

FARMERS, FORESTS, AND THE STATE
Essays on the Political Economy of Illegal Forest Use in Tanzania

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Abstract

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This series of essays explores risk perceptions and decision-making vis-à-vis state-owned and protected forests from the perspective of the rural agriculturalist. With comparative case studies of villages in Tanzania's Kilombero Valley, I ask two overarching questions: *1) what are the costs and benefits agriculturalists consider when deciding whether to illegally cut from protected state forests?* And *2) how do overlapping social, economic, and political institutions influence those calculations?* Using extensive primary survey and interview data, as well as a list experiment to capture estimated rates of illegal forest cutting, I explore: 1) how and under what conditions community monitoring programs influence illegal forest use when monitors exist but are inactive; 2) how land titling processes, which are increasingly common throughout SSA, send signals of state capacity that spill over onto the forest sector, engendering forest policy compliance; and 3) how local knowledge and experience can be thought of as a form of power enabling locals to better evade forest restrictions. Together, these essays help explain, from the perspective of forest users, the signals that shape perceptions of state coercive capacity and elucidate important household behavioral trends in forest use.

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Table of Contents

INTRODUCTION	6
1.1 Theoretical and Empirical Contributions.....	8
1.2 Three Articles: The Perceived Costs of Illegal Forest Use.....	8
1.3 Methods.....	10
References.....	14
Appendix 1.1.....	17
THE MYTH OF COMMUNITY MONITORING.....	18
2.1 Introduction.....	19
2.2 Community Monitoring in Tanzania	23
2.3 The Myth of Monitoring.....	26
2.4 A Conditional Impact of the Myth on Behavioral Change.....	45
2.5 Conclusion	51
References.....	53
Appendix 2.1.....	58
LAND TITLING AS A SIGNAL OF STATE CAPACITY	59
3.1 Introduction.....	60
3.2 Land Control in Tanzania: a history	61
3.3 The Registration Process and Reputational Spillover.....	67
3.4 Methods.....	70
3.5 Results.....	73
3.6 Discussion.....	80
3.7 Conclusion	81
References.....	82
Appendix 3.1.....	85
Appendix 3.2.....	86
A LOCAL'S GUIDE TO EVADING FOREST RESTRICTIONS.....	87
4.1 Introduction.....	88
4.2 Local Communities and Forest Use.....	90
4.3 Local Power to Confront Barriers to Entry.....	95
4.4 Methods.....	100

4.5	Results and Discussion	103
4.6	Conclusion	113
	References	114
	Appendix 4.1	118
	Appendix 4.2	119
	CONCLUSION	120
	References	125
	Appendix 5.1	127

INTRODUCTION

Over one billion people worldwide rely on tropical forests for their livelihoods and food security (either for timber revenue, agricultural and hydrological services, medicines, or edible forest products, such as bushmeat, fruits, and nuts). Yet, political and economic circumstances often place local users in the unsustainable situation of incrementally diminishing their own means of survival through rampant deforestation. Subsistence agriculture (including fuelwood collection and charcoal-making) accounts for, at approximately 40%, the largest share of deforestation in sub-Saharan Africa (SSA).¹ In Tanzania, an estimated 70% of deforestation can be attributed to woodfuel production alone.²

The Kilombero Valley of the Udzungwa Mountain forests shares the dilemma faced by so many natural resource areas throughout sub-Saharan Africa: a need for resource conservation and a simultaneous economic and cultural need to maintain some continuation of resource use. To protect forests in a way that is not economically or socially disruptive to those who depend on them is not merely culturally sensitive; failure to incorporate the incentives and constraints of forest users will necessarily make policies to combat forest loss either prohibitively costly, politically infeasible, or ineffective.

To better understand the multiple factors underlying subsistence forest use in SSA, this series of essays explores decision-making and risk perceptions from the perspective of the rural agriculturalist abutting the Udzungwa Mountain forests, state-owned forests along the southern rim of the biodiversity-rich Eastern Arc Mountains of Tanzania. With comparative case studies in four forest-adjacent villages around two of these forests, Magombera Forest and the Udzungwa Scarp Forest, this series of essays contributes to a more nuanced model of agriculturalist decision-making vis-à-vis state-owned and protected forests. I ask two overarching questions: *1) what are the costs and benefits agriculturalists consider when deciding whether to illegally³ cut from protected state forests? And 2) how do overlapping social, economic, and political institutions⁴ influence those calculations?* Using extensive primary survey, interview and spatial data, I investigate three of the myriad contextual factors that influence individual risk perceptions of illegal forest use, with a focus on understanding intra-community variation in responses to forest policy.

I seek to contribute to a more nuanced understanding of forest use in the SSA context, where institutional and market pressures differ significantly from the oft-studied Latin American and Southeast Asian cases in two important ways.⁵ First, while international market pressures and large-scale commercial farming (e.g., for soy, cattle, palm oil, and timber) constitute the bulk of forest pressure in other contexts, deforestation in SSA is overwhelmingly fueled by

¹ FAO, 2016.

² CIFOR, 2015; 9

³ I use the word “illegal” here and throughout this series of papers not because of a personal political or moral stance on the issue, but purely because the action is considered illegal under the Tanzanian government’s legal system and by the villagers interviewed for this research.

⁴ I hold here Douglass North’s understanding of institutions, i.e., “Institutions are the humanly devised constraints that structure political, economic and social interaction. They consist of both informal constraints. (sanctions, taboos, customs, traditions, and codes of conduct), and formal (North, 1991; 97).”

⁵ Rudel, 2013.

smallholder subsistence farming pressures and domestic charcoal markets;⁶ the Kilombero Valley of the Udzungwa Mountains follows this pattern.⁷ Udzungwa-adjacent communities rely on nearby forests for their energy needs, building poles (construction material), supplemental income, as well as agricultural expansion, particularly during times of drought.⁸

Second, forests are overwhelmingly owned and “managed” by governments in SSA (approximately 95%), though formal management is effectively non-existent in many cases (e.g., only 4% of forested land in Tanzania is under an official management plan).⁹ The SSA context necessitates attention to the nuances shaping smallholder farmers’ cost-benefit analyses of land and forest use in order to formulate policies that best serve the interests of forest users, as well as African governments, which recognize their forests as important cultural and economic assets.

Tanzania

Tanzania is an optimal country in which to carry out this research for two primary reasons. First, relative political stability, clearly defined forest boundaries and laws, and governmental recognition of the importance of forest sustainability make it a sort of “best case” scenario, which other countries will likely follow as an example.

Second, the underlying pressures for land clearing and the underlying constraints to effective enforcement in Tanzania are similar to those faced throughout agricultural SSA. 70-80% of the population is engaged in subsistence farming, compared to 80-90% in all of tropical SSA.¹⁰ Smallholder farmers who use the cleared land for charcoal, housing poles, and agricultural production are directly responsible for the bulk of forest clearing in Tanzania as elsewhere in SSA. Tanzania’s development experience of urbanization without industrialization, which mirrors the development experience of much of SSA,¹¹ puts additional stresses on forests; urban households, which have generally larger incomes but are lacking in modern energy sources, consume significantly more charcoal energy than rural households.¹² Additionally, throughout SSA and including Tanzania, *de jure* property rights are sub-optimally defined and enforced, creating tenure insecurity and making Payment for Ecosystem Services (PES) schemes, such as REDD+, challenging to implement successfully.¹³ Approximately 2-10% of

⁶ FAO, 2016.

⁷ Harrison, 2006; p. 14, 23, 30, 40

⁸ Harrison, 2006; p. 5, 20-21, 32

⁹ URT, 2012.

¹⁰ FAO. This includes areas south of the Sahara and north of Namibia, Botswana, and South Africa

¹¹ Rudel, 2013

¹² For every 1% increase in urbanization, there is a 14% increase in demand for charcoal (CIFOR, 2015)

¹³ Lund et al, 2016. Results of decentralization and participatory forest management plans in Tanzania have been mixed, mostly due to the incomplete nature of the reforms (Ribot *et al*, 2006; Lund and Treue, 2008). Though some cases in Tanzania have had positive results on resource conservation, these are relatively few. As of the mid-2000s, only 23 villages had decentralized forest management. REDD+ and Participatory Forest Management (PFM) too represent a tiny fraction of forest management (approximately 2%) in Tanzania. While national laws support community forest management, implementation on the ground “faces uncertainty due to poorly produced land-use plans and existence of village lands that are unregistered (CIFOR, 2015; 17).”

land in SSA is under official titles; in Tanzania, only 2% of land is registered under private title.¹⁴

1.1 Theoretical and Empirical Contributions

This project builds on a wealth of research in the natural and social sciences on forest use and management, contributing a novel approach. I rely on a political economy perspective to investigate how formal and informal institutions shape smallholder farmer risk analysis and behavior vis-à-vis proximate forests.

I borrow Ostrom's institutional approach, taking as a key assumption that institutions, whether they be *de jure* or *de facto*, or of a political, cultural, or economic nature, shape user behavior. Ostrom (2010) notes, "Biologists recognize that an organism's appearance and behavior are affected by the environment in which it develops.... Social scientists also need to recognize that individual behavior is strongly affected by the context in which interactions take place rather than being simply a result of individual differences (20-21)." A primary objective of this project is to understand the broader context and institutional structures in agricultural Tanzania, so as to better structure and implement policies that can effectively conserve precious forest resources without compromising the livelihoods of smallholder farmers.

This research primarily elucidates *household behavioral trends*, a necessary complement to research on deforestation as determined by satellite imagery of canopy covers or measures of tree density, diameters, etc. for two reasons: 1) where forests are primarily used for firewood and timber rather than agricultural expansion (as is common in Tanzania), the canopy cover may remain intact while the underbrush and forest biodiversity are fully depleted;¹⁵ and 2) observing aggregate deforestation and attributing it to all households equally misses key elements of the story; is all forest clearing occurring at the hands of one individual, or is each household in a community contributing equally?¹⁶ Rather than assessing the health of forests, this research addresses behavioral variation of forest users; it lays the groundwork for developing a sort of Gini coefficient of forest use with the hope of informing more efficient and equitable forest policy.

1.2 Three Articles: The Perceived Costs of Illegal Forest Use

A central objective of this research is to better understand how villagers conceive of risk and other costs and how they incorporate their perceptions into illegal forest use decision-

¹⁴ Boone, 2014

¹⁵ For instance, Andrew Marshall finds that the major forest damage to occur in Magombera forests, Tanzania, is below the canopy level; this important destruction of smaller trees, which are paramount for maintaining the forest's biodiversity and supporting forest mammals, goes undetected by satellite imagery.

¹⁶ In addition, there are important methodological challenges associated with comparing forests across sites, due to variation in ecological zones. As an example, average diameter at breast height, a common tree measure, is strongly affected by elevation, soils, and rainfall conditions. In light of this challenge, the International Forestry Resources and Institutions (IFRI) has the foresters and ecologists supervising forest data-collection report forest health on a five-point scale (Ostrom, 2010). While this allows the rating to speak to the forests in question more directly, it continues to leave room for variation across forest sites, as there is likely to be some subjectivity involved.

making. While the benefits of “free” firewood are relatively constant (nearly all villagers in this study are rural, subsistence farmers lacking sufficient firewood, which they rely on for cooking),¹⁷ the costs of illegal firewood collection are more varied. Costs depend on individual, or perceived, valuations for: 1) the opportunity cost of doing other activities; 2) the transaction costs of gathering information on forest access; and 3) the (perceived) cost of punishment. This series of papers focuses on intra-community variation on different components of the latter two. Perceived costs of punishment, for its part, depends on one’s expected punishment if caught times the perceived probability of being caught, either by state patrollers, community monitors, or being observed and then reported on by a fellow villager. These real and perceived costs are captured by the following calculation for each individual household i :

$$\text{Cost of firewood collection}_i = \text{information gathering cost}_i + \text{punishment cost}_i + \text{opportunity cost}_i$$

where

$$\text{Punishment Cost}_i = \text{Pr}(\text{getting caught})_i \times U(\text{punishment})_i$$

and where $\text{Pr}(\text{getting caught})_i = \text{Pr}(\text{caught by patrol})_i + 1 - \text{Pr}(\text{caught by patrol})_i \times \text{Pr}(\text{observed by villagers})_i \times \text{Pr}(\text{villagers report})_i$

Each of the following essays explores a different dimension of these perceived costs and, especially, perceived punishment costs of illegal forest use. Cost perceptions necessarily has an element of subjectivity, as denoted by the subscript i following each of the perceived costs and expected (or negative utility of) punishment. I demonstrate how forest laws, community monitors, and land titling programs each shape costs and risk perceptions differentially across subgroups; and, in doing so, help explain why these institutions have uneven impacts on illegal forest use.

Article 1, titled “**The Myth of Monitoring**,” explores the impact of stealth monitoring institutions on perceived risk of forest use. Community monitoring programs and their associated secret villager informants, though largely inactive and without teeth, inspire a great deal of fear within the research sites. Secrecy and myth help perpetuate and give plausibility to rumors. While the myth permeates both forest sites, however, it only curbs illegal cutting in the Udzungwa Scarp. With in-depth qualitative and survey analysis of two forest sites in south-central Tanzania, I show how existent norms of forest use (communal versus private firewood collection), which are themselves influenced by local laws and institutions, either allow or don’t allow for the myth of monitoring to shift behavior. I demonstrate that it is only when villagers collect firewood *collectively* that inactive community monitoring schemes influence villager risk perceptions, and so behavior, vis-à-vis illegal cutting. This paper explores the nuances of

¹⁷ Only 7% of survey respondents in the four villages studied report having sufficient firewood.

community monitoring to shed light on why and under what conditions the *myth* of monitoring, in the absence of real enforcement, can promote behavioral change.

Article 2, titled “**Land Titling as a Signal of State Capacity**,” investigates the indirect impact of a land titling pilot program in the Kilombero Valley on perceived risks of forest use. I argue that the process of registering for a title, which entails district government surveyors physically coming and measuring land, taking photos, and collecting signatures is a strong and unmistakable marker of central government capacity and control over the land sector (a sector that plays the dominant role in villagers’ lives, as it shapes their livelihoods and food security). I exploit the fact that the registration process was to come in stages and, at the time of research, only 57% of landowners had registered their land for a title. I show that these households are significantly and substantially less likely than other landowners to have illegally cut from the neighboring forest in the previous year. Further, Registered households are also more likely to over-report the frequency of central government patrolling activities. Whereas Article 1 focuses on the stealth presence of patrollers, Article 2 examines how the very visible presence of the state in one domain (land policy) has spillover effects onto another (forest policy compliance).

Article 3, titled “**A Local’s Guide to Evading Forest Restrictions**,” compares “local” and “non-local” households in their ability and willingness to disobey forest laws. It is an opportunity-based argument rather than a need-based one: in both Magombera Forest and the Udzungwa Scarp, locals face lower real and perceived costs of forest use, resulting in greater instances of illegal cutting. I argue that this is due to two primary factors that make forest use more costly for non-locals: 1) newer migrants are less familiar with and thus intimidated by forest-related activities as well as forest patrollers; and 2) norms and legal context inhibit locals from sharing important information regarding the forests with new migrants, including common access points, ways to avoid injury and capture, etc. Equity-minded implications of this finding are that newcomers who might have a greater need for forest resources (more vulnerable, land scarce or insecure households), are not given an “in”. New migrants, who lack historical and spiritual connections to the forest, are often painted as the prime contributors to deforestation; this paper suggests a more nuanced view of local behavior and a need to revisit beliefs about locals as guardians of forests in certain contexts.

1.3 Methods

To investigate these questions, I use a mixed methods research design. I conducted 136 semi-structured interviews with villagers and 682 household surveys, including a list experiment, in four¹⁸ villages in Tanzania’s Kilombero Valley District from March through July 2018. I carried

¹⁸ I say four because the village of Ikule (bordering the Udzungwa Scarp forest) was in the process of splitting into Ikule in the south and Kikoleko in the north; though, at the time the fieldwork was conducted, the official designation had not yet gone through, the villages were understood to be distinct from one another and in the process of legally dividing.

out an additional 25 interviews with village leaders, village and district elected officials, forest patrollers, industry executives, and NGOs.

I trained and worked with seven Tanzanian research assistants for the project, including three survey numerators, one interview translator, and three local village assistants.

Research Sites

The Kilombero Valley is a fertile valley in the Morogoro Region which abuts the Udzungwa Mountains. The Udzungwa Mountains National Park and forest reserves are particularly important for ecological biodiversity. Further, they are catchment forests, meaning that they serve important ecological functions, such as encouraging rainfall, stabilizing water flows, and reducing erosion, landslides, and floods. Effects of further forest degradation in the Udzungwa forests thus include: soil erosion, sedimentation of dams and rivers, the spread of pollutants and disease, and threats to wildlife.¹⁹ Beyond being integral to human livelihoods and species conservation, Udzungwa is an important water source for Tanzania more broadly. 30% of Tanzania's hydroelectric supply comes from the Kihansi and Kidatu dams, each with water supplied from the Udzungwa Mountains.²⁰

Udzungwa Mountains and Research Sites

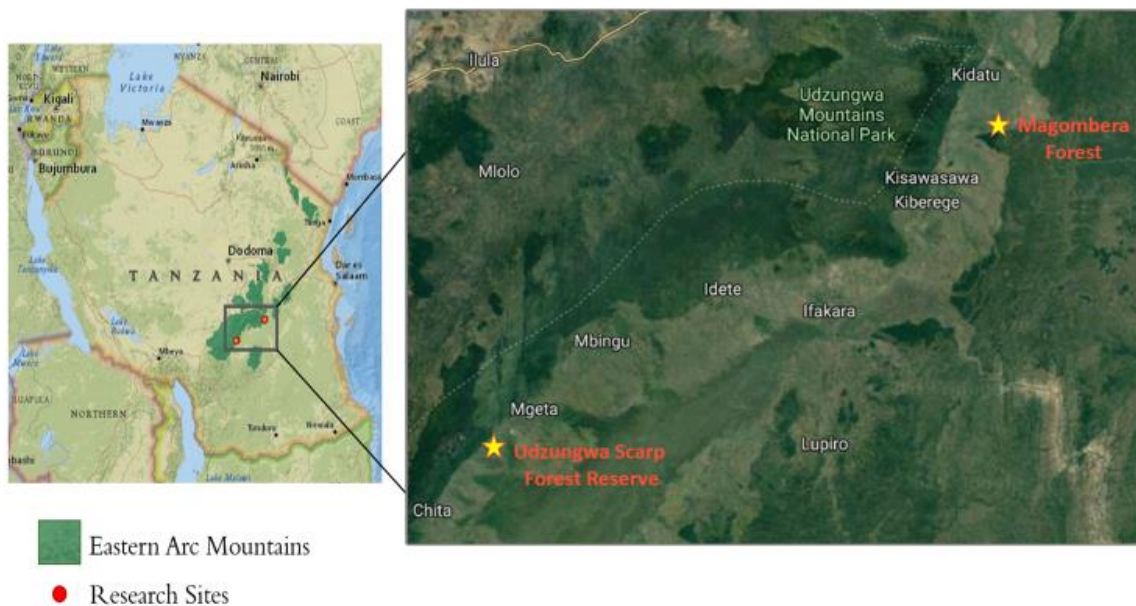


Figure 1.1: Research Sites, located in Kilombero Valley, along the Eastern Arc Mountains of Tanzania

¹⁹ Harrison, 2006; p. 42

²⁰ Ibid.

Forest-proximate communities rely on Udzungwa forest resources for their livelihoods and food security, especially during times of drought and hardship, and primary energy source.²¹ The forested land is used for shifting agriculture, especially for maize production, which grows well on the higher terrains of the forested areas.²² Resource constraints in the region are exacerbated by land scarcity and insecure land tenure. Households are encouraged to plant trees, though this is largely not carried out, both because of the proximity of the forests and the low tenure security that reduces the incentives for this type of an investment in one's land.²³

The Udzungwa forests are administratively divided into sub-forests, each of which has been designated its own level of protection status by the central government. This research was carried out in villages alongside two of those forests: Magombera Forest and the Udzungwa Scarp Forest, each of which is currently protected under Nature Reserve status, and so no cutting is permitted. While part of the greater Udzungwas, neither forest is part of the Udzungwa Mountains National Park (UMNP), a much more heavily protected and patrolled park within the forested mountain range.²⁴ There is one important variation in the forest laws between the two forests, the implications of which will be further explored in each of the three articles. While villager entry for any reason is illegal in Magombera Forest,²⁵ villagers in the Udzungwa Scarp are permitted entry on Saturdays and Sundays to collect dry, fallen branches only (it is illegal to do any cutting or to bring along an ax or knife, the typical implements used to cut branches).

I conducted surveys in interviews in four villages abutting these two forests: Katurukila and Magombera Village (next to Magombera Forest) and Ikule and Kikoleko (next to the Udzungwa Scarp). Each of the villages has between 1500 and 3000 villagers.

Sample Selection

I conducted surveys and interviews in four villages, two bordering the Udzungwa Scarp Forest Reserve and two bordering what is now the Magombera Forest Nature Reserve²⁶. The

²¹ Harrison, 2006; p. 48

²² Ibid; p. 45

²³ Ibid; p. 15. For more on tenure security and land investments: Chimhowu and Woodhouse, 2006; Migot-Adholla *et al.*, 1991; Goldstein and Udry, 2008; Clay, Reardon and Kangasniemi, 1998; Abdulai *et al.*, 2011

²⁴ These particular forest areas were selected (for a different project) because of their relative distance from UMNP. Though neither forest is part of UMNP, I initially was interested in the effect of proximity to tourism-related work opportunities. It became immediately apparent that all villages were too far removed from the park for tourism to touch any village in any significant, or even insignificant, way. This may change in the future with Magombera's new designation as a Nature Reserve, which hopes to bring tourism to Magombera itself, the proceeds from which should ostensibly go toward village development (it is unclear to what degree this will happen – there is criticism of the degree to which this has happened in the villages bordering UMNP, for instance).

²⁵ This does not include researchers and tourists, though these activities are rare.

²⁶ This protection status was officially designated in January 2019. Prior status was unclear as the forest was supposed to have been annexed into the bordering government-owned Selous Game Reserve in the 1980s, but this annexation never officially went through (only to be “discovered” in 2002). At the time of my fieldwork, the understanding by most villagers, including village leaders, was that the forest was owned and managed by the central government and patrolled by Selous patrollers (an arm of the central government). The reality is that Selous patrollers did (albeit rarely) patrol the forest, but that part of the forest itself was in fact owned by the neighboring Illovo Sugar Company (having been sold in the 1980s when it was supposed to have been annexed by the Selous Game Reserve)!

sampling frame includes all households living in the four selected forest-bordering villages; the final sample was selected using a random walk technique. In the three villages of Katurukila, Ikule, and Kikoleko, every other household was selected to be surveyed; in Magombera village, every third household was selected.²⁷

List Experiment

For each of the articles, I use a list experiment, also known as an item count technique, *to capture the percentage of different household types to have cut illegally from the forest in the previous year*. Due to the sensitive nature of the question and potential social desirability bias, it could not otherwise be reliably captured with the household survey;²⁸ respondents may have been more likely to omit or be untruthful about behavior if the question could have been traced to their household directly.

The list experiment was included as the last question in the survey. The sample was randomly divided in two (odd and even number surveys). Group 1 was read a list of five innocuous statements; group 2 was read that same list plus one sensitive statement on illegal forest cutting in the previous year. Each respondent was asked to give the number of statements that were true for him/ her. The initial group of five statements was constructed such that it would be very rare for any respondent to have either all five statements or none of the statements apply to him/ her.²⁹ See Appendix 1.1 for the specific wording of the list experiment.

Because the two groups are statistically identical, one can estimate the percent of people engaging in illegal forest cutting with the difference in means across the two groups. For instance, if group 1 reports a mean of 2.3 and group 2 reports a mean of 3.0, the difference in means of 0.7 suggests that approximately 70% of the respondents in group 2 counted the illegal activity in their response. Because the sample has been randomly drawn from the population, we can estimate that 70% of the whole population has engaged in the illegal activity. While not revealing household-level behavior, this technique *estimates* group-level rates of non-compliance. For instance, it tells us that approximately 40% and 31% of households around Magombera Forest and the Udzunwa Scarp Forest, respectively, engaged in illegal cutting in the previous year.

I apply this technique to different subsets of households in each of the three articles to tease out variation in cutting behavior across different populations (e.g., those who do and do not buy into the “myth of monitoring”, those with land title registrations versus those without them, and locals versus non-locals). I use difference in means statistical analysis to test that the list results differ from the null hypothesis (that is, that the sensitive and non-sensitive responses are statistically different from one another) and secondary t-tests to compare the results across different groups of households.

²⁷ Only one household refused to complete the survey; another approximately 20 were unable to be contacted after multiple attempts.

²⁸ Rosenfeld, 2016

²⁹ For the non-sensitive list, three respondents reported all five; four respondents reported zero.

