirect benefits to neighbours:

    (a) Technology Learning: When some people have security they try new things and then learn new things. Others learn from them

    (b) Beliefs Learning: When people have security, they test whether others actually try to steal from them: learn from their watchmen about actual theft attempts, correct their beliefs.

iv. Improvements to security may have other effects the individual farmer may not value, but a social planner might:

    (a) Political Opinions

        i. Farmers observe they are able to protect property rights themselves.

        ii. Farmers are less reliant on public institutions (local government, chief's office) for property security

        iii. Substituted institutions have lower legitimacy among farmers

(b) Social Interactions & Attitudes

    i. Thieves perceived to come from other groups, or non-neighbours → reduced fear of theft leads to less stereotyping

    ii. Broader economic networks and more interactions outside very local area

    iii. theft-prone crops are more marketable → subsidized farm protection gives greater incentive to trade and interact outside close neighbours

7.2.2 Results Testing Argument

Note: results listed in **bold** will have baseline data and higher power.

    Table 1: Summary Stats.

i. Improved security relaxes constraints on economic activities.

    (a) Agricultural Production – Table 2

        i. **Manipulation Check: Test Treatment Effect (TE) on hiring a Watchman (binary and number of weeks)**

        ii. **Test Treatment Effect (TE) on subjective/perceived farm security.**

        iii. **Test TE on farmers share of land used for theft-prone crops.**

        iv. **Test TE on farmers trying new crops. (1/0)**

        v. **Test TE on share of land used for new crops. (1/0)**

    (b) Off-Farm Enterprises & Employment – Table 3

        i. **Test TE on perceived security risk from engaging in off-farm economic activity.**

        ii. **Test TE on off-farm enterprises (1/0)**

        iii. **Test TE on off-farm employment. (1/0)**

    (c) Scale of Farming – Table 4

        i. **Test TE on total amount of land planted.**

ii. Improvements to security may have positive spillovers by enhancing the effectiveness of other investments in security

    (a) Coordination problem / safety in numbers – Table 4

     i. **Test for heterogeneous treatment effect on main outcomes (Table 2,3) by village treatment intensity.**

     ii. Test effect of having treated neighbour on perceived farm security

iii. Improvements to security may have indirect benefits to neighbours:

  (a) Technology Learning –Table 5

     i. Test TE on treated farmer trying new crops, learning new techniques.

  (b) Beliefs Learning – Table 6

     i. **TE on change in beliefs: baseline likelihood of thefts & hypothetical future beliefs on likelihood of thefts with no security**

     ii. TE on whether their watchman was more/less busy than expected.

     iii. TE on self-reported change in beliefs on likelihood of thefts

     iv. Test effect of having treated neighbour on beliefs on likelihood of thefts

iv. Improvements to security may have other effects the individual farmer may not value, but a social planner might:

  (a) Political Opinions – Table 7

     i. **TE on opinion of local chief effectiveness**

     ii. TE on trust of local chief

     iii. TE on reliance on other institutions

  (b) Social Interactions & Attitudes – Table 8

     i. **TE on self-reported trust of neighbours**

     ii. TE on trust game results with neighbours

     iii. TE on stereotyping 'others' and ethnic out-groups as being at fault for crime

     iv. **TE on self-reported trust of ethnic out-groups**

     v. TE on trust game results with outgroups

     vi. Test TE on on number of social relationships outside immediate neighbourhood.

     vii. Test TE on on selling and trading more within-village

References

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A   Crop Category Definitions

The following are variables I classify as Fruits and Vegetables:

- Amaranthus, Avocado, Banana/Plantain, Squash, Cabbage, Carrots, Dania/Coriander, Courgettes, Mito/Crotolaria, Cucumber, Eggplant, Kale, Mangoes, Melons, Miraa, Okra, Onion, Passion Fruit, Pawpaw, Peppers, Pineapple, Pumpkin, Radishes, Spider Plant, Spinach, Sweet Pepper, Tomatoes.

B   Recruitment Information Session Script

Hello, my name is Julian Dyer, I'm a PhD student at the University of Toronto and I'm are here to tell you about a research project that will be running in your area. This project is an experiment to understand how security concerns influence your business as farmers.

The way this works is we will empower some farmers with improved security by matching you with high-quality Maasai watchmen from Narok District at a subsidized wage rate. This design has been chosen because of their reputation for being very trustworthy guards and because as outsiders in the community, they will not have other obligations to allow others to steal the crops they are guarding.

Their pay comes mostly from the research budget I have been allocated for this project, but farmers will pay 250 Kenya Shillings per week to the watchmen. The watchmen will be available for up to six weeks to work for the farmer they have been matched with, or less if the farmer chooses they do not want to hire them for that long. If the farmer wants to continue working with the watchman after the six weeks, then you can arrange a separate contract with the watchman once this project is finished. This project currently takes place during the upcoming short rainy season, with the planting beginning during August.

To learn about Security and Agriculture, it is important to compare people who have improved security to those who are farming under normal conditions. For this reason, once we have recruited a sample of ten farmers from each village in the sample who are interested in participating, we will enter all that data into a computer and randomly select the twenty villages where farmers will be matched with watchmen. We are not personally selecting the villages to be matched with watchmen and all villages have an equal chance of being selected.

This project provides only an improvement to security, not inputs or marketing services or anything else. There will be one watchman per farmer in selected villages. The watchman will protect the crops you choose to grow, all produce and profits are yours to keep. The watchmen will only be doing security work, not providing any other farm labour.

After we take your questions, we will break into groups by village and provide the names of ten farmers from each village who may be interested in this project, who will then be invited to a session to sign forms and answer a questionnaire.

Thank you for your time! I look forward to working together!