Analysis from the User's Perspective

In his assessment of forest-adjacent communities near the Udzungwa Mountains, Paul Harrison notes that “in order to succeed in the long term, each type of [forest] management regime would need to be implemented *taking into account the realities and aspirations of the communities*.... a socio-economic perspective must be considered alongside an ecological perspective in considering future approaches to forest management (5-6).”³⁰ This claim echoes the voices of many. As user cost perceptions and resultant behavior are shaped by the larger institutional structures in which households are embedded, effective and equitable policy solutions can only come through careful attention to those formal and informal institutions; the three subsequent articles aim to do just that and, in doing so, contribute to conservationist and development objectives in Tanzania and sub-Saharan Africa more broadly.

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³⁰ Harrison (2006) discusses this reality as it pertains to the Udzungwa forest reserves more specifically, noting that communities must come to see themselves as the custodians of the forests, as there are often no other means of patrolling available; TANAPA and TFS have insufficient resources to effectively protect such an extensive forest area. He adds that this will only happen if households see the forest as a benefit rather than a cost, as can only happen with community say and involvement in management, which will undoubtedly consist of at least a limited continuation of forest use (46-47). See pages 38-39 for more detailed information on community-level preferences for forest reserve management along the Kilombero Valley.

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Appendix 1.1

The English translation of the list experiment wording is as follows:

PROMPT: "Next, I will ask you a question that might seem strange. The purpose of this question is to help us have a better idea of how many households are in need of forest resources. It is important that you know that there is no way to determine from this question whether your household is among them.

I am going to read you a short list of statements. Please tell me how many statements (NOT WHICH - only how many) are true for you."

LIST:

- You remember your dream from last night
- You ate a banana yesterday
- You prefer rice to ugali
- You prefer listening to music to dancing
- You have broken a bone in the last year
- At least one person in your household has cut at least one tree or live tree branch from %FOREST% in the past year (without approval, e.g., for a funeral) [**ADDED FOR GROUP 2 SURVEYS ONLY**]
- You enjoy speaking in large groups

ENUMERATOR: "It is very important that you respond honestly. I would like to say again that there is no way for me to know which of these things is true for you. For example, it would be impossible for me to know whether you remember your dream from last night. This question will be a useful tool in understanding the village's forest needs as a group - it will tell us nothing about your household specifically. I will now read the list again."

ENUMERATOR: Read the list again.

LIST: "How many (NOT WHICH) of the following are true for you: ...

THE MYTH OF COMMUNITY MONITORING

How perception rather than reality shapes risk perceptions of illegal forest use in rural Tanzania

Abstract

Local monitoring programs (as well as decentralized and polycentric forest management more broadly) are studied primarily to determine their efficacy in curbing illegal resource use (relative centralized management plans, for instance) and especially to understand the conditions under which local groups are more likely to organize effectively for conservation. *In this paper, I ask whether even inactive community monitoring programs and their villager informant networks (i.e., the myth of community monitoring more so than the practice of it) has the ability to influence illegal resource use.* Surveys and interviews with villagers reveal that local monitoring groups inspire great fear in their communities despite their relative inactivity; they contribute to the perception that government eyes are always watching, even if, in reality, they are not. This paper explores the nuances of community monitoring to shed light on why and under what conditions the *myth* of monitoring, in the absence of real enforcement, can promote behavioral change. With in-depth qualitative and survey analysis of two forest sites in south-central Tanzania, I show how existent norms of forest use (communal versus private firewood collection), which are themselves influenced by local laws and institutions, either allow or don't allow for the myth of monitoring to shift behavior. I demonstrate that it is only when villagers collect firewood *collectively* that inactive community monitoring schemes influence villager risk perceptions, and so behavior, vis-à-vis illegal cutting. This research sheds light on mechanisms through which even poorly funded community monitors can influence illegal forest use, a question of particular import for forest conservation in low-capacity countries.

2.1 Introduction

When forest users have management rights over the forest, effective and equitable resource regulation hinges on formal and informal community institutions, and especially their ability to help users overcome collective action problems and solve common pool resource dilemmas.³¹ With few exceptions, Tanzania does not present such a case;³² like most countries in sub-Saharan Africa, Tanzanian forests are largely owned by the central government and management decisions come from the Tanzanian Forest Service (TFS) executive agency. Even still, the success of forest protection hinges in many ways on local institutions and the participation of local communities³³ who, in Tanzania, depend on the forests for, above else, their subsistence firewood needs. The game is not won, so to speak, once a resource's borders are clearly delineated and the property rights well established, especially not if those property rights fall to an under-resourced central government.

Community-based monitoring groups, encouraged³⁴ by the central government, are meant to serve two functions: they are at once at least a token demonstration of decentralized forest management (even if de jure authority is still squarely in the hands of the central government) and fill the gaps in central government capacity. The only problem, however, is that these groups, too, lack sufficient resources to do their job. They are unpaid, causing motivation to be low, are not allowed weapons (or, in some areas, to even enter the forest), and lack uniforms, which they see as problematic for establishing authority.³⁵ Importantly, though community monitoring groups are well aware of their own limitations, villagers appear, by and large, not to be. The presence of community monitors and their informants in the village, combined with uncertainties over their relationship with the much more powerful central government, helps to perpetuate an atmosphere of fear surrounding illegal resource use.

³¹ Variables identified in the literature that increase the likelihood of resource-users' ability to overcome CPR dilemmas include resource attributes (e.g., size, productivity, predictability, and mobility), institution attributes (e.g., the degree of user input in rule-making, monitoring, sanctioning, and conflict-resolution), as well as user attributes (e.g., group size, the existence of leadership, knowledge, resource-dependence, and opportunities for communication) (Ostrom, 1990; Ostrom, 2010; Cardenas et al, 2004). For work on local management and enforcement more generally, see: Alston and Andersson, 2011; Carlisle and Gruby, 2017; Chhatre and Agrawal, 2009; Gibson, Williams, and Ostrom, 2005; Kajembe et al, 2002; Mbwambo et al, 2012; Poteete and Ostrom, 2004; Ostrom, 1990; Ostrom, 1999; Pérolat, J. et al., 2017.

³² The Tanzanian government has undertaken a small degree of forest decentralization (starting in 1998) with two types of Participatory Forest Management (PFM) schemes: Joint Forest Management (JFM) and Community Based Forest Management (CBFM). Under JFMs, communities are granted greater management rights over the forests; managerial and ownership rights under CBFM forests, on the other hand, fall to the communities the forests (Mbwambo et al, 2012). These two schemes together made up an estimated 20% (Gross-Camp, 2017) of Tanzanian forests (or, according to CIFOR (2015), only 2%); of the remaining forested land (46.1 million ha in 2015 (FAO, 2015) or 24.7 million ha of natural forest in 2010 (Hansen, 2013)) is owned and, to varying degrees, managed by the Tanzanian Forest Service (TFS).

³³ Alston and Andersson, 2011; Ostrom and Nagendra, 2006; Pfaff, Amacher, and Sills, 2013.

³⁴ I say "encouraged" because community monitoring is a top-down arrangement, but one that, as far as I can tell, is not supported (aside from the initial training of patrollers) or, it would seem, enforced by the central government.

³⁵ I should not that there *may* be one advantage to not having uniforms; that is, they are perhaps less easily identifiable. This is not a point any patrollers raised, but may be relevant, especially considering what this paper argues, i.e., that it is their stealth presence more than their actual patrolling that influences illegal behavior.

Local monitoring programs (as well as decentralized and polycentric forest management more broadly) are studied primarily to determine their efficacy in curbing illegal resource use (relative centralized management plans, for instance) and especially to understand the conditions under which local groups are more likely to organize effectively for conservation.³⁶ **In this paper, I explore whether and under what conditions even *inactive* community monitoring schemes (i.e., what I refer to as the “myth of monitoring” more so than the practice of it) influences illegal villager resource use.** In doing so, this work informs a more comprehensive understanding of the mechanisms through which community monitoring groups influence perceived risk and sheds light on what tools might be available to low-capacity countries seeking to maximize their conservation efforts without placing unnecessary burdens on the populations affected.

The Myth of Monitoring and Perceived Costs of Punishment

Monitors of any type will shape household decisions to illegally cut via their impact on each household’s perceived costs of punishment, or risk calculation.³⁷ I propose the following risk calculation each household *i* must consider when contemplating illegal forest cutting (with elements directly influenced by the myth of monitoring in blue):

$$\text{Punishment Cost}_i = \text{Pr}(\text{getting caught})_i \times \text{U}(\text{punishment})_i$$

where

$$\text{Pr}(\text{getting caught})_i = \frac{\text{Pr}(\text{caught by patrol})_i}{\text{Pr}(\text{caught by patrol})_i + 1 - \text{Pr}(\text{caught by patrol})_i} \times \frac{\text{Pr}(\text{observed by villagers})_i}{\text{Pr}(\text{observed by villagers})_i + 1 - \text{Pr}(\text{observed by villagers})_i} \times \frac{\text{Pr}(\text{villagers report})_i}{\text{Pr}(\text{villagers report})_i + 1 - \text{Pr}(\text{villagers report})_i}$$

Perceived punishment cost depends on one’s perceived (negative) utility of punishment as well as one’s perceived probability of being caught. Perceived probability of being caught, for its part, depends on one’s perceived probability of being caught by an official (state or village) patroller as well as one’s expectation that one’s illegal activities might be observed by a fellow villager (given that they have not been observed by a patroller) who might (acting as a secret informant) report on his or her illegal cutting. The myth of community monitors plays on all of these dimensions; those fully buying into the myth believe that 1) patrollers perform regular and thorough patrols; 2) their fellow villagers would report on them for illegal cutting (i.e., the

³⁶ Agrawal and Gibson, 1999; Conrad, C., & Daoust, T., 2008; Conrad and Hilchey, 2011; Chhatre and Agrawal, 2008; Gibson, Williams, and Ostrom, 2005; Hayes, 2006; Saunders, 2014; Wright, G. D., Andersson, K., Gibson, C., & Evans, T., 2015.

³⁷ It is possible that monitoring groups might also influence behavior via their presence serving as a reminder of the environmental importance of the forest. That is, their existence may in itself shift user thinking on forest use not merely because forest use is illegal but because users have internalized the need to preserve the forest (to maintain the rains, for instance, as is mentioned by a number of villagers). This side dimension is not explored in this paper but may be an interesting future project. To speak briefly to the point, interview evidence suggests that while a majority of villagers expressed the need to protect the forest for environmental reasons, nearly all villagers were in support of opening the forest for villager firewood needs (or, in the case of the Udzungwa Scarp, expanding use rights); either subsistence needs trump long-term environmental concerns or villagers did not perceive firewood cutting to be as environmentally destructive as timber- and charcoal-making, poaching, etc. In short, there is little evidence to suggest that environmental concerns were a primary factor in individual decision-making not to cut from the forest for subsistence firewood needs.

network of secret informants is ubiquitous); and 3) if caught, high, official fines are strictly enforced; there is no getting let off easy with a lower fine, even for cutting for one's household use only. In this paper, I use survey data on the latter two indicators to measure belief in the myth.

As this paper will demonstrate, though 1) community monitors and their informant networks are largely inactive and 2) punishment for illegal subsistence firewood cutting is rare and much reduced from official fines (generally by a factor of ten), this myth of monitoring permeates all research sites. Only 20% and 24% of survey respondents in Magombera Forest and the Udzungwa Scarp Forest, respectively, do not buy into either notion, i.e., they believe villagers won't report on them and expect only a small, reduced fine if caught collecting for subsistence use; 47% and 33%, respectively, have fully bought into the myth (i.e., they expect fellow villagers to report on them and that, if caught, they would be required to pay the heavy, official fines, at a minimum; at a maximum, they expect they would be imprisoned or shot). Community monitoring groups and their informant networks need not be particularly active for villagers to fear them; they need only to inspire a myth of monitoring.

The pervasiveness and strength of the myth of monitoring in Tanzania owes much to the quasi-decentralized or de facto polycentric forest governance scheme, wherein the central government has full ownership and managerial authority over forests but where enforcement falls to community monitoring groups. Uncertainty over the relationship between community monitors and the central government leads to a conflation of two and augmented perceived capacity of both.

I further show that buying into the myth of monitoring will only influence decisions to cut illegally *if illegal use might likely be observed by fellow villagers*. Note that, in the risk calculation above, one's expectation regarding whether fellow villagers would report one's illegal behavior factors in as a risk *only* if there is a greater than zero probability of being observed by a fellow villager; the perceived risk that accompanies the belief that one's fellow villagers would report is either magnified or minimized by one's probability of being observed by a fellow villager. The two forest sites of Magombera Forest and the Udzungwa Scarp have distinct laws regulating what is and is not legal in the forests, *resulting in, respectively, private versus collective collection practices*, a distinction that greatly impacts one's probability of being observed by a fellow villager; this variation between the two legal structures shapes the ability for community monitoring to impact rates of illegal forest use.

The argument is a simple one: if your fellow villagers aren't likely to see you cutting firewood, their tendency to report on you if they do is largely irrelevant to your risk calculation and decision-making; you may harbor feelings of mistrust for your fellow villagers in response to a community monitoring scheme, but if they are not likely to see your illegal behavior, this fear will not translate to behavioral change. These are indeed the patterns that we see; though the myth of monitoring is pervasive, belief in the myth is only linked to reduced rates of cutting in the Udzungwa Scarp, where the allowance for forest entry (though not cutting) engenders communal collection practices.

Contributions

This paper contributes to thinking on community monitoring in two important ways. First, it demonstrates that monitoring need not be overt, or even particularly active, to be effective. Belief in a secret monitoring network, or the belief in stealth monitoring, can, in certain contexts, shift would-be forest users' risk perceptions vis-à-vis illegal cutting. Second, this paper explores an important scope condition for effective community monitoring. Though it is well established that local context is vastly important for understanding where and when community monitoring will be effective, this research brings to light a new dimension: only when villagers habitually collect firewood together, and so might easily be observed engaging in illegal cutting, can a community monitoring network based on myth have a significant impact on rates of illegal cutting. These realities both add nuance to and beget further questions of our understandings of community monitoring.

Methods

To explore these questions, I rely on 682 household surveys and 161 semi-structured interviews with villagers, village leaders, community forest patrollers, TANAPA and Selous managers, Tanzanian academics, NGOs, and forest researchers located in two distinct forest sites of the Kilombero Valley, Tanzania: Magombera Forest and the Udzungwa Scarp Forest. I use the interviews for insight into: 1) villager perceptions of the activities and schedules of village monitoring groups and their informants, especially as those perceptions differ from the realities expressed by community patrollers themselves; 2) villager punishment expectations as they deviate from reality; and 3) understandings of *why* villager perceptions diverge so far from reality on the aforementioned accounts. Survey data from the same forest sites complement reports of exaggerated fear of community patrollers, their informant networks, and punishments.

I use survey data to measure the pervasiveness of the “myth of monitoring” in each site: the interaction of perceived likelihood of being caught (which hinges on one's perception of whether fellow villagers might report one's illegal behavior) by the expected punishment (high or low) one expects to receive.³⁸ Last, using a list experiment, I then demonstrate that, while the myth is arguably more pervasive in Magombera Forest, it is only positively correlated with reduced rates of illegal forest use in the Udzungwa Scarp Forest; the forest *entrance* rights (though not cutting) engender communal collection (where one's likelihood of being observed by a fellow villager is increased) and thus allow for one's fear of community patrollers to shape illegal forest use decision-making.

This paper is divided into three sections. First, I provide a brief history of community monitoring in the study sites and discuss existent literature on community monitoring of natural resources more generally. The second and third sections address each of the questions proposed here: first, whether largely inactive community monitoring groups are able to inspire fear and

³⁸ See Appendix 5.1 for the wording and translations of all relevant survey questions.

perpetuate a “myth of monitoring” within their communities; and, second, under what conditions belief in the “myth of monitoring” influences decision-making vis-à-vis illegal forest use.

2.2 Community Monitoring in Tanzania

Employing a transaction costs framework, Libecap (2014) argues that international agreements on protecting biodiversity and unique habitats should be easier to realize (relative other global, environmental problems like GHG emissions) because there are fewer uncertainties (e.g., scientific uncertainty and information asymmetries regarding the resource itself) and single-country enforcement is comparatively cheap. Any pushback, e.g., from local users with different resource preferences, can simply be, “addressed through transfers (438).” What Libecap misses here is that without an effective enforcement and monitoring scheme on the ground, local users may have little interest, outside of their own preferences for environmental conservation, in obeying central government restrictions;³⁹ the vast majority of biodiversity hotspots and unique habitats are not high-profile, foreign exchange-generating⁴⁰ areas like Kruger National Park and the Serengeti, which he uses to illustrate his point.

As the myriad of common pool resource scholars knows well, central government resources in low-capacity countries such as Tanzania do a consistently poor job of protecting their commons.⁴¹ Even when bolstered by international donors, resources are insufficient to monitor and enforce behavior in remote areas outside of the tourism circuit, which constitute the vast majority of forests.⁴² Such officially protected areas may be more accurately deemed “paper parks” as they function as protected areas on paper only.⁴³ While protecting unique habitats in the eyes of international treaties might be relatively easily achieved, effectively curbing resource destruction on the ground is quite another story.⁴⁴ This is where CBM and polycentric governance schemes come in; when functioning effectively, they are more adaptive and context-appropriate systems that fill in the gaps in capacity of central governments.

Community Monitoring in the Research Sites

Starting in the late 1990s and formalized with the Tanzanian Forest Act of 2002, Tanzania started toying with decentralized forest management via two different approaches to

³⁹ Gibson et al, 2005.

⁴⁰ Ranade, 1998.

⁴¹ *In Tanzania*: Kajembe et al, 2012; Mbwambo, 2012. *In General*: Aligica and Tarko, 2013; Chhatre and Agrawal, 2008; Gibson et al, 2005; Lund and Treue, 2008.

⁴² Alston, Andersson, and Smith (2013) argue that when there is not a private, marketable benefit to be derived from the resource, e.g., when neither wildlife preservation nor ecotourism is an integral part of the local economy, the resource will suffer the same free-riding fate of reducing greenhouse gases.

⁴³ Robinson, 2014; Hayes, 2006; Ostrom and Nagendra, 2006.

⁴⁴ There is a tendency to create protective areas (PAs) in generally remote and isolated areas, where resource use would have been relatively lower regardless of protective status given distance from roads and cities; this has led to an overestimation of the impact of PAs in general (Joppa and Pfaff, 2009; Andam et al., 2008).

Participatory Forest Management (PFM). While these initiatives have not gone especially far,⁴⁵ a more common arrangement that was initiated around that time is that of community monitoring groups, which are enlisted (with no managerial rights) to patrol and enforce state forests according to state law. It is these groups that are the focus of this paper.

There are multiple villages abutting both Magombera Forest and the Udzungwa Scarp Forest; surveys and interviews for this paper have been conducted in two villages bordering each of the forests (four villages in total). Both areas have Village Game Scouts, or a VGS, as well as an Environment Committee (EC); the two serve different functions from one another and across sites. As this paper is concerned with community monitoring, I focus on the VGS of Magombera Forest and the EC of the Udzungwa Scarp; these are the two groups charged with patrolling the forest in their respective areas.⁴⁶ As will be discussed in section 2, Magombera Forest's VGS and the Udzungwa Scarp's EC are engaged in similar patrolling activities and frequencies.⁴⁷

De Facto Polycentrism

Outside of the 11% of forests that fall under PFM schemes, Tanzanian forests are not under any *formalized* polycentric scheme; it is well understood that the central government owns the forests and makes management decisions.⁴⁸ That being said, the primary patrollers of the forests (despite the fact that the majority of villagers do not recognize this) are local monitoring groups. Lacking sufficient resources and encouraged by international donors, the Tanzanian government has encouraged and trained⁴⁹ these community groups to monitor state forests.

Though this arrangement may ring of decentralization, it is arguably yet another instance of the central government seeking to insert itself more profoundly into village life.⁵⁰ In a similar fashion, one of the two village leaders in all Tanzanian villages, the *mtendaji*, is appointed by the central government. The appointed *mtendaji* is not from the village nor is he to remain there after his five-year post. He serves as the most local link between the central government and villagers and is at once a local leader and an extension of the central government. Community monitors play a similar role linking rural villages with the larger government apparatus. While community

⁴⁵ Gross-Camp (2017) estimates 20% of Tanzania's forests were under such a scheme in 2012; CIFOR (2015) estimates only 2%.

⁴⁶ According to the leaders of each group, while the EC's primary responsibility around Magombera Forest is to look after the cleanliness of the village environment in general (e.g., educating villagers about planting trees and providing them with tree saplings; checking that people have functioning toilets), around the Udzungwa Scarp, its role is to protect and patrol the forest. Contrastingly, the VGS's role around Magombera Forest is to patrol the forest. Around the Udzungwa Scarp, the VGS and the EC work together to patrol the forest; each village's five EC members must contain one member of the VGS (this because the VGS have military training, which the Udzungwa Scarp EC do not necessarily have). The Udzungwa VGS are thus in charge of doing the actual catching, though they are not allowed to patrol the forest without the EC patrollers.

⁴⁷ One notable difference is that the Udzungwa Scarp EC is allowed to patrol from within the forest while Magombera Forest's VGS patrols along the borders (or only 50 meters inside) only.

⁴⁸ Funder et al, 2013.

⁴⁹ WWF, 2018. Also discussed by community monitors and village leaders in both forest sites. Village guards, or monitors, are sent for training at a natural resource college in southern Tanzania.

⁵⁰ Kothari, 2001; Ribot et al, 2006.

monitors, for their part, are local villagers and not appointed by the central government, their official role is to monitor and enforce per TFS policies.

Even though this might be the central government's intention, however, as Funder et al. (2013) describe, there is a process in Tanzanian forests whereby "conservation interventions involving local communities... go through a process of 'localization' which modifies the outcomes intended by external initiators (219)." That is, community monitors act, within limits, according to their own priorities and concerns. Due to the practiced autonomy on the part of community monitors, this arrangement can be considered a sort of informal, or de facto, polycentrism that benefits from the authority of the central government but which caters to local realities (and so experiences much of the benefits of formal polycentrism⁵¹).

Though polycentric governance in its ideal type entails multiple levels of governance acting cooperatively yet independently with a non-hierarchical relationship,⁵² in reality, multilevel relationships cannot escape power asymmetries. Morrison et al (2017) argue that more attention needs to be paid to the power imbalances within polycentric governance schemes. If formal polycentric schemes can be riddled with power asymmetries (without ceasing to be polycentric schemes as a result of them) then, it seems, so too can a centralized scheme be made de facto polycentric due to those same power asymmetries and de facto autonomy. Indeed, Marshall (2015) contends that it is de facto rather than formal autonomy that is of primary concern for polycentric governance.

It is the sort of "pragmatic power" discussed by Morrison et al (2017) and Morrison et al (2019) that is of particular relevance to the Tanzanian case, i.e., "the power to administer and implement rules." Though community monitoring groups have not been granted formal autonomy as such, in reality, monitoring groups make decisions about when and where to patrol as well as, importantly, how severely to punish offenders.⁵³ Those decisions may not be consistent (either within or across groups), but they do consistently deviate from the desires of the central government, e.g., fines imposed on illegal subsistence users are approximately one tenth of official fine amounts.

Though it is no panacea, there is wide acceptance that bringing the resource users into the governance of the resource (including in its management, monitoring, and enforcement) will often have better outcomes for forest regeneration and reduced degradation, certainly relative a purely centralized management scheme.⁵⁴ Without local users' having any role to play in the forest's management, rules will likely 1) be less-appropriately tailored to the local context; and 2) be seen as illegitimate;⁵⁵ both of these factors increase the costliness of enforcement and so decrease the likelihood of successful governance. North's assertion that the "costs of

⁵¹ Ostrom, 1999; Ostrom, 2010; Marshall, 2015; Carlisle and Gruby, 2019; Morrison et al, 2017; Morrison et al, 2019.

⁵² Ostrom, 2010; Morrison et al, 2017; Morrison et al, 2019.

⁵³ According to interviews with community monitors in both Magombera Forest and the Udzungwa Scarp. Funder et al (2013) also observe this in Tanzanian forests under PFM regimes.

⁵⁴ Aligica and Tarko, 2013; Chhatre and Agrawal, 2008; Gibson et al, 2005; Lund and Treue, 2008; Kajembe et al, 2002.

⁵⁵ Aligica and Tarko, 2013

maintenance of an existing order are inversely related to the perceived legitimacy of the existing system” clearly holds in the realm of local resource management.⁵⁶

That being said, as this article will demonstrate, legitimacy is not the only mechanism through which local monitoring schemes can elicit compliance; the proximity inherent in local monitoring gives rise to perceptions of inescapable surveillance. Monitors’ ties, real and perceived, to the central government make this surveillance all the more threatening. Tanzania’s polycentric governance structure serves to augment the coercive capacity of the state, not by generating a greater sense of legitimacy (for, as a reminder, local monitors have no *de jure* authority over forest rules and management), but by creating an atmosphere of fear.

2.3 The Myth of Monitoring

Gibson et al (2005) argue that rule enforcement is “a necessary condition for the establishment and sustainability of effective forest conditions” and that the debate is not on whether rules should be enforced but who should do the enforcing (275). Similarly, Aligica and Tarko (2013) contend that existing on the books is insufficient; rules need to be “in-use” not merely “in-form” (735). The case of community monitoring in the Kilombero Valley challenges these assertions. As I will demonstrate, though the community monitoring programs in the Kilombero Valley are only minimally active, their very presence on the ground contributes to a myth of monitoring that is, under certain conditions, sufficient to curb rates of illegal cutting.

In this section, I compare the realities of community monitoring in Magombera Forest and the Udzungwa Scarp Forest with the widespread misperceptions villagers have about them, demonstrating that the “myth of monitoring” is alive and well even if community monitoring is not.

2.3.1 To Monitor or Not to Monitor?

According to interviews with patrollers and informants in both sites, the primary reason they choose to patrol or report is a perceived duty to protect the environment (especially the rains) and a belief that villagers are all responsible for patrolling one another. At the same time, however, very few villagers elect to take part in these activities and, with some exception, even those who have signed up as official patrollers have little motivation to engage actively in their roles. This section explores the motivations and constraints for monitors in the Kilombero Valley.

⁵⁶ North, 1981; 53.

Environmentality

With nods to environmentality,⁵⁷ a large subset of villagers seems to have internalized the need to police one another's forest use behavior, saying that, e.g., "As a villager, I'm also a guard.", "We have been told that we, ourselves, are the government", "Everyone should be the guard of each person", "the whole village protects the forest; everyone patrols his or her fellow", and "if you see someone carrying firewood [from the forest], you have to report it." Few respondents were so adamant that they would report; more suggested they would stop a fellow villager but not report them. As to why someone might report on or seek to stop another's behavior, primary reasons pertained to environmental protection, e.g., "If we destruct the forest, we won't get the rain, fresh air" and "What are his plans? Does he want the rain to come? We have already been restricted, so if someone uses the trees there, it seems like he doesn't want us to get the rain. It's not jealousy." Two women hinted at local social dimensions at play, describing reporting as something that a minority of villagers would be proud to do and something they might do "just to show that they're capable of doing it." No villagers interviewed thought reporting would be compensated in any way or that not reporting would get you in trouble.⁵⁸

In addition to environmental protection, villagers around the Udzungwa Scarp expressed a second motivation to self-patrol that villagers around Magombera Forest, understandably, did not: the fear that, if they abuse their forest privileges, they will lose them entirely.⁵⁹ At the time this research was conducted, forest entry and dry branch collection (though not cutting) was still allowed on Saturdays and Sundays in the Udzungwa Scarp; no such allowance existed in Magombera Forest. Some Udzungwa respondents expressing the fear of losing entrance rights had once lived in Mang'ula⁶⁰ where, they reported, this very thing occurred: they were allowed to collect dry, fallen branches, but "people were using it poorly" and so were restricted outright. Other villagers had heard these stories even if they hadn't lived through them themselves. As one village government representative in Ikule said, "if anything [illegal] happens, the whole village will be responsible for this happening." Some who say they would not report on illegal use do say that, when they see villagers engaging in illegal behavior, they advise them against it for this reason. According to one villager, "we say that so that the forest won't be closed permanently." One villager from Mang'ula reported that people in Ikule followed the law even though, as she said, there were no active patrollers (the latter being very rare to hear); they were afraid of being

⁵⁷ An environment-focused spin on Foucault's governmentality, referring to individuals internalizing new ways of thinking about and acting on behalf of the environment (Agrawal. 2005).

⁵⁸ According to one patroller, the informant would share in the small percentage of the fine divided by all VGS patrollers.

⁵⁹ At the time of the research, villagers were granted permission to enter the Udzungwa Scarp Saturday and Sunday to collect dry kuni from the ground; villagers were granted no such permission in Magombera Forest, where even entry was illegal.

⁶⁰ Mang'ula is a more populous village along the same Udzungwa Mountains and directly outside of what is now the Udzungwa Mountains National Park. As a national park, this part of the forest is indeed, unlike the Udzungwa Scarp Forest or Magombera Forest, relatively heavily protected by TANAPA.

restricted from using the forest, for “if people stole, they [the whole village] would be stopped from going Saturday and Sunday.”

Perhaps accordingly, villagers around the Udzungwa Scarp are slightly more likely to express that they would be happy or proud to catch someone using the forest illegally than are villagers around Magombera Forest (48% to 40%). Most importantly, around the Udzungwa Scarp, groups especially likely to say this are those more likely to use the forest in general (as well as groups more likely to use the forest illegally); this tendency does not exist around Magombera Forest. In both forest sites, locals⁶¹ are more likely to use the forest illegally by a factor of two.⁶² While around Magombera Forest, locals and non-locals report pride in reporting at nearly equal rates (40% and 42%, respectively), locals around the Udzungwa Scarp are significantly more likely than non-locals to do so (60% compared to 42%). It makes sense that the group that most uses the forest would have the greatest interest in ensuring continued forest access. Given that forest access has already been fully restricted in Magombera Forest, this dynamic is not at play among those villagers.

Monitoring as Irrational

While villagers are, outwardly at least, supportive of community monitoring⁶³ and have apparently internalized the need to self-police, few villagers choose⁶⁴ to be patrollers or informants themselves. At the time of research, each forest site (each of which is comprised of multiple villages) had 15 community patrollers in total.⁶⁵ The number of secret villager informants is unknown but, as will be discussed, unlikely to be large or particularly active.

In surveys, very few people have, or at least admit to having, household members who have patrolled or “protected” the forest, loosely defined.⁶⁶ In a survey of 682 households across both forest sites, 20 report that at least one member of their household often participates in

⁶¹ Defined as families who have been in the area since before the significant population booms of 1996 and 2000 around Magombera Forest and the Udzungwa Scarp, respectively.

⁶² Clay, 2020

⁶³ Due to potential social desirability bias, this should be taken with a grain of salt.

⁶⁴ The official process of becoming a village patroller is to be nominated and then voted on; patrollers do not choose to be patrollers, per se. Importantly, however, in practice, it is extremely uncommon for a nominated villager not to be approved by the village; there is not a maximum number of villagers who are able to join. It does not seem that anybody who *wants* to be a patroller is refused the opportunity. More so, it seems that many of those put forward as candidates are then socially obligated to accept the position.

⁶⁵ These being the VGS around Magombera Forest and the EC around the Udzungwa Scarp (of which at least three must also be VGS). According to VGS leaders of both Katurukila and Magombera Village (the villages abutting Magombera Forest), each village should have six VGS patrollers, each of which should have attended a patrolling and environmental training led by the central government in Tanzania’s southern Ruvuma region. At the time of field research, there were only three members of the Katurukila VGS and three in Magombera Village; while there should have been 24 in total (across the four villages surrounding Magombera Forest), only 15 remained. The other nine had left, reportedly because of the lack of payment (according to interviews with Magombera Village and Katurukila VGS patrollers). Ikule is divided into three wards, of which Kikoleko is technically still one (though the process had begun for it to separate as its own village); For this reason, I consider Kikoleko to be its own village. According to Kikoleko leaders and villagers, it already functions as if it is. Each ward has five EC members, making a total of 15.

⁶⁶ “Protecting” the forest is being loosely defined here and may be interpreted differently by different respondents. It extends, in any case, beyond formal patrolling.

protecting the forest; 12 report that at least one member of their household has done so, but only rarely. This represents under 5% of total respondents (6.5% of the population surrounding Magombera Forest and 3.4% of the population surrounding the Udzungwa Scarp).⁶⁷

If patrollers are largely respected by their communities and they are doing important work for the environment, why is there not more interest in joining their ranks? The arguments coalesce around three key points: 1) patrolling is unpaid and their labor is required more urgently elsewhere; 2) they lack the strength they perceive necessary (especially to run after people and deal with potentially dangerous confrontations); and 3) fears of social repercussions. Being a patroller has a series of costs that most are unwilling to take on.⁶⁸ This is, of course, expected according to non-cooperative game theory; individuals will not elect to provide the public good of monitoring or rule enforcement unless they are themselves paid and monitored by supervisors (neither of which they are here).⁶⁹

To the first point, villagers are very aware that patrollers are unpaid. Official community patrollers⁷⁰ describe themselves as volunteers; they do each share a small percentage of fines imposed,⁷¹ but these are rare and small (even if a full fine of TSH 50,000 was given,⁷² each VGS patroller would keep 4,000 TSH, or less than \$ 2USD).⁷³ In both forests, patrollers report that the lack of payment causes motivation to be very low. Magombera Forest has experienced trouble with retention of patrollers, having lost eight of its original 24 patrollers, reportedly due to the lack of payment.⁷⁴ If it had been lucrative, VGS members wouldn't have quit. It can't be both high fines every day (as, to be discussed in the following section, villagers assume) and also not lucrative for the VGS. A UFP coordinator estimates that, "for all their work, it's as if patrollers are paid one day a month."

⁶⁷ Though it could be possible that this is an undercount due to a preference to remain anonymous as a forest patroller or reporter, interviews with leaders of the different community monitoring groups wouldn't suggest so. In fact, it is likely that this is an overcount due to a perhaps liberal interpretation of protecting the forest. Of possible side interest, these self-reporting "protectors" are no more likely to be locals versus newcomers, nor of the dominant tribe versus a non-dominant tribe.

⁶⁸ Kajembe et al, 2002.

⁶⁹ Gibson et al, 2005; 275. Lawry, 1990.

⁷⁰ The VGS in Magombera Forest and the EC in the Udzungwa Scarp

⁷¹ In both Magombera Forest and the Udzungwa Scarp, the share divided among all community patrollers (VGS in Magombera forest and EC in the Udzungwa Scarp) is 40% of the fine charged; the remaining 60% goes to the village government (for general development around the Udzungwa Scarp and to the EC for the villages around Magombera Forest (where the EC is responsible for the general village environment and not forest patrolling)).

⁷² This is very rare, if it happens at all, for subsistence cutting; generally fines imposed are closer to one tenth of the official

⁷³ The Selous sector warden says that he no longer works with the Magombera Forest VGS precisely because they are not paid and so cannot be relied upon to report the fines they've collected; he suspects that they continue patrolling in order to keep the money for themselves. If this is true, then, of course, they do receive greater compensation than they are reporting; in either case, they do not receive sufficient payment to encourage regular patrolling.

⁷⁴ They lost nine patrollers altogether, though one was due to the patroller passing away.

Only 2% of respondents⁷⁵ think there would be any compensation if a regular villager informant were to catch someone illegally using the forest.⁷⁶ Nobody reported that anything other than monetary compensation would be possible (i.e., nobody thinks that one might be compensated with a job, title, post, political position, or other). One Katurukila VGS patroller said that the VGS's fine share would be split with the informant, though this was not corroborated by other patrollers.

To the second and third points, though many villagers in both forest sites are supportive of the monitors' work, it only takes one angry person to cause problems. The EC chairman (who is also a VGS patroller) reports that he is often threatened by those who have been caught (it is notable from a punishment reality perspective (as will be discussed in the next section) that he finds he has no alternative but to pardon those threatening him; VGS patrollers are not allowed weapons of any kind and can thus find themselves in vulnerable positions). A VGS patroller from the neighboring Magombera Village reports that, though he regularly feels uneasy around certain villagers, he has never actually been harmed or directly threatened by them. He says that only those who use the forest (which he estimates to be more than half) are not friendly to him, half showing this directly and half indirectly.

In interviews, some villagers say that the community patrollers are "hated" or "not liked at all." One man shared that, recently, people were talking badly of a strict VGS patroller at his own funeral. Another reports that "the one who got caught might say to others that he is a very bad person with bad manners; if he sees you in the forest, he will catch you without mercy." Some villagers are angry with them because "if they need firewood and timber, they can't get." One villager in Katurukila summed up the situation nicely: "[villagers as a whole] like them in terms of security, but some dislike them if they catch their relatives." Others have the impression that patrollers use the forest for themselves while blocking others, suggesting that "the ones chosen to look after the forest are the ones who steal!" or "[while they are patrolling] their wives collect firewood!"

Certain villagers may disapprove of the work community patrollers do, and others still may "hate" the patrollers themselves (some enough to threaten them with violence or social retribution), but they are also often afraid of the patrollers. As an example, one VGS patroller in Magombera village had his chicken coop *outside* of his house as opposed to inside (where it is typical to have nearly all farm animals);⁷⁷ the fact that he was able to do this without fear that his chickens would be stolen, it was explained to me, demonstrated how much villagers feared him. Many are afraid to be patrollers, but villagers are also afraid of patrollers. Some may see the latter as a social cost, others as a social benefit.

⁷⁵ 14 of 661; 21 don't know.

⁷⁶ Most (of these very few) think it'd be the mtendaji (appointed by the central government for a five-year term; one of the top two village leaders) who would pay you, but there is no consensus on for how long this payment for reporting arrangement has existed (respondents are equally likely to report: only recently, for less than three years, for between three and five years, for between five and ten years, and for more than ten years).

⁷⁷ Notably, he was the only villager in any of the four villages studied to have his chicken coop, or any animals for that matter, outside of his home.

2.3.2 Lack of Motivation and Minimal Patrolling

Because patrollers in all sites are unpaid, those who remain, are (self-reportedly) largely unmotivated to commit very much time to patrolling; they often drop out of their patrolling group altogether. This section lays out the activities of the VGS of Magombera Forest and the EC of the Udzungwa Scarp according to the patrollers and village leaders themselves. Given that there are some discrepancies between reports, I cannot be 100% confident in all activities, for instance, the frequencies of patrols. My efforts have been focused on capturing the range of responses and to summarizing the likely realities. Importantly, patrollers and informants in each forest site engage in similar practices and patrolling frequencies.⁷⁸

Magombera Forest

The VGS from all four villages surrounding Magombera Forest (two of which have been surveyed and interviewed as a part of the research for this paper) coordinate with one another to decide a date and location for patrols. There is some disagreement about this; while the VGS chairperson from Katurukila agrees that all four village VGS groups patrol together, a VGS patroller from Magombera Village says that he patrols alongside the VGS of Katurukila only, not also with the VGSs of the other two villages. I gather the discrepancy comes both from divergences from official policy in practice and the reality not all patrollers participate with the same regularity. Indeed, the frequency of their patrols is also up for debate. While the VGS themselves report patrolling from around once or twice a week to two or three times a month, the project coordinator of the Udzungwa Forest Project (UFP), a forest research organization based in nearby Mang'ula, says that the VGS don't perform their own patrols at all, but only patrol the forest when requested to do so by Selous (central government patrollers⁷⁹) or the UFP (the UFP requests this of them only when there has been some destruction of their experimental plots located inside the forest, which is not a regular occurrence). The sector warden of Selous reports that Selous has not used the village VGS patrollers since 2017, though he suspects that they continue to patrol the forest on their own, catching villagers and taking the fine money for themselves (telling the villagers that they have been sent by Selous, though they haven't been). The Katurukila village chairman, to whom the patrollers must report their activities and whose wife happens to be a VGS patroller, estimates that the VGS patrollers go to the forest maybe once or twice a month. I suspect once or twice a month is a reasonable, if perhaps generous, estimate.

In terms of activities and approach, there is greater consistency across patrollers. They select a starting point and direction, e.g., “maybe today we'll start in Katurukila and go toward

⁷⁸ One key difference is that EC patrollers in the Scarp are allowed to physically enter the forest, while VGS patrollers in Magombera Forest are not.

⁷⁹ Selous patrollers, often referred to colloquially as “MaGame”, are based in nearby Msolwa Station. Their primary role is protecting the neighboring Selous Game Reserve from poachers, not patrolling Magombera Forest. Their main purpose when they do come to the villages surrounding Magombera Forest is to scare elephants away from the villages and back into the forest.

Kanyenji.”⁸⁰ They tend to head to the forest early in the morning and return by late afternoon (from around 6 am to 4 pm) because, they say, this is when people tend to use the forest for higher crimes, such as fishing and timber-making (it is no surprise, then, that those collecting firewood tend to go in the evenings and at night). Because the VGS patrollers aren’t allowed weapons, they aren’t allowed inside the forest (the possibility of a dangerous encounter with an armed poacher being the primary concern). They walk along the forest border (or, according to one Katurukila patroller, “not more than 50 meters inside”)⁸¹ looking for signs of disturbance along frequently used entrances (of which there are many). Should they find any signs of large-scale destruction or poaching (not including cutting for subsistence firewood), they send word to Selous.⁸²

VGS patrollers can only catch illegal forest users along the forest border, not inside, as mentioned, nor at the users’ homes; users must be caught in the act and close enough to the border for the VGS patrollers to see them. This obviously presents a challenge for effective patrolling, and so they solicit help from their fellow villagers (referred to in this paper as “village informants”). There are two types of village informants: 1) those selected by the VGS due to their proximity to the forest (of which there are reportedly⁸³ four in the village of Katurukila who report illegal behavior once every few months)⁸⁴ and 2) those who provide information of their own volition. It is unclear how helpful the informants are. They pass information either by phone or in person “sometimes once or twice a month and some months not at all,” according to one Katurukila patroller. A Magombera VGS patroller says that they cannot just wait for informants to provide information because it is very difficult for villagers to see illegal forest use from their homes. All in all, with the help of informants and with their own patrols, the VGS patrollers report catching illegal users anywhere from “once or twice a week” to “once every two or three months”. Given how regularly and how many villagers illegally use the forest, this is quite a low use-to-catching ratio.

Udzungwa Scarp Forest

In the Scarp, patrolling entails “walking in the forest to check whether there is any destruction.”⁸⁵ As in Magombera Forest, all 15 EC patrollers coordinate and go together. If all 15 are available, they split into two groups and go in separate directions; when they are few in number, they go in one group. So as to minimize being seen entering the forest by forest users, they use the paths of Ikule to enter the forest when they patrol the forest closer to Kikoleko and vice versa (note that it takes a minimum of 30 minutes to walk between the two villages on the

⁸⁰ Katurukila EC chairperson and VGS patroller

⁸¹ Another Magombera Village VGS patroller says that they are allowed inside because people do not cut right along the border; I suspect he, too, is referring to this 50-meter entrance allowance or something of that nature. That the VGS are not allowed to patrol inside the forest is corroborated by village leaders as well as VGS leaders.

⁸² This is reported consistently by Katurukila’s village chairperson, or “mwenyekiti” (whose wife happens to be a Katurukila VGS patroller), and VGS patrollers from both Magombera Village and Katurukila.

⁸³ This is according to one Katurukila VGS patroller.

⁸⁴ These informants are selected in secret and known only to the VGS leaders; informants do not know of one another.

⁸⁵ Ikule EC chairperson

flat, main road between the villages and presumably much longer in the forest; just getting to and returning from the forest will take up a substantial part of their patrolling time). Patrolling days and times are secret, but they primarily go in the morning only (returning by 1 or 2 pm) and, as in Magombera Forest, anywhere from twice a week to twice a month (depending on who you ask). Importantly, they patrol only on “off days”, that is, weekdays, when all forms of forest use are illegal; they do not patrol for illegal cutting on the weekend when villagers are permitted to collect (but not cut) dry, fallen branches.

Patrollers do on occasion catch people, though it is unclear how often. The wife of one patroller notes that it is very rare for the EC to catch anyone; another patroller says that some days they do end up chasing many people (though not necessarily catching them). It is logistically challenging for one or two groups of patrollers (depending on whether they have enough participating that day to divide in two) to effectively comb through dense forest that is a few miles long and at least as deep. The chair of the EC shares the story that illegal forest use increased in 2017 precisely *because* the village government and EC were in the forest collecting wood to make tables and chairs for the schools; when I asked why government forest use would increase illegal use on the part of villagers, he explained that, because the government, together with the EC, were known to be in one part of the forest, villagers could go to other parts safely unobserved. “Actually,” he said, “in the forest, if you are here, you can’t notice anyone behind you.”

Accordingly, as in Magombera Forest, patrollers in the Udzungwa Scarp, also rely to some degree on reports from village informants. The wife of one EC member says that informants come to the house to report about illegal firewood collection (using knives or axes, the primary tools used for cutting wood, or going in on off days) as well as charcoal- and timber-making. When her husband hears this information, he “calls his fellows and they go and see.” According to the head of the EC, it’s common for villagers to report on other villagers; others say this happens very rarely.

In sum, it is most likely that community monitors in both sites patrol approximately once or twice a month during the morning and early afternoon and that they rarely catch people. If you’re a villager wanting firewood for subsistence use, you can almost guarantee not being seen by a patroller in the evenings or at night (in either forest) and on weekends in the Scarp. Informant networks do exist, though they are only minimally active. Though monitors do on occasion receive information from village informants, this is rare enough that, combined with regular patrols, villagers are rarely caught (once a month might be a reasonable estimate).

Even patrollers concede that their ability to be effective is limited. Patrollers around Magombera Forest report that villagers could (and do) easily go into the forest at night when they know the patrollers are not there. Similarly, a common refrain among patrollers around Magombera was that, because the VGS patrollers are known throughout the village, forest users can easily be strategic about when they go in, such as after they see the patrollers return home from the forest or when they see patrollers engaged in other business in the village (e.g., being

interviewed by me). Similarly, though most villagers seem to be unaware of it, patrollers in the Udzungwa Scarp exclusively patrol during the weekdays (i.e., days when even entering the forest is illegal); illegally cutting on days when it is legal to enter the forest (Saturdays and Sundays) will, therefore, almost certainly go undetected by community monitors (fellow villagers and potential villager informants, of course, are another story).

Further, patrollers in both sites are limited in that they can only catch illegal users in the act. A Katurukila VGS patroller shared that, even if he catches and fines someone, that same person might go to the forest again in the night to compensate for his lost money. As he says, “we may meet tomorrow on the street. He will say, I have already compensated my money. So what can you do?” Because illegal activity is only punishable if one is caught in the forest, in the act, villagers can brag to the VGS patroller all they want about how much they have stolen without the patroller being able to do anything about it.

2.3.3 Villager Perceptions of Community Monitoring

A UFP coordinator suggests that the problem with community monitoring (as well as central government patrolling, for that matter), is that “there are very few people who can protect the resource, and the villagers know that.” But do they? In this section, I discuss the interview and survey findings that show very clearly that community monitors do not need to be active in order to inspire fear (though, as will be discussed in section 2.4, not necessarily compliance). What is readily evident in both Magombera Forest and the Udzungwa Scarp is that a majority of villagers have an outsized perception of community monitoring activities. Villagers 1) believe patrollers and informants to be much more active; and 2) expect punishments for subsistence firewood cutting to be much harsher than, in reality, they are. In this section, I synthesize the interview evidence suggesting that the myth of monitoring is strong, even if the monitoring itself is not.

2.3.1 Perceptions of Monitoring Activities and Frequency

There is notable inconsistency in villager understandings of patroller frequencies and activities across the two forest sites; with a host of contradictory stories, it would, understandably, be difficult for a villager to discern truth from myth. What is very well understood is that patrolling happens in secret when it does happen. Whether one thinks patrollers are in the forest every day, a few times a week, or even a few times a month, the understanding is that their practices are secret and it is impossible for villagers to know for sure where in the forest they are and what schedules they follow.

Magombera Forest

In terms of perceived frequency of patrols, villagers around Magombera Forest report everything from “everyday” (the most common) to “twice a week” to “once or twice a month”. One villager said that the VGS patrolled, very specifically, “Saturdays and Tuesdays, but not every Saturday and Tuesday.” Others say that while VGS patrollers are supposed to patrol every day, they only go around three times a week, or that their routines are not consistent; “if they

decide to patrol frequently, they do. Sometimes they patrol frequently.” Those who suggested that the VGS does not patrol every day are still nervous about running into them; “once or twice a month but it’s not easy because you don’t know which day” and it’s often assumed that “when they go, it’s all day, morning to evening.” To highlight the inconsistency in villager understandings of the VGS, some respondents noted that VGS enforcement has increased this year, or recently, while a handful of others believe the VGS to be, recently, largely defunct.⁸⁶

Udzungwa Scarp Forest

Similarly, villagers in the Scarp believe the EC monitors to patrol “all the time” to “two to three times per week” to not at all. As in Magombera, there are villagers who believe community monitors patrol *only* when the central government patrollers (what they call “TANAPA”⁸⁷) come and need accompaniment, e.g., “when TANAPA arrives, they’ll go together – when TANAPA here. Not other times.” One suggests that “village patrollers started patrolling recently – in past years, none.” Some guess they started in 2016; others report that they have been patrolling since at least 2000.

Some think central government patrollers come only a few times a year, and so patrolling is really in the hands of villagers, e.g., “The EC patrols; TANAPA only comes without warning maybe three times a year,” or “TANAPA goes to different places, so can’t depend only on them, but [the EC] is there all the time, so they patrol.” Suggesting the very opposite, others say that villagers don’t patrol at all and that TANAPA alone does this, e.g., “TANAPA is there every day. That is their work. They are employed for it. The EC has other work to do so they can’t patrol every day.” One villager suggested that there are not state or community patrollers at all and that the only reason villagers obey the law is that they are fearful of losing forest rights altogether.

2.3.2 Perceptions of Village Informants

As with community patrollers, there is a lack of a consensus and a veil of uncertainty over informant networks in both forest sites. Villagers report fear of a large secret informant network and, not knowing the extent of it, imagine it to be omnipresent. There is a prevailing sense, though not shared by all, that any one of your neighbors may be an informant, but that you don’t know when or for what crimes they may report on you.

⁸⁶ Some cited a lack of payment as the recent VGS drop in activity.

⁸⁷ State patrollers are known ubiquitously in the Scarp as TANAPA, though it is not fully clear why. The TFS is in charge of the Scarp (as well as Magombera Forest) *not* TANAPA, which is the body responsible for national park protection (the Udzungwa Scarp Forest does not have national park status). TANAPA does not ever conduct patrols in the Scarp. This is most likely a misunderstanding on the part of villagers, but a generally harmless one given that the body who is actually responsible for Scarp management, the TFS, is another central government agency.

Magombera Forest

As to whether it's common to report, there is no consensus. Some think that, yes, informants are how the VGS gets their information; others say no or that only some would, e.g., "only those who are close with the VGS." One woman said that there were no official community patrollers, only one's fellow villagers, who would keep an eye and report on you. Why villagers *wouldn't* report came down to two reasons: 1) the belief that villagers "don't have that kind of behavior," especially because, as I heard often, "everyone is in need of firewood;" and 2) because doing so would be "a source of conflict" with their neighbors. Of those who are sure their fellow villagers report, they don't know of any one in particular who has been reported on but have only heard rumors.

Udzungwa Scarp Forest

Similarly, in the Scarp, there was a lack of consensus as to whether villagers report on one another and whether it is common practice. Similar to what was noted by some in Magombera Forest, one woman suggested that villagers must report because "where else would TANAPA get their information?" Also, as in Magombera Forest, some villagers say that, while they don't report (or there is no tendency of reporting in the village), villagers do police one another "so that the forest won't be closed permanently". They tell one another, for instance, that it isn't a good thing to bring weapons to the forest. Many believe that if it's known villagers are bringing weapons to the forest on allowed days, the village may be restricted from forest use altogether.

Some admitted to having reported on others, while others said that reporting was not up to them; that patrolling was what the EC was for. One woman said that reporting happens only when you, yourself have been caught, not because your fine will be reduced but because you may say, "why me and not others." One woman said that timber-makers tended to tell on one another so as to keep the best trees for themselves.

One woman shared that the village chairman⁸⁸ of Kikoleko discouraged reporting on one another because using the forest is a sign of respect for one's fellow villagers, "because he wants to build his house and bring development to his home." Though this story does not square with what I heard from village leaders themselves or other villagers, it is important to note that not all villagers view illegal cutting as destruction; some view it as an unfortunate necessity and still others view it in a positive light as contributing toward village development.

Interestingly, though a) there is arguably more at stake for the Udzungwa villages if villagers are seen to be breaking the rules (i.e., as previously mentioned, they stand to lose what little forest use rights they still have) and b) Udzungwa patrollers are more likely to be happy or proud catching someone (48% to 40%), Udzungwa villagers are actually slightly *less* likely than those from Magombera to assume their fellow neighbors would report on them (54% compared to 65% in Magombera Forest).

⁸⁸ The mwenyekiti

2.3.3 Punishment Expectations

The perceived omnipresence of community monitors and informants makes up only half of the myth of monitoring; an equally important factor is one's expected punishment. It is the product of one's expectation of being caught and one's expected punishment if one is caught that constitute one's calculation of risk. Here, I demonstrate that villagers are equally ill-informed about punishments as they are about monitors and informants.

Reality

In reality, punishments are both low and infrequent. Community patrollers and informants in both sites (as well as central government patrollers) are primarily concerned with larger crimes, such as poaching⁸⁹ or felling whole trees for charcoal and timber; women cutting firewood (which is by far the most frequent type of illegal use) is by no means the target of village monitoring and informant networks.⁹⁰

While official fines may be between TSH 50,000 and 100,000⁹¹ (or USD 20.00 – 40.00, which is an extremely heavy fine) for illegal cutting (not including felling full trees for timber, which is a much more egregious crime), full fines are rarely, if ever, paid. When community patrollers in both forest sites catch women collecting firewood for their households (the most common of illegal cutting), they typically educate the women on the importance of the forest, rather than imposing a fine. According to the Udzungwa Scarp EC chairman, for firewood on illegal days, “we leave them and warn them and we educate them on what to do and what not to do.”

When community patrollers do require fines, it is of a significantly reduced amount. As an example, the head patroller in Katurukila (Magombera Forest) said that they have raised official fines (from TSH 20,000 to TSH 50,000 and now TSH 100,000) in recent years to try and curb forest use; what they actually ask of people they've caught, however, is very different. When it was 20, they asked for 5; 50, they asked for 10; and “ever since we said 100,000, nobody pays”. Another patroller similarly reports, “we have minor laws that we have created for ourselves – for small matters, people are fined just a small amount.” In Ikule (Udzungwa Scarp), one patroller says that, “for minor crimes that can be handled in the village, the fine is TSH 5,000 – 10,000, or TSH 15,000.” There is the general feeling that you can't ask people to pay when they don't have money.

Patrollers in all villages report that if the central government is the one doing the patrolling, official fines are imposed. If this is true, it is certainly not a regular occurrence, given the near non-existence of central government patrolling.⁹² In any case, central government

⁸⁹ Poaching is a significantly lower practice or concern in the Udzungwa Scarp Forest.

⁹⁰ For cutting whole, fresh trees or poaching, patrollers report that they take additional steps. Depending on the scale of the crime, the offender may be sent either to the county or district court to be fined or jailed if he cannot pay.

⁹¹ This comes to approximately USD 20.00 – 40.00 and would be considered a heavy fine. For perspective, renting one hectare of land for an entire season is TSH 100,000 (or USD 40.00).

⁹² Central government patrollers perform cursory patrols of known entrances approximately once every three months.

patrollers report being concerned with poaching and higher crimes, not firewood cutting and collection.⁹³

Villager Perceptions

Villagers, however, are not all aware of this. According to the survey data, 63% and 57 % of villagers around Magombera Forest and the Udzungwa Scarp, respectively, believe it would not be possible to be let off easy with a reduced fine for illegal subsistence cutting.

Magombera Forest

If caught (in general), people report expecting fines of TSH 50,000 to TSH 500,000 (the higher fines mostly for more egregious fines than firewood collection). Some suggest that if you can't pay the fines, you'll be sent to jail. One noted that if you're caught with firewood (even by a VGS patroller), they'll force you to carry the wood you've collected all the way to Msolwa Station (where Selous patrollers are based, approximately six miles away), where you'll wait until someone comes to free you. In line with the survey data (Figure 2.1), many suggested that, if caught, there would be no getting off easy; as one respondent noted, "you can't just talk with patrollers and not pay. Never happened – you need to pay."

People are more likely to say that they've heard of people having been caught, perhaps in previous years, than they are likely to know someone personally (this is also supported by the survey data as seen in Figure 2.1). The few people to have a greater understanding of enforcement realities were indeed those who appeared to use the forest regularly for firewood. One longstanding family recounted that the day beforehand a group had been found in the forest by the VGS; each was forced to pay TSH 10,000, or approximately USD 4.00 (this event, including the resultant fine, was corroborated by other interviews).⁹⁴ They suggested that this TSH 10,000 was a normal fine if caught by the VGS, but that if caught by Selous, it's TSH 50,000. Others also appearing to use the forest illegally agreed that "sometimes you can talk and resolve the dispute with VGS, but not with MaGame [Selous]."

This is indeed the message we hear from VGS patrollers, i.e., that if they catch villagers cutting firewood, they generally let those users off with a small fine or a warning, but that if Selous catches them, consequences will be much more severe. The assumption is that, at a minimum, fines will be higher if caught by Selous, or "MaGame", as it's called colloquially. Others suggest that "if caught red-handed – you will be sent to the court of law and then prison" or "if they find you, they will beat you". Many suggested that jailtime was likely; a handful thought those found by Selous might even be shot. Only one respondent suggested that it might be possible to be let off without punishment "if you find good-hearted MaGame" but that others "will beat you, take your firewood (sell it, dividing the money, or giving it to other people), and fine you." We know, of course, that being caught by a Selous patroller for firewood cutting is an extremely rare event if it happens at all.

⁹³ For crimes of this nature, central government fines, as reported by community patrollers, can be as high as TSH 700,000.

⁹⁴ Locals, or longstanding families, are statistically more likely to cut from the forest illegally (Clay, 2020)

Udzungwa Scarp

A similar range of expected punishments exists in the Scarp. While some assume a more reasonable TSH 5,000 when caught by the EC for illegal firewood cutting or off-day collection, others suggest fines would be TSH 50,000 to 500,000. Some do have a good sense of reality, or at least an understanding that matches reports from EC patrollers. One respondent said that the worst the EC would do would be to take your ax or panga from you, but they wouldn't even report you to the village office, let alone state patrollers. Another villager echoes this, saying that the EC would take your weapons, but you're allowed to keep your firewood. Others say that the EC will take you to the village office and from there it is up to the village leaders what to do with you; one respondent happily reported that while previous governments would have set offenders free, the current government no longer lets offenders off without punishment. Another respondent corroborates: "Before, the criminals were not punished, but now they are."

As in Magombera Forest, there is a generally supported (though not unanimous) belief that fines are harsher if coming from state rather than community patrollers. One villager says that collecting firewood on an off day (i.e., not Saturday or Sunday) would only elicit a TSH 10-20,000 fine from the EC, while TANAPA could charge TSH 100,000 if they caught you. One respondent suggests that the difference between the two bodies is that the EC only fines you, while state patrollers will also put you in jail. Another says, if caught by the state patrollers, one *hopes* to be forced to pay rather than receive other punishment, which is very severe and may include "being forced to carry your firewood from where they caught you until the village office, while they beat you and you have to crawl." Another says that "if they catch you there, they'll walk you around the whole forest until evening and they'll make you do pushups! 'Push-out! Push-out!'" One villager reported that you would be sent to jail if merely found carrying a weapon in the forest by state patrollers. Being taken to jail, beaten, or shot are common enough expectations (this supported by survey responses, Figure 2.1). Some suggest that, while it's possible to be let off easy by the EC, this is not true of state patrollers.

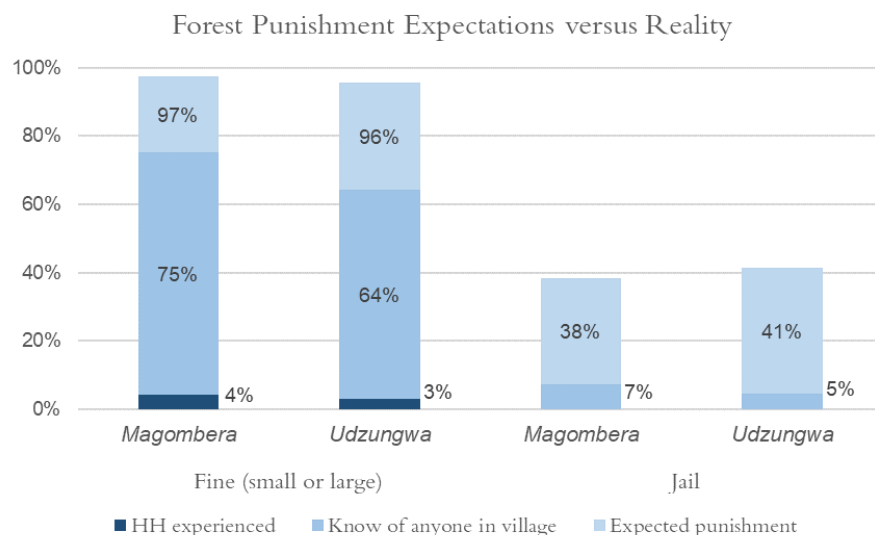


Figure 2.1

2.3.4 Economically Irrational *Not* to Cut

If villagers had an accurate understanding of the potential risks of cutting subsistence firewood from the forest, they would nearly all do it.⁹⁵ The cost of *buying* firewood is approximately TSH 5000 per week; the reported cost of buying charcoal is TSH 7,000-14,000 per week, depending on the season. Given the reduced fines that are actually imposed on illegal subsistence users (typically TSH 0 – 10,000⁹⁶), from an economic standpoint, it would be rational for Magombera Forest villagers to “steal” from the forest rather than buy firewood from the village even if you were caught every two weeks.

Villagers in the Udzungwa Scarp have a slightly different calculation to make as they are currently permitted to gather fallen, dry firewood from the forest ground two days a week. For them, legal alternatives to illegal cutting include not only buying firewood, but also spending significantly more time in the forest on the allowed days collecting sufficient firewood to last the week. It would be hard to put a cost to the extra time and energy spent climbing the forest as this will likely be different for different users, but interview evidence suggests that the extra time is significant. Especially in recent years as village populations have been growing, women report that they may search for over an hour before finding even one piece of fallen firewood. Many report needing to buy supplementary firewood mid-week when they have run out of wood.

This miscalculation on the part of non-users (i.e., those villagers who opt to buy rather than cut illegally) serves as evidence that *perceptions* of expected punishment are inflated, either because people believe village patrollers (and/ or their informants) to be more active than they are or because people believe that the fines if caught are higher than they are. There is clearly a miscalculation of the risks, and so costs, of forest use.⁹⁷

2.3.5 How widespread is the myth?

As should now be quite clear, stories exaggerating the activities and mercilessness of community monitoring (including patrollers and their informant networks) are widespread around both Magombera Forest and the Udzungwa Scarp Forest. As we’ve also seen, however, not all villagers buy into the myth; some accurately paint community monitors as generally inactive and likely to dole out minimal, if any, punishments should they find villagers illegally cutting for subsistence purposes. I turn now to survey data to measure the pervasiveness of the

⁹⁵ With some exception for the wealthy and handicapped, for instance, and I’m sure others in unique situations.

⁹⁶ Or USD 0.00 – 4.00.

⁹⁷ Instead of this resulting from an exaggerated understanding of fine amounts and patrol frequency, as I suggest, the cost “miscalculation” may additionally or instead stem from 1) the added costs of the perceived physical challenges and dangers of forest use or 2) the value of one’s time being greater than that which one might reap in the collection of illegal forest products; the second is unlikely for the vast majority of villagers. Concern over the physicality of forest entry in the Udzungwa Scarp, which is quite steep, is a noted concern of newer migrants who are not familiar with the forest (Clay, 2020). I did not hear such concerns in Magombera Forest; rather, nearly all interviewees suggested that their family would collect firewood from the forest were access to be granted.

myth; that is, how many villagers are actually buying in and how many dismiss the tales of an omnipresent villager spy network and patrollers beating or shooting offenders as mere stories?

Here, I measure the pervasiveness of the myth along two dimensions: 1) belief in the existence of a robust informant network; and 2) an expectation of harsh punishment if caught. I measure these dimensions with the following indicators: 1) whether one expects one’s fellow villagers would report on them for illegal cutting; and 2) whether one thinks subsistence cutters would be let off easy with a reduced fine (as opposed to the official, harsh fine of TSH 50-100,000).

As seen in figure 2.2, the most common opinion in both forest sites (the most highly populated quadrant) is that, yes, villagers would report and, no, it would not be possible to get off with a lesser punishment if caught (the bottom-right quadrant): high belief in the myth. 47% and 33% of villagers in Magombera and the Udzungwa Scarp fall into this category, respectively. Only 20% and 24% of villagers, respectively, do not buy in at all, while the rest accept only one of the two dimensions to be true.

How Pervasive Is the Myth of Monitoring? Percent of All Villagers Falling into Each Quadrant

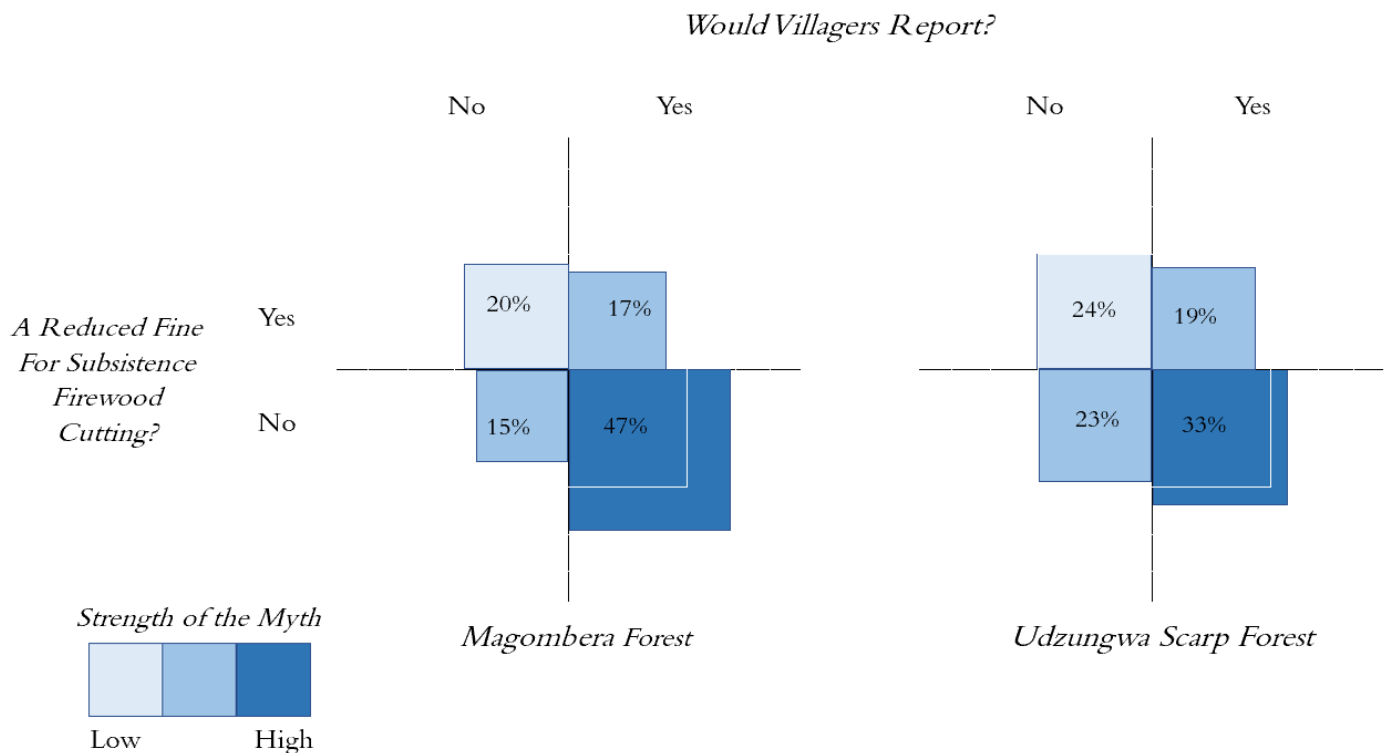


Figure 2.2: The scope of myth adoption in the two forest sites.

2.3.4 Why do so many get it so wrong?

I propose two factors that contribute to such widespread misunderstandings of community monitoring: 1) inconsistent practices; and, most importantly, 2) uncertainty over, and so a tendency to exaggerate, the relationship between community monitors and the much more feared central government. This uncertainty no doubt stems from the de facto polycentric scheme and a misunderstanding of the distinct roles the different institutions play. I will speak briefly to each point in turn.

2.3.6 Inconsistent Practices

First, the perceived veracity of competing rumors is no doubt encouraged by a system that allows for de facto discretion on the part of community monitors and informants. Inconsistencies in villager stories are easier to buy if patrollers do indeed use discretion and punish offenders at different rates; even if some people are let off easy, you may not be. As one Udzungwa Scarp villager says that, for off-day firewood collection, “there are some who have paid maybe 400,000-500,000, but no official amount. Everyone pays a different amount.” There is little to support that any villager paid TSH 500,000, or over USD 200, for off-day firewood collection; it is implausible that any villager would have that amount of money (and if they did, it is unlikely that they would be relying on the forest for their firewood). But the fact that, in reality, offenders do pay varying amounts,⁹⁸ per the discretion of the patroller or informant who finds you, allows one to more easily believe the shocking rumors one hears.

Further contributing to the misinformation about patrol activities and frequencies are rumors, in both forest sites, that the local patrol group does not patrol its own area, but that it has an exchange with neighboring patrol groups, e.g., as one villager from Ikule recounted, the EC has an exchange with “Chita or Kiberege to avoid favoring people of the same community. For example, last year, many people from Kiberege were here.” Kiberege is many hours away by train (which only comes a couple days a week) and even longer by car; it is extremely unlikely (and, importantly, not corroborated by any EC patrollers) that this exchange took place.⁹⁹ In any case, believing that the forest is patrolled by non-villagers who you a) would not recognize and b) would be less able to make a personal appeal to if caught, is a more intimidating thought. This rumor, in conjunction with the fact that patrollers do not have uniforms, helps explain why so many villagers overestimate patrol frequencies; they expect that they wouldn’t be able to recognize patrollers if they saw them. One villager from Magombera Village says that, while sometimes they patrol as patrollers, “other times they dress as villagers and pass around the forest so that they can catch people.” Both rumors conveniently help explain why people would only rarely see known patrollers carrying out their duties.

⁹⁸ Fines more likely fall in the range of TSH 0 – 15,000 and not anywhere near TSH 500,000.

⁹⁹ It is of course possible that someone from Kiberege came to stay in Ikule for the year and that this person participated in the EC; trying to understand where all of the rumors about community (and state, come from for that matter) monitoring would be an interesting study on its own.

2.3.7 Conflation of the Central Government and Community Monitors

Next, no institutions exist in a vacuum, and certainly not those of community monitoring groups, which are, though semi-autonomous in practice, nested under the central government apparatus. The relationship between the two is mutually reinforcing: 1) much of the community monitors' authority stems from their relationship with the central government;¹⁰⁰ and 2) the presence of community monitors on the ground heightens villager fear and perceived reach of the state. The de facto polycentric institutions seem to also augment the perceived capacity of each of its component parts (that is, community monitoring groups and the central government) beyond their real capacity. Lawry (1990) argues that “while state management [of common property natural resources in SSA] is ineffective, incentives for individuals to participate in local management activities are weak, and local institutions are usually unable to generate sufficient sanctions locally to enforce rules (403);” the de facto polycentric regime, however, has the ability to get around both the lack of central government capacity and lack of teeth at the local level. Uncertainty over the nature of the relationship between community monitors and state patrollers, in particular, creates a breeding ground for myths to take hold.

There is no question that the central government is more powerful than village governments; nearly every villager interviewed was emphatic on this point. Survey respondents around both forests consistently noted that they are more *fearful* of central government patrollers than they are of the community monitors,¹⁰¹ despite the fact that the central government effectively does not conduct patrols.¹⁰² This fear of a nearly non-existent threat stems at least in part from perceptions that community monitors work alongside and are in regular contact with central government patrollers, leading to conflation between the two groups and fear of the whole concept of monitoring more generally. For instance, perhaps the state patrollers are the real threat, but if community monitors work with or report to state patrollers, then community monitors represent an equal, if indirect, fear.

Bolstering these suspicions, community monitoring groups were put in place following directives from the central government.¹⁰³ Though patrollers are unpaid, the central government supports their training.¹⁰⁴ Further, perhaps most visibly for villagers as a whole, community monitors do occasionally work alongside central government patrollers when they come for their

¹⁰⁰ Funder et al (2013) too find that community monitors in Tanzania are bestowed with greater “legitimacy and clout” than they may otherwise “precisely from the fact that they have been approved by a powerful authority such as the DFO [District Forest Office] (219).”

¹⁰¹ 81% and 59% of villagers around Magombera Forest and the Udzungwa Scarp report that central government patrollers represent the greatest fear of using the forest illegally.

¹⁰² They “look for signs of destruction at key entrance points” approximately once every three months (according to the NW Sector Selous Warden and a Kilombero Sugar Company manager who has assisted in organizing patrols in the past). They are only, in theory, called in for heavy crimes, e.g., poaching, agricultural expansion, and commercial timber- and charcoal-making; central government patrollers are not called in for subsistence firewood cutting, which constitutes the great majority of illegal forest use.

¹⁰³ Via the district government and with significant encouragement from European NGOs.

¹⁰⁴ The training occurs at Ikuyu Sagamaganga College (VGS chairperson interview), the only “community based conservation training college” in Tanzania, which is located in the Ruvuma Region (southern Tanzania). It was founded in 1993 and has since trained over 4000 VGS members from Tanzania and Mozambique (WWF, 2018).

own (rare) patrols and to do other work around the forest. For instance, in Magombera Forest, central government patrollers come a few times a year and camp in the center of the village (for even two weeks at a time) tending to elephant problems.¹⁰⁵ When they come for this purpose, it is not in secret or unexpected; they only come when they have been called by village leaders and their presence is very visible.

Additionally, higher crimes, like timber- and charcoal-making are not supposed to be handled by community monitors and village governments alone; state patrollers are expected to be called in.¹⁰⁶ For most villagers who use the forest for subsistence firewood, this should be of no personal concern, but the idea that state patrollers and the EC are, in theory, in communication with one another about illegal forest use heightens perceptions of both the EC's authority and the likelihood of being put into state patrollers' hands for even illegal subsistence collection.

Confusion over the relationship between the two groups leads many villagers to over-estimate the central government's presence on the ground and over-estimate the punishments they might expect from being caught. Among villagers, 66% believe *central government patrollers* to be in the forest *at least* once a week; 50% think they are there every day; only 14% correctly estimate state patrolling frequencies to be once every three months. A handful believed that the village patrollers worked for the central government, e.g., as one person said, for illegal cutting "if you get caught, you'll be jailed! The [central] government uses [village] guards to catch people." Many assume that a local crime is passed up the chain such that there is no real difference between the two groups, e.g., one Udzungwa villager reports that, "if caught on an off day, you'll be taken to the ward government and from there to the village government and then to the upper government." Villagers around Magombera Forest report that community monitors call in "their MaGame contacts" when they find forest destruction.

Informants also serve to bolster fears of the central government. While villagers believe that informants report to ward and village leaders, some are also under the impression that informants report directly to Selous. Others suggest that informants report to village leaders or the VGS, who then reports to Selous.¹⁰⁷ Similarly, in the Scarp, most people thought informants would report to the EC or village leaders, but one woman did believe that timber-makers report on one another to TANAPA directly. The Selous warden says that he did receive regular reports from villagers in 2016-2017 when they had a problem with an expanding agriculturalist, but that he does not receive reports from villagers about illegal firewood cutting.¹⁰⁸

¹⁰⁵ That is, scaring elephants back into the forest and away from the villages, where they eat rice fields and cause general damage.

¹⁰⁶ State patrollers may very well be called in to handle these cases. It's also possible these issues are settled in the village so that a greater share of the fine stays in the village. I have no evidence of either, but have heard tales of both.

¹⁰⁷ Both village leaders and VGS patrollers report receiving occasional reports from village informants (patrollers estimate that they receive reports from informants from twice a month to once every few months).

¹⁰⁸ In 2015-2016, according to the NW Selous warden, Selous patrollers were there "every day", in response to a famous local case of forest encroachment on the part of one wealthy landowner (who lived in nearby Mang'ula). The Selous warden suggests that "citizens still think [Selous patrollers are] there every day," following this 2015-

2.4 A Conditional Impact of the Myth on Behavioral Change

Despite the low likelihood of being caught by a patroller (including a low likelihood of being reported on by an informant) as well as low real fines imposed, most villagers have outsized (and inaccurate) understanding of the threat community monitoring might pose to them (see Figure 2.1). It is evident that a community monitoring scheme need not be particularly active for it to inspire fear. This begs the question: to what extent is the *presence* of community monitoring sufficient to influence perceived risk and, in turn, illegal behavior? That is, under what conditions does the fear translate to a shift in behavior? According to one VGS patroller from Magombera Forest, “without the VGS, the forest would be already clear. The presence of the VGS in the village makes people afraid of forest use, though they don’t catch people often.” In this section, I discuss the conditions under which this is true, i.e., the conditions under which the fear, or belief in the myth, shifts user risk calculations and, in so doing, rates of illegal forest use.

2.4.2 Communal versus Private Firewood Collection

What is made abundantly clear is that a majority of villagers in all four villages assume community monitoring patrollers and informant networks to be significantly more active and harsher in their punishments than they are. The existence of unknown village informants in particular helps bolster the feeling that one is being watched and mistrust one’s fellow villagers.

This myth of monitoring’s ability to shift behavior is, however, *conditional on local cutting norms*, namely, whether the community practices communal versus private collection. To reiterate, one’s risk of engaging in illegal cutting can be understood as the product of one’s perceived probability of being caught and one’s expected punishment if caught. The perceived probability of being caught depends on one’s perceived probability of being caught by a patroller and, importantly for this paper, one’s expectation that fellow villagers might report *if* they happen to observe illegal behavior:

$$\Pr(\text{getting caught})_i = \Pr(\text{caught by patrol})_i + 1 - \Pr(\text{caught by patrol})_i \times \Pr(\text{observed by villagers})_i \times \Pr(\text{villagers report})_i$$

Accordingly, the ability for the belief in a widespread informant network to impact one’s perceived risk of cutting *hinges on one’s likelihood of being observed by one’s fellow villagers*. While it may be impossible to capture real probabilities of being observed by one’s fellow villagers, we do know that, as a result of current forest policies, the probability of being observed is relatively low in Magombera Forest (where cutting happens in secret at night) and relatively high in the Udzungwa Scarp (where illegal cutting tends to happen during the day alongside

2016 period of high patrols in response to the “emergency” situation. As evidenced by respondent perceptions of VGS and Selous patrol frequency, he is mostly correct. Even those villagers suggesting that the VGS’s patrolling has come to an end believe that Selous’s patrols continue to be regular and frequent.

other villager collecting legally). I propose that these local norms of private versus collective firewood collection shape the ability for the myth to shift risk perceptions. As will be discussed in greater detail below, communal and private collection norms stem to a large degree from forest use policies in each setting, in particular, whether forest *entry* (though not cutting) is permitted. Figure 2.3 lays out the conditions under which one might be most likely to obey forest cutting restrictions per this logic.

Conditional Effects of Community Monitoring

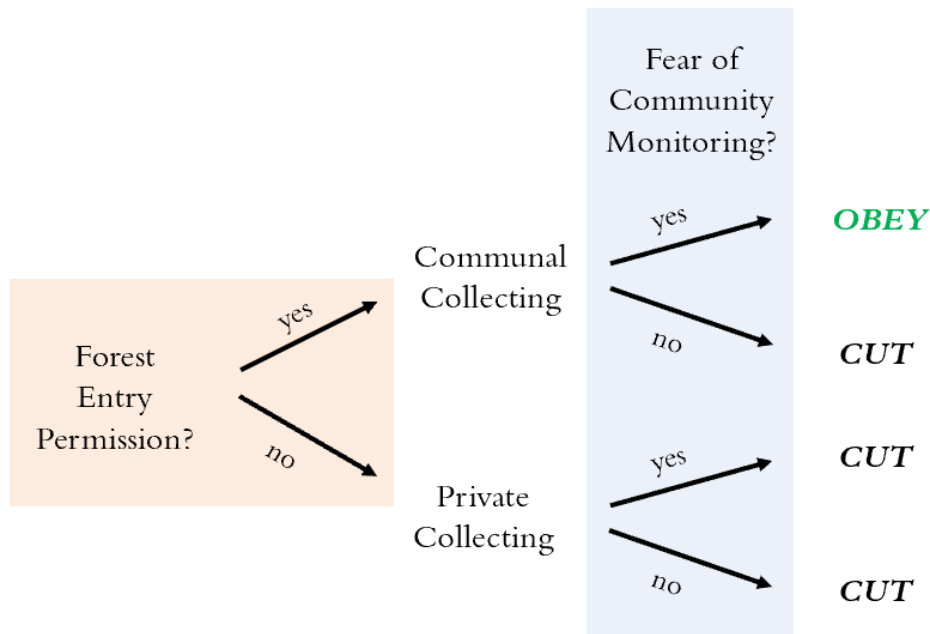


Figure 2.3: Conditions for fear of monitors to generate policy compliance

Firewood Collection (and Cutting) Practices in Magombera and the Udzungwa Scarp

While cutting of any kind is always illegal in both forests, the forest laws in the two forested areas, both determined by the central government,¹⁰⁹ differ in important ways. The key difference is this: in Magombera Forest, villagers are never permitted forest entry (this includes physically walking in the forest as well as using its resources).¹¹⁰ In the Udzungwa Scarp Forest, while *cutting* is always illegal, villagers are permitted to enter the forest on Saturday and Sunday to collect dry, fallen branches from the ground only.¹¹¹

¹⁰⁹ Via the Tanzania Forest Service, which is under the Ministry of Natural Resources and Tourism.

¹¹⁰ One exception to this is that villagers are allowed to request permission to enter accompanied by patrollers for the purposes of collecting firewood before a funeral in the family; permission is regularly granted.

¹¹¹ In both areas, carrying a weapon of any kind, most commonly a knife or an ax, serves as an additional offense.

What this means in practice is that the most frequent time for villagers to use Magombera Forest is in the evenings and at night, when they are least likely to be seen by community and state patrollers, as well as their fellow villagers. Villagers around the Udzungwa Scarp, on the other hand, are most likely to use the forest alongside their fellow villagers on the legal use days of Saturday and Sunday; if they should opt to use the forest *illegally*, i.e., bring along a weapon and cut branches from the trees, this activity is also most likely to happen on Saturdays and Sundays when they are already legally inside the forest. These use patterns are not only logical, they are backed up by extensive interview evidence.

The experience of cutting from Magombera Forest, then, is a much more secretive one; the primary objective is to be wholly unobserved. Cutting from the Udzungwa Scarp, on the other hand, presents a greater risk of being observed by fellow forest-users. In the Scarp, while women tend to take their own paths in the forest (that is, they have individual paths of firewood collection), they walk alongside friends and relatives.¹¹² Women report firewood collection being a social experience, accompanied by singing religious songs and chatting; not one woman around the Udzungwa Scarp said that she went alone to collect firewood. In the Scarp, it would be highly unusual not to come across other collectors during a day's firewood collection. And, given that all of this activity occurs during the day, it is much easier to clearly identify individual users (and illegal cutters, if the case may be).

Communal collection changes the dynamic in one important way: illegal cutting is more likely to be observed. In this context, *if* one suspects one's fellow villagers would report illegal behavior, she is less likely to cut illegally. This same dynamic does not exist in Magombera Forest; Magombera cutters are less likely to be observed by their fellow villagers and so, accordingly, one's expectation of fellow villagers reporting has a significantly lesser influence on illegal behavior.

Interestingly, though there is an additional incentive to report in the Udzungwa Scarp (i.e., more to lose if the village is seen as disobeying forest policy),¹¹³ the myth is arguably stronger in Magombera Forest where a higher percentage of villagers believe both that fellow villagers would report on them (65% versus 53%) and that a reduced fine for subsistence firewood cutting is not possible (63% versus 57%).

Hypothesis and Testing

I argue that these differences in use patterns allow for the fear of community monitoring to manifest differently across the two sites. More specifically, **I hypothesize that while the myth of community monitoring permeates both forest sites, buying into it (and the belief in a robust informant network in particular) will impact illegal forest use decision-making in**

¹¹² Typical practice entails walking along one line uphill, into the forest, collecting firewood in piles along the way. When one feels one has gathered a sufficient amount, usually after a couple of hours of walking uphill, she will follow her same path back to the village, picking up her piles of firewood along the way.

¹¹³ Given that additional incentives to report should not affect villager perceptions of the myth of monitoring independently from how they influence villager perceptions of the likelihood of villager reporting, this additional motivation in the Udzungwa Scarp does not, on its own, indicate a stronger or more prevalent myth of monitoring.

the Udzungwa Scarp Forest more so than in Magombera Forest. Those who choose to cut illegally in the Udzungwa Scarp must rely much more heavily on their trust in fellow villagers not to report their illegal behavior simply because they are more likely to be observed by them. Consequently, though the *strength* of the myth may be slightly higher around Magombera Forest, its ability to shift behavior will be measurably stronger in the Scarp.

To test this hypothesis, in the next section, I look at variation across the two settings in 1) the perception villagers have of the role villagers play in forest protection in general; and 2) the correlation between buying into the myth (per the two dimensions laid out in Figure 2.2) and rates of illegal cutting. Due to the sensitivity of the question and the potential desirability bias that might affect accuracy of the question were it asked outright, I rely on a list experiment conducted alongside the survey to determine actual rates of illegal cutting in each quadrant.¹¹⁴

2.4.2 The Impact of the Myth on Illegal Forest Use

An Augmented Perception of the Role of Villagers Play in the Scarp

Despite the fact that community monitoring is not stronger or more active in the Udzungwa Scarp than it is in Magombera Forest (patrollers do not patrol more frequently nor does it appear that village informants report with any greater regularity), villagers in the Scarp have an augmented view of the role villagers play in forest protection relative in Magombera.

First, though it's rare in either forest site for villagers to report anything other than the central government as the primary *fear* of illegal forest use, villagers around the Udzungwa Scarp are over two times as likely as those around Magombera Forest to report that villagers (including village patrollers and leaders as well as common villagers), and not the central government, present the primary fear of using the forest illegally (21% compared to 9%).¹¹⁵

Second, the network of community monitors is perceived to be more important in the Udzungwa Scarp (both compared to state patrollers and relative their importance in Magombera Forest). A majority of villagers around the Udzungwa Scarp believe villagers (including leaders and hired patrollers, as well as regular villagers) are primarily responsible for patrolling and protecting the forest, while a majority of villagers around Magombera Forest believe this role to fall to state patrollers (Figure 2.4). Interestingly, 6.5% of households around Magombera Forest report someone in their household having either regularly or rarely participated in protecting the forest, while only 3.4% around the Udzungwa Scarp report the same. If there is any correlation between number of participating protectors and patrolling responsibility, it would suggest that villagers are relatively less responsible for patrolling around the Udzungwa Scarp than around Magombera Forest, contrary to what their fellow villagers believe.

¹¹⁴ See Section 1.3 for more information on the list experiment and Appendix 1.1 for the specific wording used.

¹¹⁵ See Appendix 5.1 for the wording and translations of all relevant survey questions.

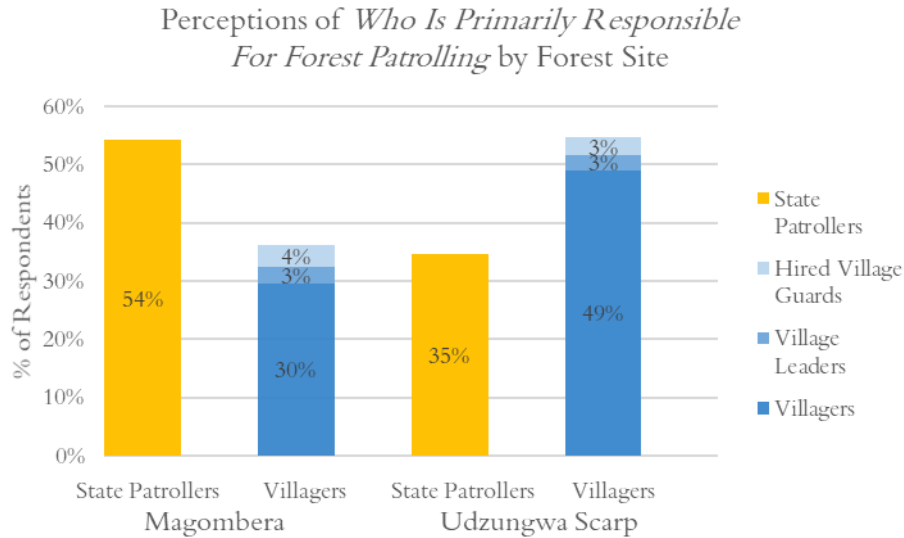


Figure 2.4: A breakdown of who villagers see as primarily responsible for forest patrolling.

Effects of the Myth on Illegal Cutting: a comparison of two settings

Next, I look at the relationship between illegal cutting rates and “buying into the myth” of community monitoring. If the myth of monitors shifts user risk calculations (as I have hypothesized it will in the Udzungwa Scarp as a result of communal cutting practices), we should see lower illegal forest use among villagers who have bought into it. Where the myth is strong but there is no associated reduction in illegal cutting, we can assume that the myth of community monitoring is not sufficient to cause behavioral shifts.

I measure “buying into the myth” along two dimensions: 1) whether respondents believe fellow villagers would report on them for illegal behavior; and 2) whether they expect that, if caught, they’d face the official, heavy fine (i.e., there is no reduced fine or “getting off easy” for subsistence firewood collection). Neither of these things is likely in either village, hence why they fall squarely in “myth” territory. Villagers only seldom report on one another for illegal behavior and villagers cutting for subsistence use would almost certainly be let off with a reduced fine, or none at all.¹¹⁶ As demonstrated in Figure 2.5, the myth of monitoring is much stronger than the reality; 47% and 33% in Magombera and the Udzungwa Scarp, respectively, having fully bought in and another 32% and 42%, respectively, have bought in along one of the two dimensions. Only 20% and 24%, respectively, fall in the top left quadrant, not having bought into the myth at all.

If the myth of monitoring shifts behavior, we should see reduced illegal cutting among villagers who believe their fellow villagers would report on their illegal cutting and an even greater reduction in illegal forest use among those who also believe a reduced sentence is not

¹¹⁶ As discussed in section 2.3.3, patrollers report that subsistence users are most often women with no other options to feed their families; in lieu of a fine, patrollers often educate them on why it is important to protect the forest. A large fine, such as the official amounts of 50-100,000 are perhaps never requested for this type of use.

possible (i.e., one expects to face heavy punishment). When we look at each forest site separately, we see that only around the Udzungwa Scarp does this pattern prevail; the myth of monitoring around Magombera Forest does not appear to influence illegal forest use.

In the Udzungwa Scarp, of the four types of villagers (when considering these two metrics), those who a) don't think their fellow villagers would report on them and b) do think getting let off easy is possible (the top left quadrant in Figure 2.5) are over four times as likely to cut from the forest illegally than are villagers in any other quadrant. The greatest number of Udzungwa villagers fall in the bottom-right quadrant of: yes, villagers would report, and, no, a reduced fine is not possible (97 villagers, or 33%), but only an estimated 1% of these households cut illegally over the previous year (compared to an estimated 90% of households under the impression that neither watch nor punishments are particularly strong). This suggests strongly that belief in the myth of monitoring has a significant impact on risk perceptions, and so illegal behavior, in the Scarp. Rates of illegal cutting among villagers buying into only one of these two dimensions of the myth are also very low (21% and 13%), though not as low as the group buying into both dimensions (1%). While the NE and SW quadrants are not statistically distinct groups, all other quadrants are statistically significantly different from one another at the 0.05 level.¹¹⁷

Rates of Illegal Cutting by the Strength of the Myth of Monitoring
Percent of Villagers in Each Quadrant Cutting Illegally

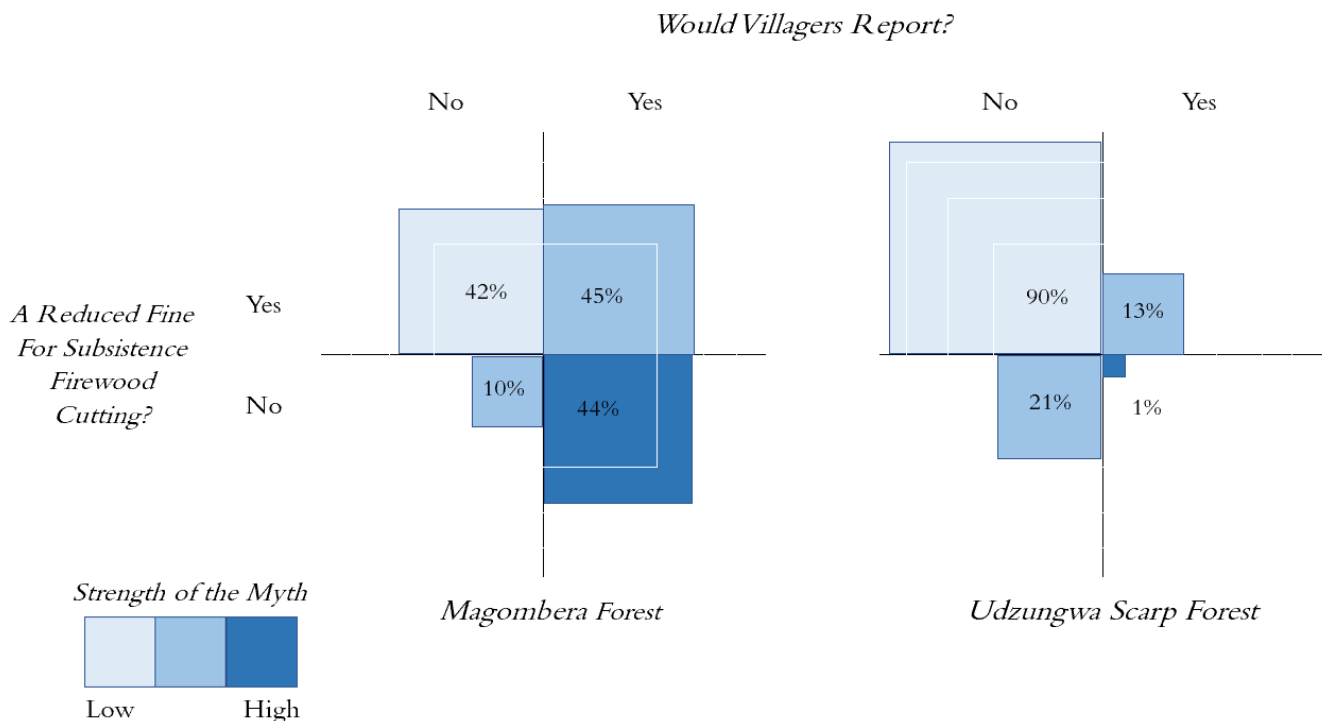


Figure 2.5

¹¹⁷ See Appendix 2.1 for statistical analysis of the list experiment.

In Magombera Forest, on the other hand, buying into the myth of monitoring is not as clearly linked to lower rates of illegal cutting. There is no significant difference in rates of cutting between high and low believers in the myth. Believing neighbors would report on you actually has a higher rate of cutting; those using the forest are *less* trusting of their fellow villagers and yet they continue to cut. While those expecting a heavy fine are indeed less likely to cut relative those *expecting* to be let off easy, this factor (unlike reporting expectations) does not depend on collective versus private collection. The SW quadrant is statistically significantly different at the 0.05 level from the remaining three quadrants; neither of the remaining three quadrants is significantly different from one another.¹¹⁸

2.5 Conclusion

As this paper has demonstrated, in Tanzania's Kilombero Valley, community monitoring programs (and their informant networks) have contributed to an aura of fear throughout their communities despite their general inactivity and tendency for reduced punishments. Villager informants are to community monitoring groups what the community monitors are to the central government: a relatively inactive group that augments the perceived capacity of the other. That fear, however, only translates to reduced illegal forest cutting under certain conditions (specifically, when the norms and institutions on the ground engender communal as opposed to private wood collection). Community monitoring can be successful at curbing illegal forest cutting, but attention needs to be paid to the specific legal structures on the ground; without doing so, one risks creating an atmosphere of mistrust without effectively conserving the resource in question.

Gibson and Ostrom (2005) note that "it is almost tautological that rules must be enforced for the possibility of successful resource management." With this paper, I challenge this seemingly intuitive argument. It is not necessarily that rules must be enforced but that villagers need to *perceive* them as being enforced. The *myth* of a functioning monitoring system may be, under certain institutional settings, sufficient to curb illegal resource use. It is perceptions and expectations, not reality, that factor into individual risk calculations. In some cases, perceptions may be a direct reflection of reality, though they need not be. As such, an inactive community monitoring network doesn't *necessarily* mean an ineffective one.

I further present evidence that this fear can, but does not inevitably, curb illegal forest use; attention must be paid to the local institutional and legal environment. For the myth of monitoring to factor into would-be users' decision-making, much hinges on whether illegal users are likely to be seen by their fellow villagers as they collect firewood. If they are, community monitoring (and its associated networks of villager informants) has a greater chance of shifting villager risk perceptions, and so rates of illegal cutting.

¹¹⁸ See Appendix 2.1 for statistical analysis of the list experiment.

In this research, I have explored the impact of the myth of monitoring under two institutional contexts: one where forest access on special days is legal and so collecting (legally and otherwise) most often occurs collectively, and another where forest access is completely restricted, and so the bulk of firewood collection occurs in greater secrecy and, most often, in the evenings and at night. While fear of community monitors and village informants permeates both forest sites (and is arguably more widely believed in the latter, Magombera Forest), it is only tied to reduced illegal cutting in the former, Udzungwa Scarp Forest, due to the communal collection habits that exist in the Scarp, but not in Magombera Forest.

Is the Myth Effective at Curbing Deforestation?

Without longitudinal data on household forest use, it's hard to model a reliable counterfactual of illegal use in the absence of patrollers. What we do know is that illegal forest use continues despite the presence of community patrollers in Magombera Forest and the Udzungwa Scarp Forest. Though community monitors may scare off many villagers from the forest, their presence does not stop illegal forest use altogether. The list experiment shows that around 40% and 31% of all households in Magombera Forest and the Udzungwa Scarp Forest cut illegally from the forest. A UFP coordinator reports that it's common that he might find 20 to 50 women collecting firewood in Magombera Forest every day; as he is in the forest doing research and is not in the business of patrolling, they do not hide themselves from him.¹¹⁹

One Magombera Forest patroller reported that he believes *frequency* of use is decreasing, but *destruction* increasing. As he says, "because they're fearing being caught, if they go, they collect until they're satisfied." He contends that fines just lead to more egregious destruction when forest use does happen. People increasingly stay in the forest longer to maximize their potential profits each time in order to make up for the increased risk. If cutting has indeed become a riskier venture, this is a pattern that should emerge given that people still rely on firewood for their cooking (and that populations in each of the villages are increasing); with greater fear of forest use comes a greater market for illegal wood in the village, and thus potentially high profits to be made. Further, charcoal-making is both more destructive of forest resources and more lucrative; if community monitoring makes it so that the only people willing to risk forest use are charcoal-makers, they may cause more harm than good from a conservationist perspective.

Potential Negative Implications of Community Monitoring and Future Research

As this research has demonstrated, the myth of monitoring does not affect all communities equally, nor all villagers within those communities, necessitating research into the efficacy and equity of these programs. First, in areas where the myth does not appear to shift behavior, does it cause more damage than it's worth, e.g., in dismantling community trust and cohesion? Among villagers around Magombera Forest, 65% assume their fellow villagers would

¹¹⁹ As he says, "Katurukila people aren't scared when they see me because they know I don't touch them. I just ask them to plant trees."

report on them for illegal behavior and yet those villagers are no less likely to cut illegally than those who don't share in their mistrust; have community monitors unleashed a deleterious institution with little benefit to resource conservation? This question merits greater investigation; without a reliable counterfactual, we cannot know what levels of trust would be in the absence of the VGS program.

Further, the myth of monitoring *can* alter risk perceptions and illegal use practices, but, as we have seen, not all villagers fully buy into the myth (20% and 24% in Magombera and the Udzungwa Scarp don't buy into it at all). From an equity point of view, do certain groups face greater real or perceived risk of being reported on by their fellow villagers? If so, these populations will disproportionately abstain from illegal cutting, something that may have adverse effects on their economic standing and food security (even if it may have beneficial effects on forest conservation). More research needs to be done to ensure that community monitoring schemes are not perpetuating or generating community inequities.

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Appendix 2.1

List Experiment Difference in Means

Forest	Figure Quadrant	Perceptions	N	Est	SE	90% CI		ANOVA (<i>p</i>)
Magombera	SE	Report: Y; Reduced Fine: N	149	44%	15%	29%	59%	0.045
	NE	Report: Y; Reduced Fine: Y	55	45%	25%	20%	70%	
	NW	Report: N; Reduced Fine: Y	63	42%	45%	-3%	87%	
	SW	Report: N; Reduced Fine: N	48	10%	30%	-20%	40%	
Udzungwa Scarp	SE	Report: Y; Reduced Fine: N	97	1%	24%	-23%	26%	0.000
	NE	Report: Y; Reduced Fine: Y	56	13%	25%	-11%	38%	
	NW	Report: N; Reduced Fine: Y	70	90%	31%	59%	121%	
	SW	Report: N; Reduced Fine: N	67	21%	24%	-3%	46%	

LAND TITLING AS A SIGNAL OF STATE CAPACITY

A Study of Their Spillover Effects on Illegal Forest Use in Rural Tanzania

Abstract

Tanzania is currently undergoing a pilot phase of land titling throughout the Kilombero Valley, a heavily forested district in the Morogoro Region; starting in 2017, head government land surveyors began the process of measuring and registering land throughout the district. The land titling process, which entails government surveyors physically coming to and measuring one's land, is a strong and unmistakable marker of central government capacity and control over the land sector (a sector that plays the dominant role in villagers' lives, as it shapes their livelihoods and food security). Using household survey data, a list experiment, and interviews (with villagers, leaders, and key informants) in four villages in the Kilombero Valley, I show that this overt demonstration of state capacity spills over onto the forest sector; the experience of having one's land prepared for a title heightens perceptions of central government forest monitoring and enforcement capacity, thereby engendering greater compliance with forest policies. Households whose land has been registered for a land title are significantly and substantially less likely than other landowners to have illegally cut from the neighboring forest in the previous year. Registered households are also more likely to over-report the frequency of government patrolling activities.

3.1 Introduction

This paper explores the impact of land policy on forest policy compliance, finding that the land titling *process* itself serves as a signal of state capacity for public forest monitoring. To exert control over a citizenry's agricultural land rights, especially in subsistence economies, is to wield considerable control over that citizenry's potential livelihood and food security. This powerful lever has influence well beyond the realm of agricultural land management, including, as this article shows, engendering compliance with forest policy. It is an area of research that is especially important and timely given that countries throughout sub-Saharan Africa (SSA) (encouraged by pro-poor development strategies promoted by the FAO, the World Bank, and UNDP, among others¹²⁰) are currently undergoing land titling programs.¹²¹

Tanzania is currently undergoing a pilot phase of land titling¹²² throughout the Kilombero Valley, a heavily forested district in the Morogoro Region; over 2017-2018, central government land surveyors began the process of measuring and registering land parcels throughout the region. Interestingly, the effects of these title *registrations* on forest use (note that no households in this study have yet received their titles) appear to have taken almost immediate effect; surveys conducted in the spring and summer of 2018 find that Registered households were already exhibiting patterns of significantly reduced illegal forest use. In this paper, I argue that land titling goes beyond shifting household economic rationale;¹²³ the *process* of land titling serves to, additionally, bolster household *perceptions* of state coercive capacity, augmenting perceived costs of illegal forest use and engendering reduced illegal forest use even in the short-term.

When forests in the Kilombero Valley are used by villagers, it is predominantly for the purpose of collecting and cutting firewood for subsistence use.¹²⁴ Villagers shift to alternate modes of firewood collection (including purchasing wood, which, of course, may or may not have been cut illegally from the forest by someone else), when the *perceived* risk of illegal forest use increases (which may, but need not, be in response to an increased real risk). I propose that land title registrations shift household *perceived* (though not real) risk by giving households the impression that the central government is newly reasserting its power in the area and will, accordingly, have an increased interest and capacity in forest protection.

¹²⁰ Tsikata, 2016

¹²¹ Other countries undergoing land reform include: Rwanda, Cote d'Ivoire, Kenya, Uganda, Senegal, Mozambique, Zimbabwe, and South Africa.

¹²² "Titling" in Tanzania really means giving "rights of occupancy". Since the Land Ordinance of 1923, all lands are "public" and so in the hands of the state; since independence, that has meant that all lands are under the domain of the President. "Titles" typically refer to 99 year leaseholds – usufruct rights rather than full ownership.

¹²³ Land titles are known to have effects on household land use; these changes in land use behavior, especially in tree-planting (Feder and Feeny, 1991; Besley, 1995; Chimhowu and Woodhouse, 2006; Migot-Adholla *et al*, 1991; Goldstein and Udry, 2008; Clay, Reardon and Kangasniemi, 1998; Abdulai *et al*, 2011; Otsuka and Place, 2001), can have the added effect of pulling would-be forest users away from the forest in the long term. With the shifting cost-benefit analysis in favor of increased tree-planting comes a decreased reliance on the forest for fuelwood. However, an economically-motivated behavior shift of this kind should necessarily take a minimum of three years to take hold, as farmers await trees to mature to levels suitable for cutting or even pruning.

¹²⁴ Timber, charcoal-making, and hunting (which are all considered much larger crimes), are secondary uses.

Mechanism and Evidence

This research elucidates *household behavioral trends* in response to signals of state capacity. I argue that the mechanism by which land titles engender greater forest compliance is *reputational spillover*, where villagers' experiences with the capacity of the state vis-à-vis the land sector inform their expectations of state forest monitoring and enforcement capabilities and practices.

Using survey data,¹²⁵ a list experiment, and interviews (with villagers, leaders, and key informants) from forest-proximate Tanzania, I show that this demonstration of central government capacity engenders greater compliance with forest policy; that is, households that have had their land registered for a land title, a group that has been selected as if at random, are less likely than other landowners to illegally cut from the neighboring forest. Registered households are also more likely to over-report the frequency of government patrolling activities.

The structure of this paper is as follows: first, I discuss a history of control over the land sector in Tanzania. Next, I introduce my theory and hypotheses for capacity signaling and spillover onto the forest sector. I then lay out the methods used to test these hypotheses, followed by the results. After a discussion of implications and further research questions, I conclude.

3.2 Land Control in Tanzania: a history

As this paper argues, titles, and even the title registration process, allow Tanzania's central government to reassert its control over the land sector and, in doing so, signal its strength and capacity to exert control over remote populations. This newfound, or reinvigorated, perception of state capacity spills over onto other sectors within the central government's purview as well. In this section, I discuss the context in which the land titling process began and how, today, it demonstrates a reassertion of central government control over rural Tanzania. I illustrate here household experiences with and perceptions of the central government's at times murky control over the land sector.

Why Control Over Land Matters

Land is at the heart of livelihoods, food security, and even culture in subsistence communities – the institution responsible for providing, protecting, or taking away that land has regular opportunities to demonstrate its strength. As Boone (2012) shows, the rules of land tenure have powerful and transformative impacts; the institution responsible for this activity has vast power over peoples' lives. She asserts that “in agrarian society, to reform the rules of land tenure is to redefine relationships between and within communities, and between communities and the state.”¹²⁶

¹²⁵ See Appendix 5.1 for the wording and translations of all relevant survey questions.

¹²⁶ Boone, 2012; 558.

Land tenure regimes are often described as either statist or customary (or neocustomary); under the former, it is the central government that controls land policy, while, under the latter, the land sector falls in the domain of local chiefs or traditional leaders (80-90 % of all farmland in SSA is held under a neocustomary rather than statist tenure regime)¹²⁷. Tanzania can best be described as having a statist land tenure regime, though it is often not black and white and, indeed, there is collective uncertainty among citizens about who, or what institution, has authority over the land sector.¹²⁸ Questions of what land rights villagers have and who grants them are not trivial in agricultural societies, where access to land or the lack thereof has implications for one's livelihood, social standing, as well as survival. As Boone notes, statist regimes endow the central government with "micro-level levers of influence over ordinary farmers."¹²⁹ James Scott (2009) echoes these thoughts, suggesting that, alongside the patriarchal family enterprise, agriculture and property rights are encouraged by the state and a primary foundation of its power.¹³⁰ As such, even if Tanzania is considered more statist than neocustomary, a lack of obvious control over this sector suggests a relative lack of a central government presence in remote villagers' lives and uncertainty about the role or capacity of the state.

A Murky History of Land Control

As Broegaard (2005) asserts, it is *perceived* land tenure that matters. Equally important, albeit in other ways, is the institution one perceives to be in charge of the sector. The lack of consistency in legally recognized land rights, and perceptions over those rights, today stems from a colonial and post-independence history that left legacies of overlapping land institutions. Under colonization, local leaders, called "Native Authorities" were ostensibly given power to create and impose orders over the land sector. Mamdani argues that this was a "fiction"; he suggests that there was enough similarity, including identical language, across individual orders that many analysts suggest they must have been coming from the central administration). On the surface, in any case, and likely what was perceived by villagers, local leaders (who were themselves empowered by colonial powers) called the shots on local land and agricultural policy, including dictating what villagers were and were not allowed to plant.

"In agriculture the power to make orders covered not only the 'protection of trees and grassland' and 'the control and eradication of animal and human diseases,' but also 'the increase of food production.' In 1930 these powers 'were greatly added to' by specific orders of the governor. The regulation 'related to every conceivable aspect of farming

¹²⁷ Boone, 2015; 67.

¹²⁸ As an example, Afrobarometer data from 2008 (which was the last year in which the question was asked) show that there is substantial interregional and intraregional variation in Tanzania in perceptions of which level of government is responsible for land allocation (question 58f). The average percent of respondents across all regions thinking the central government was responsible for land allocation was 44% (across regions, the percent of respondents believing this spanned from 22% to 94%). Given the significantly reduced role land allocation plays in villagers' lives (though it was considerably more in 2008), these findings should be taken with a grain of salt; it is unclear how the question would have been interpreted by the respondents.

¹²⁹ Boone, 2014; 240

¹³⁰ Scott, 2009; p. 9

practice and land use.’ There were orders ‘on everything’: from ‘anti-erosion measures (compulsory tie-ridging and terracing, de-stocking, control over grazing, etc.)’ to ‘improved methods of cultivation (destruction of old cotton plants, mulching of coffee, etc.),’ and from the practice of ‘animal husbandry (cattle-dipping, etc.)’ to methods ‘designed to prevent famine (compulsory production of some famine crops such as cassava or groundnuts).’ ”¹³¹

Independence in 1961 and President Nyerere’s socialist movement of Ujamaa, and especially the associated Villagization movement (which lasted from the later 1960s through the mid-1970s), ushered in a new wave of centralized control over the Tanzanian countryside. Mamdani (1996) argues that Tanzania, like other “radical” reformers (in contrast with what he deems “conservative” reformers), attempted to upend colonial institutions, including neocustomary land tenure institutions,¹³² but, in doing so, only strengthened the centralized state, and the ruling party, TANU, in particular.

Nyerere sought to unify, and so de-tribalize, the Tanzanian population following a period of colonization during which, by and large throughout SSA, propping up tribal institutions was used as a means of control.¹³³ Rather than perpetuate a system of localized customary law, Nyerere sought to create and codify a single body of law that would apply to all areas and ethnic groups.¹³⁴ Such a legal structure would necessarily come from above. According to Mamdani, “the deracialized and detribalized power they organized put a premium on administrative decision-making. In the name of detribalization, they tightened central control over local authorities. Claiming to herald development and wage revolution, they intensified extra-economic pressure on the peasantry.”¹³⁵

Under Ujamaa, village leaders’ official role was diminished. With the formal renaming of local chiefs (the wajumbe, locally, and the Native Authority formally) to Village Executive Officers (VEOs),¹³⁶ came a very real limitation of powers. While Native Authorities “were given power to make orders (section 9) and rules (section 16) for ‘the peace, good order and welfare of the natives’ under the 1927 Native Authorities Ordinance,”¹³⁷ the VEO, as well as the WEO (Ward Executive Officer) above him, was primarily, according to Mamdani, an “enforcement officer”, who now “lacked the power to introduce bylaws or to adjudicate cases. Those powers belonged to the party cadre (107).” Schneider (2014) argues that Nyerere’s central government used notions of “decentralization” as yet another hand of the state; with these centrally-appointed local leaders, they sought to “create more powerful executive and administrative authorities in

¹³¹ Mamdani, 1996; 124

¹³² Boone and Nyeme, 2015.

¹³³ Boone, 2014; Mamdani, 1996

¹³⁴ Mamdani, 1996; 131

¹³⁵ Mamdani, 1996; 26

¹³⁶ Today, this position is still known as the VEO or the mtendaji. It is a central government-appointed village leader, who is not local to the village where he serves. He generally serves five-year terms in each posting, after which time, he is typically transferred to another village to serve as mtendaji there.

¹³⁷ Mamdani, 1996; 124

the regions, a move closely tied to the purpose of readying the party and government to launch its “frontal attack” on the villagization front.”¹³⁸

Villagization, which entailed forced population resettlement, affected nearly all Tanzanians; it is estimated that by the mid-1970s, three-quarters of Tanzania’s population lived in planned villages throughout Tanzania.¹³⁹ “The displacement of a large segment of the population, often by force and with inadequate planning, caused much social and economic disruption, and left in its wake a legacy of bitterness and distrust, not to mention a substantial number of land disputes.”¹⁴⁰ All land disputes were sent directly to special land tribunals, which were dominated (four of five members) by ruling party (TANU) and the central government’s Ministry of Law and Settlement appointees.¹⁴¹

A notable part of the villagization process, especially for the purposes of this paper, is that it was devoid of any legal framework. Coldham (1995) suggests that perhaps this “stemmed from the feeling that it would be inappropriate to impose a universal model from above at a time when official rhetoric was emphasizing the importance of grass-roots participation and popular initiative.”¹⁴² In any case, what it left was further confusion over the land sector; the 8,000 villages created under Ujamaa’s villagization scheme “were grounded in neither customary tenure nor law”.¹⁴³ Ujamaa thus undermined or replaced the customary rights of previous occupants without giving legal rights to the new occupants. As one might expect, in the aftermath of Ujamaa and Tanzania’s socialist period more broadly (starting in earnest in the 1980s), there were ample land disputes with no clear way to settle them; “courts ruled in favor of traditional land holders in some cases and ujamaa settlers in others, with no consistency.”¹⁴⁴

The Village Land Act (VLA) of 1999 finally sought to remedy this. The VLA began recognizing customary tenure rights in an effort to promote private investment through land ownership. Ownership is expressed through Certificates of Customary Right of Occupancy (CCRO), which are legally binding.¹⁴⁵ Prior to Tanzania’s current wave of titling, it was possible, though often cost-prohibitive, to receive a CCRO.¹⁴⁶ As a result, the vast majority of Tanzania’s “landowners” have no formal claim to their land.

Currently, there is a lack of clarity vis-à-vis land rights and institutions. Though I found most survey respondents in the Kilombero Valley suggested that they feel mostly to somewhat secure in their rights over their “owned” land, even without a title, nearly all said that a title would make them more secure. Current sources of land security are, according to villagers, that

¹³⁸ Schneider, 2014; 130-131

¹³⁹ Silwal, Ani Rudra, 2016; 4

¹⁴⁰ Coldham, Simon, 1995; 229

¹⁴¹ Mamdani, 1996; 135

¹⁴² Coldham, 1995; 229

¹⁴³ Fairley, 2013; 73

¹⁴⁴ Fairley, 2013; 73-74

¹⁴⁵ Tanzania Government, 2009

¹⁴⁶ The cost of a CCRO was USD 10 initially and then an annual land tax of USD 90 cents per hectare thereafter (Failey, 2013; 67).)

the land has been under their cultivation or, in some cases, because it is “family”, or inherited, land.

In the Kilombero Valley, the primary sources of insecurity do not stem from other villagers or pastoralist versus agriculturalist conflicts as elsewhere in SSA (as well as elsewhere in Tanzania).¹⁴⁷ Rather, according to interviews, fears stem from state expropriation (for development, military, or other purposes) and industrial agriculture land grabs (with the support of the central government). As one villager explained, “A title will help because nobody can take our land. We’ll have more power.... Something we worried about before, the District government taking land, maybe to build, maybe a school, building storage facility for rice. If the government wants the land, they could just take it without giving the owner any money. With a land title, they still could take it, but would have to pay.”

Regarding potential land grabs by commercial agriculture industries, the Morogoro Region (including Kilombero District) is located within the Southern Agricultural Growth Corridor of Tanzania (SAGCOT), a fertile area that has been marked to large agri-businesses as a means of promoting commercial agriculture in Tanzania. The Rural 21 news source reports that “while this may be a good decision economically, it is likely to cause land pressure and evictions of landholders which will block the aspirations of the Village Land Act.”¹⁴⁸ Without an official land title, villagers feel vulnerable to these powerful interests (in addition to government development initiatives, e.g., buildings roads, schools, or expanding military or prison lands).

Land Allocation

Another historically important, though currently diminished, element of land policy is land *allocation*. For as long as there was land to be given, land allocation has been a direct and obvious form of control over the land sector. However, though this was once the purview of village governments, land allocation no longer plays the prominent role it once did, particularly in land-scarce regions, such as the Kilombero Valley.¹⁴⁹ With little (to no) uncultivated or unprotected land remaining and most land transactions now happening either privately or through inheritance, there is less of a role for village governments (or any institutional body, for that matter) to play. As a result, many Tanzanians are left unsure as to who actually is in charge of land allocation, which complicates understanding of who is in charge of the land sector more broadly.¹⁵⁰

¹⁴⁷ In fact, land disputes between agriculturalists and pastoralists in Tanzania reported “increased exponentially” between 2006 and 2016 (Rural 21, 2016).

¹⁴⁸ Rural 21, 2016

¹⁴⁹ The Kilombero Valley attracts much in-migration due to its reputation for rains and fertile land (as supported by surveys and interviews), though this is not the case throughout Tanzania. Fairley (2013) notes that, according to the village mwenyekiti (or VEO), Mitengwe village (Kisarawe District, Pwani Region) still has plenty of land and that “people from neighboring villages and even outsiders from other regions can at no cost obtain land allocated by the Village Council (68).” Land allocation at the village level clearly does play a role elsewhere in Tanzania where some land remains uncultivated and unoccupied, though these areas are becoming more and more scarce.

¹⁵⁰ According to 2008 Afrobarometer data on Tanzania, the average percent of respondents across all regions thinking the central government was responsible for land allocation was 44% (across regions, the percent of

Historically, in Tanzania (as elsewhere throughout SSA), local leaders (initially colonially-endorsed chiefs, the Native Authority, and replaced by appointed and elected village leaders¹⁵¹ in the post-independence era) were responsible for land allocation. In Tanzania, this meant doling out parcels of uncultivated, and sometimes forested, land to individual households. Land allocation, which was once a source of local power over the land sector, today plays a very minor to non-existent role in land-scarce areas of Tanzania for two reasons. First, when parents pass away, children inherit their parents' "given" land; it does not go back to the village leaders for re-allocation as it sometimes happens in other countries (e.g., "customary" regimes where chiefs wield especially high power). Rarely in Tanzania is a household's "given" land re-allocated to another household. The land is commonly understood to belong to the family in perpetuity, so long as that household continues to follow the land-occupancy conditions of the time (more below).

Second, land-occupancy conditions are lesser today than under colonization or Ujamaa; i.e., land "ownership" is less dependent on how and for what purposes said land is used. Throughout the past 50 years (since independence), the government has had various conditions on land occupancy and use. For example, during the socialist period, Ujamaa, of the 1960s-1970s, households were required to put a minimum of one hectare of their land toward the production of export crops.¹⁵² Today, the only remaining condition on land occupancy is that the land not be left fallow for longer than three years (i.e., near continuous cultivation).¹⁵³ Because very few households can afford to let their land lay fallow for even one season, this condition is generally not felt to be a burden or a challenge; it is a policy that exists in theory, but one that lacks any regular need for enforcement.¹⁵⁴

So, power over land allocation may still be an important marker of the state's or chiefdom's power elsewhere in SSA (in customary states especially) and even elsewhere in

respondents believing this spanned from 22% to 94%); there great variation in perceptions of who is responsible for land allocation both within regions and across them.

¹⁵¹ The top two positions in village leadership are the mtendaji (VEO), a non-local who is appointed by the central government and serves five-year terms in different villages, and the mwenyekiti, a locally elected leader who also serves a year-year term.

¹⁵² Scott, 1998.

¹⁵³ Fallowing is an important method for soil regeneration (Boserup, 1965). That it is both illegal and cost-prohibitive in many areas is worrisome for future soil fertility; with no other options, more and more households in Tanzania, as elsewhere, have become reliant on chemical fertilizers to maintain a sufficient food supply for their families. In interviews, respondents reported the allowance to let their land lay fallow for two or three years, but the belief that, if they did so, as one woman in Katurukila reported, "people would enter and farm, taking little by little." That same woman reports that her land is less fertile and requires expensive chemical fertilizer as a result.

¹⁵⁴ Those wealthy enough to let their land lay fallow (something I encountered with only two households in all of the four villages surveyed – both cases with absentee landowners owning over 100 hectares of land, large chunks of which were uncultivated), seem to have ways around the land cultivation condition: social and economic power, to be sure, but also official land titles, which come from the head government and so supersede any local land authority. That some are apparently exempt from the land cultivation condition evokes great ire among villagers, renters in particular, who long for the land to be confiscated and re-allocated to those in need. The few villagers who report having had their uncultivated land taken from them by the village government had let their land lay fallow not for soil regenerative purposes, but because the land was overrun with "animals... eating the crops", as one interviewee from Ikule recalled; cultivation was seen as wasted effort.

Tanzania, but in fertile, forest-proximate Tanzania, the reality is that there is little land left to allocate. Village governments have, thus, in practice, lost one of their most powerful roles.¹⁵⁵

The Land Titling Process Today

It is amidst this uncertainty over which institution is responsible for the land sector that Tanzania has embarked on its most recent titling initiative. The Tanzanian government has chosen three districts in the Morogoro Region, the Kilombero District among them, to pilot this new wave of titling. The process, which began officially in 2016 (but in practice in the Kilombero Valley in 2017), is set to have been completed in 2019.

3.3 The Registration Process and Reputational Spillover

Land titles are, perhaps incidentally, a way for central governments to capture or re-assert their power over the land sector.¹⁵⁶ The process of registering one's land for a title serves as a physical and tangible demonstration of central government control and capacity.

Signals of Capacity

If a household has registered its land for a title, it has necessarily had district land-surveyors (part of the central government) come to its land and physically measure its parcels. In the case of there being any contested land, the conflict must be resolved before the government will allow the household to register its land for a title. In theory, six months to a year following the start of the registration process, the household should receive a land title from the district government, in this case, the Kilombero district government (which is a more localized hand of the head government and several levels above the village government).¹⁵⁷

This very visible demonstration of the state, in turn, influences the perceived risks of illegal forest cutting. I argue that the reason this occurs is because of *reputational spillover*; that is, villagers' experiences with the capacity of the state vis-à-vis the land sector inform their expectations of state forest monitoring and enforcement practices. While in reality, forests are

¹⁵⁵ This is not to say that the government, both local and central, does not expropriate for "development" interests, which is different from re-allocation.

¹⁵⁶ Interestingly, a land title is the one thing villagers report will protect one's land from *government* expropriation; it is not expropriation by other villagers or passing pastoralists that inspire insecurity in land, but, consistently, the government. Whether villagers are correct to believe that land titles will protect them from "development"-inspired government expropriation is yet unclear; traditionally, those with titles were those with significant wealth and power, especially colonial settlers. It has yet to be seen whether titles, once they become commonplace throughout Tanzania, will protect all households as they seem to have done for these privileged groups in the past. In any case, what is relevant for the purposes of this study is that Tanzanian households certainly and wholeheartedly believe that titles will protect them from government expropriation.

¹⁵⁷ I say "in theory" here because, at the time of the surveys (spring and summer 2018), the first wave of the Kilombero Valley land titling pilot program was still underway; the first round of registrations had been administered, but no households had yet received their land title. The titles were not "late" to arrive and there was no suggestion that they wouldn't.

poorly protected and only rarely patrolled, the land titling initiative sends a signal that the central government is both active and capable.¹⁵⁸

Interviews with Selous Game Reserve patrollers (a distinct area from the protected forests discussed in this study, though one also protected by the central government) suggest a similar dynamic at work, perhaps even intentionally, in state game reserves. The state lacks the personnel and budget to protect Selous Game Reserve from poachers and so maintains an “establish a presence” mode of control. The name of the game, so to speak, is to be seen often enough with official cars to make poachers fearful of them, even if no or at least very few actual patrols take place. The understanding here is that the *expectation* of enforcement is sufficient to curb illegal behavior. In the absence of a counterfactual, it is difficult to say whether this policy works to deter poachers; regardless, it suggests the government may be intentionally using this strategy to protect game reserves.

Similarly, in the Udzungwa Scarp forest, no interviewees report actually having seen government patrollers (who they refer to as TANAPA¹⁵⁹) in the forest though *many* report seeing their cars drive past. This is clearly a sign to villagers that the patrollers are regularly patrolling. What villagers are actually seeing is hard to say and also probably irrelevant. What’s important for understanding villager perceptions of patrolling activity is what villagers *think* they’re seeing. What we do know is that central government patrollers patrol approximately once every few months and yet the majority of villagers believe them to be in the forest every day.

Overestimations of Government Capacity

I propose that reputational spillover occurs as a result of fear of government capacity for forest patrolling and enforcement *as opposed to* a response to any real or perceived fear of state retaliation in land, where registered (and, so, soon to be titled) households might feel that illegal forest use may strip them of their future land title. Overall, there is an impressive belief in central government strength coupled with a gross and widespread misunderstanding about the realities of state forest enforcement capacity (or the lack thereof). Importantly, this fear of state capacity for forest patrolling is not based in reality; it cannot be explained by either government or village patrollers’ activities.¹⁶⁰

First, only 14% of all respondents estimate correctly that the frequency of state forest patrols is about once every three months; 50% incorrectly believe the state patrols every day while another 16% believe patrolling happens once a week. Relatedly, the expected punishment for illegal forest use far outweighs reality.¹⁶¹ Figure 3.1 lays out the various punishments respondents expect for illegal forest use, the significantly reduced percentages of respondents

¹⁵⁸ National Parks (e.g., the Udzungwa Mountains National Park or Lake Manyara National Park) not included.

¹⁵⁹ Though central government patrollers are ubiquitously known as TANAPA in the Scarp, this is technically inaccurate. TANAPA is responsible for National Park management in Tanzania. The Scarp does not have National Park status and so TANAPA has no role to play in its management or patrolling. It is another central government agency, the Tanzanian Forest Service (TFS) that is responsible for the Scarp as well as Magombara Forest.

¹⁶⁰ Clay, 2020.

¹⁶¹ Interestingly, there is gross overreporting of forest punishment expectations even among forest users! They must just assume that they’re either particularly lucky or particularly skilled at evading patrollers/ punishment.

who have ever heard of anyone in the village to have received one of those punishments, and the even more reduced percentages of respondents who have had anyone in their household receive such a punishment. Approximately 34% of households illegally cut from the forest¹⁶² and yet only 1% has ever received a heavy fine; still, 94% of households believe this to be an expected punishment for illegal forest use.

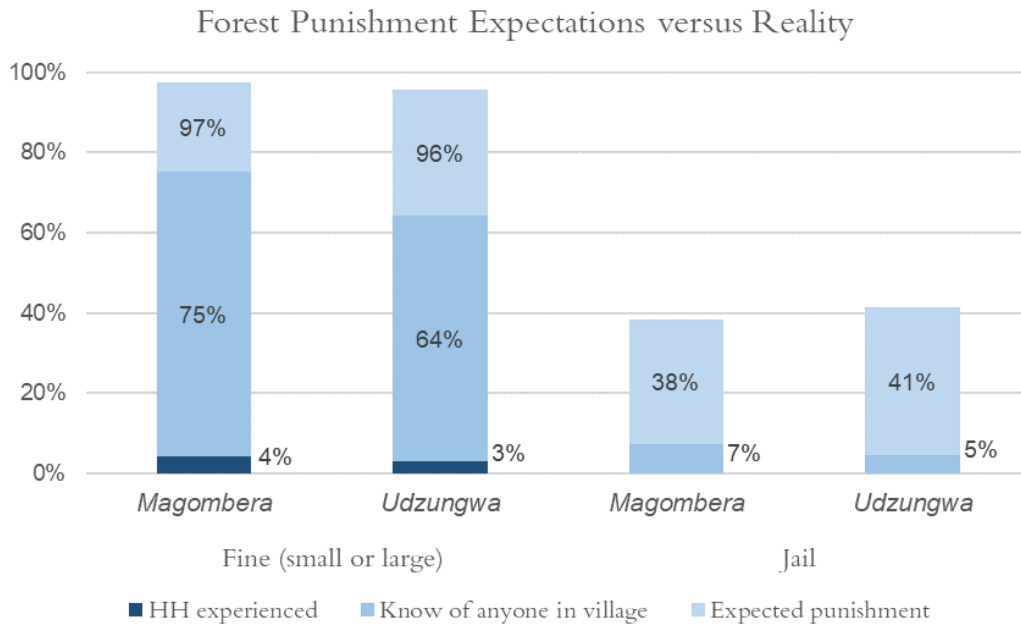


Figure 3.1: Perceptions and Experiences of Forest Punishments

According to forest patrollers, a fine is the most typical type of punishment given, though it is largely given only for repeat offenses and for crimes more egregious than dry firewood collection. Interviews with village and state forest patrollers report that they rarely ask fines of women collecting firewood for their family’s use, preferring rather to educate them on the benefits of forest conservation; their primary job is to find evidence of larger crimes, such as charcoal-making, timber harvesting, and poaching. Patrollers also report that should they demand a fine of repeat (subsistence) forest users, it is most often around one tenth of the official fine price; as an example, 10,000 TSH instead of 100,000 (this amounts to approximately USD \$5 instead of USD \$50). With those fines, a household could get caught once every two weeks and come out even with buying firewood in the village, hardly an incentive to stop cutting (especially considering the infrequency of patrols).¹⁶³

¹⁶² According to the list experiment conducted for this research. More detail on the list experiment can be found in the Section 1.3 and in Appendix 1.1.

¹⁶³ This, of course, assumes that one’s fines wouldn’t increase if they were repeatedly caught every two weeks (which may conceivably happen, though the patrollers had not experienced anything close to this). According to interviews, the cost of *buying* firewood is approximately 5000 TSH per week; the reported cost of buying charcoal is 1000 – 2000 TSH per day, depending on the season.

Second, if the government were leveraging its control over land to influence forest use behavior (or stripping households of their land as punishment for forest use), there should be some evidence of this and, in particular, evidence that villagers update their beliefs to reflect this. I find neither. There is no suggestion that land expropriation is a typical punishment for illegal forest use. As Figure 3.1 demonstrates, loss of land and loss of other property do not present primary or even significant fears of forest use; expectation of or experience with punishment or reprisal in land is minimal. 11% of survey respondents report the loss of land or loss of other property to be an expected punishment for illegal forest use (this compared with, as an example, 94% of respondents expecting a heavy fine); only between 1 and 2% of people have ever heard of this happening to a villager and only 1 of 682 respondents report this punishment having occurred in their own household.

Hypotheses

I argue in this paper that having one's land registered for a land title will serve as a tangible signal of government capacity to monitor and control the land sector and that this perception of capacity will extend to forest protection. Villagers (who tend already to have an overestimation of government capacity) will be even more fearful of the government's patrolling activities and change their forest use behavior accordingly.

Hypothesis 1: Having one's land registered for a land title will be correlated with a reduction in illegal forest use.

Hypothesis 2: Having one's land registered for a land title will be correlated with increased perceptions of state capacity for forest patrolling and enforcement.

3.4 Methods

For information on data collection and site selection, see Section 1.3.

Sample Selection

The sampling frame includes all households living in four selected forest-bordering villages in Tanzania's Kilombero Valley; the final sample was selected using a random walk technique. In the three villages of Katurukila, Ikule, and Kikoleko, every other household was selected to be surveyed; in Magombera village, every third household was selected.¹⁶⁴ For this paper, only home and landowners were included; households that exclusively rented were removed from the analyses as they were not eligible to be registered for a title.

¹⁶⁴ Only one household refused to complete the survey; another approximately 20 were unable to be contacted after multiple attempts.

The Land Titling Process

Kilombero Valley, led by the District government in Ifakara, embarked on a land (not forest) titling project starting in 2017, aiming to complete the titling process by 2019.¹⁶⁵ At the time of my research, all villages had begun the titling process, though only 57% of landowners had yet registered their land for a title.¹⁶⁶ Any already holding land titles when the surveys began necessarily opted to register and title their land before the titling pilot program began. As such, they were self-selected, and not randomly assigned, to have titles; they are not included in this paper's analysis for that reason.¹⁶⁷ The analysis thus compares only Registered to Non-Registered households in their illegal forest cutting *over the previous year*.¹⁶⁸

The allocation of land registrations was reportedly done as if at random; interviews with villagers, village leaders, as well as district government officials support this claim. In Kikoleko (a village abutting the Udzungwa Scarp), as an example, registrations began with all agricultural land north of a particular road that bisected the village; because of the nature of village layouts in Tanzania, households registered under this first wave were almost equally dispersed throughout the village.¹⁶⁹ In further support of the randomness of the Registration "treatment", survey data (discussed in Section 3.5) show that Registered households were not more economically or socially powerful, nor were they more politically involved or influential, than non-Registered households.

Because of the timing of the registration and titling process, any Registered household would have started the registration process up to one year before the survey took place, in 2017. This first wave consisted of landowners signing their names and having their photos taken by district government officials (universally understood to be a part of the central government apparatus); the second stage of the registration process, which entailed government surveyors physically coming to and measuring villager lands, happened at different times over the previous year and generally only a few months up until a few weeks before surveys began.

Statistical Analysis

To test my hypotheses, I conduct three types of analysis. First, I run a list experiment to approximate the percentage of all households of each type (those with and without a registration) who engaged in illegal forest cutting in the previous year (to test Hypothesis 1). Second, I run a series of t-tests with normalized differences comparing Registered and Non-Registered households along a series of key covariates. The purpose of this is to 1) ensure that registrations

¹⁶⁵ Rural 21, 2016. The forests of Kilombero Valley, and throughout the vast majority of Tanzania, are owned and managed by the central government; the land titling process refers only to agricultural land outside of the forest.

¹⁶⁶ 196 of 345 households had registered at least some part of their land for a land title; 149 households had not yet registered their land for a land title but would do so in the next wave of registrations.

¹⁶⁷ Only seven households were removed for this reason, which speaks again to how cost-prohibitive previous elective titling schemes were.

¹⁶⁸ The question I am interested in is which households engaged in any illegal forest cutting over the previous year.

¹⁶⁹ Starting from the socialist period of Ujamaa, and villagization in particular, under President Nyerere, village layouts were such residential areas (the village) were removed from agricultural plots. As a result, where one lives in the village suggests very little, if anything, about where one's agricultural land might be.

can truly be considered as if random, i.e., that there is no hint of reverse causation, wherein people who were already less likely to use the forest (e.g., because they had more wealth or less of a demonstrated need for forest resources) were the ones given the first opportunity to register their land; and 2) determine how registrations have influenced household perceptions of state capacity for forest monitoring and protection (to test Hypothesis 2). Third, I run an ordered logit model where I let perceptions of patrol frequency be the outcome variable with Registered as a covariate.

List Experiment

I use a list experiment to capture the percentage of households engaging in illegal forest cutting. See the Section 1.3 for more detail and Appendix 1.1 for the specific wording of the list experiment.

Regression Analyses: t-tests

To test whether, or in what ways, Registered households differ from Non-Registered households, I run a series of t-tests with normalized differences across key covariates. Covariates are divided into four categories: power (including economic, social and political power); forest need; perceptions (of government capacity and environmental protection); and knowledge (of patrolling frequencies and punishments).

Power variables are included both as controls and to test whether the registration process was truly assigned as if at random, i.e., to rule out the possibility that a household's power status led to it being registered in the first round. Economic power variables include: household income (in Tanzanian shillings, TSH), whether one has access to credit from a community group or from a bank, the highest level of education achieved in the household, total agricultural land in hectares (including rented land), total *owned* agricultural land, the amount of agricultural land per household member, whether any member of the household owns a phone or a radio, and reported food sufficiency. Political power variables include the amount of money the household had given to any village leaders in the previous six months, the total amount of time anyone in the household spent with a leader in the previous six months, and whether the household can be considered local¹⁷⁰ or of the dominant tribe of the village.

Need variables are included to test whether different household types differ in their need for forest resources, i.e., to test whether having a title registration shifts one's need for forest resources in the short term (here, I look at reported insufficiency in wood for fuel and timber whether the household planted any trees on their owned land, and whether the household planted any trees on owned land in the previous year).¹⁷¹

¹⁷⁰ A household is considered "local" if either the respondent or the respondent's spouse is a local (measured by either being born in the village or having arrived prior to 1996 (for Magombera Forest) and 2000 (for the Udzungwa Scarp Forest); years coincide with the years the villages were officially granted village status, after which point both sites saw large influxes in in-migration).

¹⁷¹ As discussed elsewhere in this paper, there is ample evidence in agricultural economics research that shows titles should influence tree-planting and other land use decisions *in the long term* (see page 3, footnote 4).

Perception and knowledge variables are included to test whether having registered one's land for a title induces shifts in perception of the government's capacity in the forest sector. I ask whether President Magufuli (elected in 2015) increased protection of the forest, to what degree the household fears future land expropriation, whether central government patrollers represent the primary fear of forest use, whether it's possible be let off with a reduced fine if caught engaging in illegal forest use,¹⁷² and with what degree of frequency government patrollers patrol the forest. I additionally look at differences between Registered and Non-Registered households in reported villager trust (i.e., do they expect fellow villagers would not report on them for illegal forest use?) and in whether they have had any environmental education.

These variables are key to understanding the underlying mechanism at play, i.e., that going through the registration process heightens one's perception of central government capacity. My expectation is that Registered households should have a heightened perception of government capacity vis-à-vis the forest sector (Hypothesis 2). See Appendix 3.1 for descriptive statistics on all variables and Appendix 5.1 for the wording and translations of all relevant survey questions.

Regression Analyses: ordered logit

As a last test for Hypothesis 2, I run an ordered logit model where perception of central government patrol frequency is the outcome, or dependent, variable. I include economic power and need variables, above, as controls. The purpose of this last test is to ascertain whether having Registered one's household for a land title shifts perceptions of patrol frequencies holding other variables constant. Response categories for patrol frequency include: "never", "once a year", "once every three months", "once a month", "once a week", and "every day".¹⁷³ As noted in section 3.3, only 14% of all respondents estimate *correctly* that the frequency of state forest patrols is about once every three months (as reported in interviews by forest patrollers and government officials in charge of the sector); 50% incorrectly believe the state patrols every day while another 16% believe patrolling happens once a week. Hypothesis 2 suggests that, all else equal, households that have gone through the process of having their land registered will be more likely to overestimate the frequency of central government patrols (because going through the registration process at the hands of the government augment's one's perceptions of government capacity more generally). The ordered logit regression analysis further tests this argument.

3.5 Results

In this section, I present the results from both the list experiment and the regression analyses; both by and large support my hypotheses that registering one's land for a land title has

¹⁷² According to the community patrollers themselves, if caught by a community patroller, villagers will most likely, if not exclusively, be let off with a reduced fine (typically 1/10th of official fine amounts) for illegal firewood collection; in many cases, they educate the offending women on the importance of the forest and let them go without a fine. The majority of villagers, however, appear to be unaware of this reality.

¹⁷³ See Appendix 5.1 for full survey questions, responses, and Swahili translations.

the effect of 1) curbing illegal forest use and 2) increasing perceptions of state capacity for forest patrolling.

List Results

First, in support of Hypothesis I, the list experiment demonstrates that there is indeed a difference in forest use between landowners who have and who have not yet registered for a land title (Figure 3.2). Overall, 46% of Non-Registered households illegally cut from the forest in the previous year, compared to 21% of Registered households (significant difference between the two groups at the 0.05 level).¹⁷⁴ Figure 3.2 breaks down these numbers by forest site, revealing that the trend holds in both forest areas. However, while the difference between Registered and Non-Registered households is statistically significant (with a t-test p-value of 0.028), this is not so in the Udzungwa Scarp (t-test p-value of 0.119). See Appendix 3.2 for statistical analysis of the list experiment.

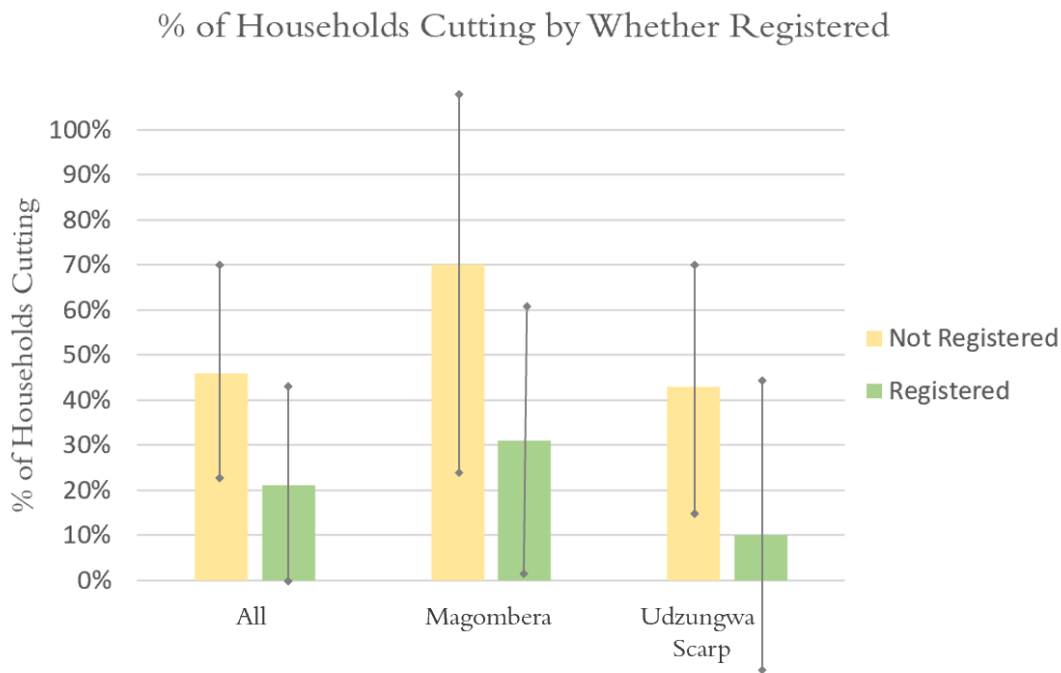


Figure 3.2: List Experiment Results by Landowner Type. 90% confidence intervals show the certainty of the list results, i.e., the certainty of the difference in means for each group. Non-Registered and Registered households are statistically distinct from one another when looking at all sites as well as Magombera alone (p-values of 0.047 and 0.028, respectively); results not statistically significant in the Udzungwa Scarp (p-value of 0.119). See Appendix 3.2 for more specifics on the difference in means statistical analysis.

Regression Results: t-test and normalized differences

Table 3.1 shows the t-test results and normalized differences for each covariate across the two groups (Registered and Non-Registered). The calculated probability of the t-test, p , demonstrates whether the differences between Registered and Non-Registered households across

¹⁷⁴ T-test p-value of 0.047. See Appendix 3.2 for all list experiment statistical analysis results.

each of the covariates is statistically significant; the normalized differences reveal the magnitude of difference between the two groups. Per Imbens and Rubin (2015), absolute values below 0.25 are not substantively significant. P-values and normalized differences that are either significant at the 0.10 level or of consequential magnitude are highlighted in gray in table 3.1.

Table 3.1 T-test results and normalized differences between Registered and Non-Registered households, by covariate

<i>Covariate</i>	<i>df</i>	<i>mean non-registered</i>	<i>mean registered</i>	<i>mean difference</i>	<i>T</i>	<i>p</i>	<i>normalized difference</i>
Power							
HH income	173.36	147.52	116.19	-31.33	1.040	0.300	-0.15
Credit - village group	192.94	0.57	0.48	-0.08	1.288	0.199	-0.17
Credit - bank	174.84	0.12	0.09	-0.03	0.664	0.508	-0.09
HH education	193.89	1.46	1.35	-0.10	1.113	0.267	-0.15
Ag land (<i>ha</i>)	202.71	4.48	4.57	0.09	-0.129	0.898	0.02
Owned ag land (<i>ha</i>)	200.51	3.41	3.73	0.32	-0.485	0.628	0.06
Ag land/ person	200.24	1.10	1.13	0.03	-0.175	0.861	0.02
Own a phone	211.07	1.17	1.08	-0.09	1.426	0.155	-0.19
Own a radio	183.36	0.59	0.61	0.01	-0.220	0.826	0.03
Food sufficiency	199.20	1.72	1.70	-0.02	0.233	0.816	-0.03
Leader Gift (<i>TSH</i>)	152.00	0.14	98.14	97.99	-1.000	0.319	0.11
Leader Meetings (<i>hrs</i>)	162.49	0.66	0.45	-0.21	0.982	0.328	-0.13
Local	183.95	0.49	0.65	0.16	-2.401	0.017**	0.33
Dominant tribe	205.57	0.27	0.39	0.12	-1.968	0.05**	0.26
Need							
Fuel sufficiency	175.59	0.13	0.11	-0.03	0.594	0.553	-0.08
Timber sufficiency	235.71	0.05	0.13	0.07	-1.958	0.051*	0.25
Planted trees on land	193.66	0.41	0.48	0.06	-0.977	0.330	0.13
Planted trees in last year	218.02	0.09	0.14	0.05	-1.226	0.221	0.16
Perception							
Magufuli - increased forest protection	158.85	0.47	0.47	-0.01	0.088	0.930	-0.01
Fear of expropriation	176.15	1.10	1.10	0.00	0.000	1.000	0.00
Forest fear - central gov patrollers	181.08	0.52	0.69	0.17	-2.621	0.010***	0.35
Villager trust (not to report)	202.00	1.57	1.72	0.16	-1.497	0.136	0.20
Environmental education	198.73	0.27	0.32	0.05	-0.808	0.420	0.11
Knowledge							
Reduced fine possible	162.29	0.42	0.51	0.09	-1.293	0.198	0.18
Central gov patrol frequency	85.22	3.40	4.04	0.64	-2.896	0.005***	0.52

Note:*p<0.1; **p<0.05; ***p<0.01

T-test results and normalized differences for each covariate across the two groups (Registered and Non-Registered households). For the normalized differences, as a rule of thumb, absolute values smaller than 0.25 indicate substantively insignificant differences between the two groups (Imbens and Rubin, 2015). All statistically significant differences between locals and non-locals at the 0.1 level or greater (demonstrated in *p*, the calculated probability of the T statistic) and substantively consequential normalized differences are highlighted in gray.

Power Indicators

First, there is no evidence that Registered and Non-Registered households differ on any measures of economic or political power. Registered households do not have statistically greater income, access to credit,¹⁷⁵ or material goods, nor are they correlated with either political power indicators (money given to local leaders and time spent with local leaders in the previous six months).

There is evidence, however, that registered households are more likely to be both locals and of the dominant tribe (both statistically and substantively significant). This is not unexpected (and so not particular cause for alarm in consideration of the registration process of having been conducted as if at random). In a t-test comparison of owned agricultural land across locals and non-locals, locals own, on average, .61 more hectares than non-locals (difference is significant at the 0.1 level).¹⁷⁶ Locals are also statistically more likely to be of the dominant tribe (40% of locals are of the dominant tribe relative only 20% of non-locals).¹⁷⁷ Given that one is only able to register *owned* land for a title, it is logical that those who own more land (e.g., locals) would be more likely to have any of their land registered. And given that this same group is twice as likely to be of the dominant tribe, it is also no surprise that members of the dominant tribe are more likely to have registered any of their land.

What is particularly interesting about these findings (i.e., that Registered households are more likely to be local and of the dominant tribe than non-Registered households), is that, though a potential source of social power, locals, as a group, are actually statistically significantly *more* likely to have cut from the forest illegally in the previous year.¹⁷⁸ The fact that Registered households cut from the forest at *lower* rates than Non-Registered households over the previous year (figure 3.2), despite the fact that they are more likely to be locals (who cut at higher rates than non-locals), further bolsters Hypothesis 2.

These results generally support the understanding, as has been put forth by villagers, village leaders, and district officials, that the first wave of the land registration process was indeed carried out as if randomly and did not give preference to the most powerful groups; this helps establish the causal relationship between land registration and the paper's findings. Further, they demonstrate that there is no alternate economic or power mechanism that can explain the link between registrations and reduced rates of illegal forest use; Registered households do not

¹⁷⁵ This is not unexpected; as most tenure rights in SSA are not formalized, credit markets have relied on de facto property rights perhaps more so than de jure land rights. Bubb (2013) suggests that there is little evidence that de jure law affects de facto property rights in West Africa (564). His paper examines and supports this claim with evidence from Ghana and Cote d'Ivoire. While Bubb looks at West Africa in particular, the argument can be extended to Tanzania and much of sub-Saharan Africa, where state capacity and reach beyond major cities is limited.

¹⁷⁶ Clay, 2020b.

¹⁷⁷ Ibid.

¹⁷⁸ Ibid.

cut from the forest at reduced rates because they have a greater ability to buy fuelwood, for instance.

Forest Resource Need

Next, the differences in forest use between Registered and Non-Registered groups cannot be explained by a decreased need among Registered households. As table 3.1 demonstrates, Registered and Non-Registered households do not differ in their reported fuel sufficiency or in whether they have planted trees on their owned land (either ever or specifically in the previous year). Registered households are more likely to report timber sufficiency relative Non-Registered households (significant at the 0.1 level), which does certainly suggest a reduced demand for forest products among Registered households. While this may explain part of the reduced illegal cutting on the part of Registered households, it cannot explain a great deal of differences in illegal cutting, as only 4.9% of households (or 32 in total) report having timber sufficiency.

As discussed earlier, there is an economic logic that households with *titles* are more secure on their land and so more able to plant trees (thus making them less dependent on the forest).¹⁷⁹ While there is ample evidence to support this, the economic rationale doesn't hold up under such a short timeframe; it generally takes several years even for fast growing tree varieties like eucalyptus to yield (and then dry) significant biomass for burning. Further, it is unlikely that shifts in tree-planting behavior should start to take effect before household have actually received their official land title. Indeed, the results show that Registered households (all of which have yet to receive their title) are no more likely to report that they planted trees on their land (at any point or in the previous year, specifically). As was echoed in household interviews, the need for illegal forest cutting among Registered households, in particular for fuelwood, was very much still present at the time the research was conducted.

Shifting Perceptions of Government Capacity and Patrolling Activities

Regarding shifting perceptions or fear of the central government and in support of Hypothesis 2, Registered households differ from Non-Registered households in that they more commonly report central government patrollers as the primary fear of illegal forest use (significant difference at the 0.01 level and substantively consequential with a normalized difference of 0.35), but not in other measures. Registered households do not differ from Non-Registered households in their feelings of trust for fellow villagers or in their having received environmental education.

There is also no evidence that Registered households have a less accurate understanding that, if caught, one might be let off with a reduced fine (i.e., there is no reason to believe Registered households cut at higher rates than Non-Registered households because they are less aware of the common practice of letting subsistence users off with reduced or no fines). This can perhaps be explained by the fact that being let off easy with a reduced fine is something that typically happens at the hands of *community monitors* and not state patrollers; more than

¹⁷⁹ See page 3, footnote 4.

anything, this result shows that increased fear of the central government (or heightened perceptions of its capacity) need not extend to community monitors.

Importantly, in support of Hypothesis 2, Registered households are significantly and substantively distinct from Non-Registered households in their more commonly *overestimating* the frequency with which central government patrollers patrol the forest (table 3.1). While central government patrollers only patrol approximately once every three months, 50% of villagers inaccurately estimate that the central government patrols *every day*. It is into this question, i.e., that Registered households more often overestimate central government patrolling, that I probe further with the following ordered logit analysis.

Regression Results: ordered logit and odds ratios

The t-test and normalized differences shown in table 3.1 demonstrate that Registered households overestimate the frequency of central government forest patrolling at a greater rate than do Non-Registered households. To further test this question, I run an ordered logit model with perceptions of patrol frequency as the dependent variable, holding a series of the above power and need variables as controls.

Table 3.2 Ordered logit results

<i>Covariate</i>	<i>Coef</i>	<i>SE</i>	<i>T</i>	<i>p</i>	<i>Odds Ratio</i>
Power					
Registered	0.684	0.351	1.946	0.050	1.982
HH Income (<i>logged</i>)	-0.040	0.037	-1.065	0.290	0.961
Credit - village group	-0.585	0.361	-1.621	0.100	0.557
Credit - bank	0.539	0.559	0.963	0.340	1.714
HH education	-0.221	0.229	-0.967	0.330	0.801
Ag land (<i>ha</i>)	-0.097	0.071	-1.356	0.180	0.908
HH size	0.062	0.117	0.529	0.600	1.064
Landowner	-0.135	0.431	-0.313	0.750	0.874
Own a phone	-0.043	0.350	-0.123	0.900	0.958
Own a radio	-0.308	0.336	-0.916	0.360	0.735
Local	0.353	0.259	1.362	0.170	1.423
Dominant tribe	0.620	0.355	1.745	0.080	1.859
Need					
Fuel sufficiency	0.690	0.521	1.324	0.190	1.993
Timber sufficiency	0.364	0.789	0.462	0.640	1.439
Trees owned (<i>binned</i>)	-0.197	0.182	-1.082	0.280	0.821
Village	-0.870	0.409	-2.126	0.030	0.419
Ag land*HH size	0.014	0.018	0.791	0.430	1.014
Observations: 163					
Note:*p<0.1; **p<0.05; ***p<0.01					

Ordered logit results, where perceived frequency of central government forest patrols is the outcome variable. All statistically significant covariates at the 0.1 level or greater (demonstrated in *p*, the calculated probability) are highlighted in gray along with their associated odds ratio.

As table 3.2 shows, the ordered logit further supports Hypothesis 2; a household having registered for a title is correlated with an increased overestimation of central government patrolling frequencies, all else equal. The odds of overestimating patrolling frequencies are greater if one has had any of one's land registered for a title. Because households can be considered to have had their land registered for a title as if at random (supported by table 3.1), this finding suggests that having had one's land registered for a title increases ones perceptions of government capacity not only as it pertains to the land sector, but also as it pertains to forest protection. The experience of having one's land registered for a title, which entails the physical presence of and interaction with the state, augments one's perceived capacity of the state, a feeling which spills over onto the forest sector.

3.6 Discussion

I have argued here that the land titling process serves as a signal of state capacity. This begs (at least) two important questions about the nature of this signal: how and to whom it is communicated. I touch on each briefly here.

First, the land titling process is just that, a process; which elements of that process are sufficient to shift perceptions? The registration process consists of at least two rounds, each of which is conducted by district government and district land surveyors: first signing one's name and having one's photo taken, and then, generally many months later, having one's land physically measured. At the time the surveys were conducted, some households had only just completed the second wave of the land registration process, but all Registered households had *begun* the process, including signing their names and having their photos taken by the previous fall (approximately eight months to a year before the surveys were conducted). It is impossible to know from the surveys which households had only recently completed the registration process and which had completed it months beforehand. Despite these realities, Registered households *still* exhibit having cut at markedly different rates than Non-Registered households over the previous year.

The following three reads, then, are possible: 1) when asked about their forest-use behavior over the previous year, some households tended to report their more recent behavior only (assuming they finalized their registration process more recently and so shifted behavior only recently); 2) it is the initial process of land registration (i.e., signing one's name and having one's photo taken, which happened much earlier in the year) that starts to shift's household cutting behavior; 3) households that have only recently finalized the registration process in the weeks or months prior to the surveys being conducted had not yet changed their behavior in the year preceding the survey; the effects of land registration on illegal forest use should thus be even higher than we see in this paper. Figure 3.2 shows a clear difference in forest use between Registered and Non-Registered households; none of these reads take away from or challenges the findings, though they all suggest a need for a deeper look into the specific mechanisms involved in the registration process that affect change in perception and behavior.

Second, who is picking up on the signals the government is, intentionally or otherwise, putting out? The impact of the registration process may actually be stronger than it appears in this paper due to likely information spillover from registered to non-registered households. I have argued here that going through the process of land title registration serves as a signal of state capacity, but what if a household witnesses its neighbor going through the process? Given that the important factor here is a shifting *perception* and not a shifting economic rationale in response to the titling process, it's arguable that some non-registered households have already shifted their behavior in response to their indirect experiences with the pilot program. This is unfortunately only something I am able to speculate about at this point, but it may be a valuable extension of the research.

3.7 Conclusion

Land titling is generally seen as a positive, pro-poor development strategy.¹⁸⁰ In theory, titled households will invest more in their land (with the confidence that they will reap the benefits of those investments), including growing perennials and trees, resulting in longer-term sustainability as well as profit. Whether that always pans out is another question altogether, as it too depends on local context (e.g., what property rights institutions preexisted the titling scheme? Do households have sufficient food security and economic flexibility to strategize over the long-term?), but it has certainly generated much interest in land titling schemes among international donors and national governments alike.

This paper has explored a, perhaps unexpected, dimension of land titles. In Tanzania, the land titling *process*, which entails government surveyors physically coming to and measuring one's land, is a strong and unmistakable marker of central government capacity and control over the land sector (a sector that plays the dominant role in villagers' lives, as it shapes their livelihoods and food security). I show that this demonstration of capacity spills over onto the forest sector; the experience of having one's land prepared for a title inspires greater fear of the central government regarding forest policy enforcement and capacity, thereby engendering greater compliance with forest policies.

Expanding local property rights over *forests* can be an effective means of incentivizing longer time horizons and, in doing so, engendering more sustainable resource use. This research sheds light on how property rights over *agricultural land* can shift the calculus of forest exploitation via an entirely different mechanism, but with the likely unexpected consequence of also bolstering compliance with conservationist policies. Rather than putting in place a system in which conservation is economically rational (e.g., by ensuring that forest users have ownership rights over the forest), titling programs of agricultural land can bolster local compliance with forest policies via sending signals that lead to villagers to augment their perceived risk of illegal resource use.

On the one hand, these findings are promising. There may be fascinating extensions of this research to other areas of conservation and governance more generally; we should be asking where extensions of power in one domain may engender compliance in another, both in order to use scarce resources efficiently and to be on the lookout for more concerning unseen power dynamics. If implementing one policy can effectively address two issues, this may be of particular interest for low-resource countries.

Before we jump at this two-for-one discount, however, a distinction needs to be made between forest policy compliance and forest conservation. Unfortunately, the observed change in user behavior does not *necessarily* suggest that fewer trees and branches are being cut from the forest. Registered (and titled) households still need to eat and they do not yet have sufficient trees from which to collect firewood. While firewood markets in town centers would be less

¹⁸⁰ Exceptions, of course, abound and, as with any policy, attention to local context is fundamental. For instance, in certain contexts, official land titling can serve to reinforce ethnic or gender inequalities in land rights.

likely to openly source forest firewood (it is recognizable as old-growth wood, not newer eucalyptus or pine), there is a great preference for old-growth wood, especially when it comes to charcoal, as it is said to be denser and so to burn much longer. As such, with every villager who now feels that the forest is too risky to use, there is an increased value in illegal forest charcoal-making. The trend may be fewer illegal forest-cutting *households*, but perhaps just as much cutting overall.

Similar to leakage concerns with PES schemes, increased enforcement (or at least increased perception of enforcement) against firewood collection may lead to the rechanneling of forest destruction into new (or fewer) hands, without having a net positive on forest protection. Further studies into how forest restrictions influence local firewood and charcoal markets are necessary in order to fully understand how this change in household-level dynamics might affect forest conservation more broadly.

Conservationist policies aside, what this paper does do is underscore the importance of perceptions, both how they are formed and how they can be effective in managing forests. To better understand which types of households continue to evade forest (and other) laws, attention needs to be paid to the perceived risks of shirking the law, which cannot be fully explained by objective costs.

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Appendix 3.1

Descriptive Statistics - All Variables

	Obs	Mean	Std Dev	Min	Max
Registration	345	0.57	0.50	0	1
Income	643	103.00	176.47	0	999
Credit - village group	680	0.54	0.50	0	1
Credit - bank	680	0.09	0.28	0	1
HH Education	682	1.28	0.67	0	3
Ag Land (<i>ha</i>)	682	2.99	3.86	0	58
HH Size	682	4.29	2.07	1	11
Land Owner	682	0.52	0.50	0	1
Phone	635	1.07	0.47	0	2
Radio	635	0.58	0.49	0	1
Leader Gift (\$)	681	22.68	574.82	0	15000
Leader Meetings (<i>hrs</i>)	677	0.55	1.88	0	24
Local	593	1.60	0.74	1	3
Dominant Tribe	681	0.30	0.46	0	1
Fuel Sufficiency	652	0.08	0.27	0	1
Timber Sufficiency	652	0.05	0.22	0	1
Trees Owned	442	0.66	1.06	0	4
Planted Trees in Last Year	438	0.09	0.28	0	1
Magufuli - Increased Forest Protection	573	0.44	0.50	0	1
State Patrol Frequency	435	1.86	1.10	1	5
Reduced Fine Possible	611	0.40	0.49	0	1
Village	682	1.49	0.50	1	2

Appendix 3.2

List Experiment Difference in Means

Forest	Registered?	N	Est	SE	90% CI		t-test (<i>p</i>)
Both	No	196	46%	14%	22%	70%	0.047
Both	Yes	149	21%	14%	-1%	44%	
Magombera	No	26	70%	27%	24%	116%	0.028
Magombera	Yes	112	31%	18%	1%	61%	
Udzungwa Scarp	No	123	43%	17%	14%	71%	0.119
Udzungwa Scarp	Yes	84	10%	21%	-25%	44%	

A LOCAL'S GUIDE TO EVADING FOREST RESTRICTIONS

Abstract

Are longstanding residents (“locals”) protectors of forests or the main contributors to continued deforestation? The vast majority of illegal forest use in rural Tanzania is for the collection of fuelwood, of which virtually all households express an insufficiency and greater need. Not all households, however, engage in this illegal and oftentimes risky activity. Using interviews, survey data, and a list experiment conducted in two rural, forest-proximate areas of Tanzania, I demonstrate that locals are twice as likely to illegally cut from the forest than are more recent migrants. I argue that this is due to two primary factors that make forest use more costly for non-locals: 1) newer migrants are less familiar with and thus intimidated by forest-related activities as well as forest patrollers; and 2) norms and legal context inhibit locals from sharing important information regarding the forests with newer migrants, including common access points, ways to avoid injury and capture, etc. Equity-minded implications of this finding are that newcomers who might have a greater need for forest resources (more vulnerable, land scarce or insecure households), are not given an “in”. Implications for resource conservation are that there may be a need to target conservationist programs to local populations; successful policies must develop a greater understanding of and seek to shift the locals’ cost-benefit analysis of forest use. New migrants, who lack historical and spiritual connections to the forest, are often painted as the prime contributors to deforestation; this paper suggests a more nuanced view of local behavior and a need to revisit beliefs about locals as guardians of forests in certain contexts.

4.1 Introduction

Local, and especially indigenous, communities have come to be seen, often for good reason, as stewards of the forest. There is a strong argument to be made for bringing resource users themselves into the management and enforcement of resources.¹⁸¹ Centralized management does a consistently poor job of managing forests relative indigenous communities who have long managed their forests using local institutions, including norms and more formalized rules for use, monitoring, and enforcement.¹⁸² That being said, over-romanticizing the local risks obscuring a context-specific and fluid concept. First, local groups are dynamic in their makeup and interests; indigenous communities who have historically been successful at managing forests face increasing population growth, heterogeneity, and market access, all of which dampens the ability for local institutions to continue to perform well.¹⁸³ Second, much of what has been observed and admired about local resource management stems from longstanding institutions and relationships with the resource; decentralization efforts that seek to engender new local institutions are often much less successful.¹⁸⁴ It isn't enough to say that locals don't operate monolithically; who is considered a local, not only how they behave, varies drastically by context.

The Udzungwa Mountain forests in Tanzania's Kilombero Valley challenge the 'locals as stewards' simplification for three reasons, which, it should be noted, are far from unique to the Tanzania context: 1) there is increasing heterogeneity within forest-proximate communities stemming from increasing land scarcity throughout the country;¹⁸⁵ 2) it is the central government, not local communities, who have ownership and managerial authority over the vast majority of Tanzania's forests; and 3) most locals are relative newcomers and not indigenous to the study sites; the earliest settlers arrived in the late 1960s,¹⁸⁶ with a more significant group not arriving until the Ujamaa period of the 1970s.¹⁸⁷ In this context, what it means to be a local

¹⁸¹ Aligica and Tarko, 2013; Chhatre and Agrawal, 2008; Gibson et al, 2005; Lund and Treue, 2008; Kajembe et al, 2002.

¹⁸² Agrawal and Gibson, 1999; Conrad, C., & Daoust, T., 2008; Conrad and Hilchey, 2011; Chhatre and Agrawal, 2008; Gibson, Williams, and Ostrom, 2005; Hayes, 2006; Ostrom, 1990; Saunders, 2014; Wright, G. D., Andersson, K., Gibson, C., & Evans, T., 2015.

¹⁸³ This may be exactly when a more centralized, coercive order becomes necessary, i.e., when exchanges become more complex and impersonal (North, 1990; 121). Better yet, this is where polycentric governance is likely to be most fruitful.

¹⁸⁴ Saunders (2014) cautions overestimating the ability for local communities to behave as expected in the absence of endogenously evolving commons institutions; one cannot easily transpose the ideal attributes and knowledge to local communities.

¹⁸⁵ This as a result of population growth in general as well as soil degradation in other areas of the country. New migrants consistently report moving to the Kilombero Valley, fertile due to the nearby Udzungwa Mountains and accompanying rainfall, to find better farming opportunities. While it's true that forest-proximate land is more fertile, land is growing increasingly scarce and the lands will only stay fertile if not over-used by villagers and if the nearby forest (which plays a key role in maintaining soil fertility and generating rainfall) remains intact.

¹⁸⁶ The earliest settlers talk of having lion scares as children and it being nothing but wild forests.

¹⁸⁷ Tanzania's period of Ujamaa and it's associated "villagization" program brought in by President Nyerere's socialist movement (the main policies of which lasted from the late 1960s through the late 1970s) included forced migration on a massive scale. Around 11,000 new villages were created (Coldham, 1995) and an estimated 5 million were forcibly resettled (Scott, 1998; Schneider, 2014).

differs drastically from what it means elsewhere; it is perhaps unsurprising, then, that I find little evidence of locals as stewards.

On the contrary, I hypothesize and find that, first, *locals use the forest more in all four research sites*. Even when villagers are legally able to enter (though not cut from) the forest (and so would seemingly be able to learn about access points, use strategies, etc.) from local villagers, locals are much more likely to cut than are non-locals. I argue that this is due to two primary factors that make forest use more costly for non-locals: 1) newer migrants are less familiar with and thus intimidated by forest-related activities as well as forest patrollers¹⁸⁸; and 2) norms and legal context inhibit locals from sharing important information regarding the forests, including common access points, ways to avoid injury and capture, etc.

With extensive interview evidence, I further find that, though being a local matters, it matters differently in each of the two forest areas studied. In Magombera Forest, users have no entry or use rights, meaning that secrecy is paramount and knowledge-sharing about access points, patroller behavior, etc. happens only among trusted households, such as among kin; non-locals face an often insurmountable knowledge gap. In the Udzungwa Scarp, while *cutting* is always illegal, villagers are permitted to enter the forest on weekends to collect dry, fallen branches only. Here, the greatest barrier to entry is the physicality of forest entry. While Magombera is largely flat, the Udzungwa Scarp has a significant incline, which, as was a common refrain with household interviews, can intimidate those unfamiliar with the forest.

Locals win against both the secrecy and intimidation barriers in the two forest sites, respectively. Though they are not more powerful by traditional measures, e.g., economic, political, or social power, locals' knowledge about and experience with the forests facilitates their going against forest policy in both sites. Consequently, non-locals face greater costs to forest use and so are *relatively* disadvantaged in that they have less access to important forest resources (firewood, in particular). Contrary to what we have come to expect of locals, locals in the research sites show no greater inclination toward forest conservation; while nearly all villagers express an appreciation for the environmental services provided by the forest (the rains, in particular), 88% of villagers report fuel insufficiency, a more pressing concern.

In order to tease out the more specific mechanisms through which being a local matters differently in the two forests, I compare two slightly different measures of local status: one that deems a family local if *either* spouse is a local and a second that sees family as local only if the *woman* is a local. Because it is by and large women who are responsible for firewood collection (seen as part of cooking, which falls squarely in the female domain), having a female-centric measure of local helps tease out under which conditions the barriers to entry for non-locals are based on a knowledge gap and under which conditions it is based on an experience or familiarity gap. Both measures of local status capture whether the household or household's family was living in the village before large waves of outsiders moved to the area, 1996 in the two village sites abutting Magombera Forest and 2000 in the two village sites abutting the Udzungwa Scarp

¹⁸⁸ Community patrollers, for their part, are no more likely to be locals than non-locals, as defined in this article.

Forest¹⁸⁹ Local, here, is thus more of a shorthand to refer to longstanding families in the area and *relatively* newer migrants; both groups are currently citizens of and live in one of the villages studied.

This article challenges the argument that locals are natural stewards of forest while newcomers who lack the same attachment (emotional, spiritual, economic) to the forest are the ones who abuse it. I argue that, under certain legal and institutional arrangements, newcomers are, on the contrary, much *less* likely to illegally cut from the forest than locals due to their lack of knowledge about forest access and how to evade punishment as well as being intimidated by the forest more generally.

Methods

To explore these questions, I designed, managed, and implemented field research in rural, forest-proximate Tanzania, which consisted of 682 household surveys¹⁹⁰ and 161 household and key informant interviews. To better understand intra-community variation in illegal forest cutting, I conducted a “list experiment”.¹⁹¹ Due to the illegality of the activity, reliable rates could not be otherwise captured with the more direct household survey, where respondents would be more likely to omit or be untruthful about their household behavior.

Paper Structure

The structure of this paper is as follows: first, I give an overview of the literature on local forest use and governance. Next, I introduce the Tanzanian context and my hypotheses predicting heightened local use, stemming from a greater access to forest knowledge writ large. I then lay out the methods used to test my hypotheses, followed by the results. After a discussion of implications and further questions, I conclude.

4.2 Local Communities and Forest Use

Today, we often conceive of locals as stewards of the forests in which or alongside which they live; they are seen as more tied spiritually and culturally to the forest and its resources, in particular in comparison to faraway politicians or large-scale agriculturalists who often prioritize economic productivity rather than long-term sustainability.¹⁹² This understanding of local communities is relatively new and comes out of a long history of mistrusting the capacity of local communities. Now, however, we risk going too far; we risk over-romanticizing the role that locals play in protecting and managing the forest, *especially* when we ignore the institutional

¹⁸⁹ In both sites, the year is linked to the official designation by the state of the area as a village. For robustness, all statistical analyses were also conducted using alternate measures for local year with no shift in the significance of either variables of interest or control measures.

¹⁹⁰ See Appendix 5.1 for the wording and translations of all relevant survey questions.

¹⁹¹ See Section 1.3 and Appendix 1.1 for more detail and the specific wording of the list experiment.

¹⁹² Nolte, C., Agrawal, a., Silvius, K. M., & Soares-Filho, B. S., 2013; Brosius et al, 1998.

arrangements that may or may not allow locals to develop a protective or spiritual connection with the forest.

In much of Sub-Saharan Africa (SSA), and certainly in Tanzania, 80-95% of forest land is owned and managed by central governments and not by the local communities who live alongside or in close proximity to them.¹⁹³ Further, with sustained in-migration, locals are increasingly both heterogeneous and not indigenous to those areas; there is, therefore, little reason to expect them to have a greater spiritual connection to the forest. I explore in this section a brief evolution of thinking on local communities and forest management and how differences in institutional realities merit greater nuance in how we think about local communities.

Initial thought on commons management, stemming from Olson (1965) and non-cooperative game theory suggests that rational individual behavior should lead to a disconnect between individual and collective rationality and thus a failure of collective action among groups; these failures of collective action translate to common pool resource (CPR) overexploitation. In particular, a primary concern with managing collective goods is free-riding, where it is individually rational to shirk one's collective obligations, e.g., by continuing to increase one's cattle on the communal grazing land (per Hardin (1968)'s foundational example) or by continuing to cut at unsustainable levels from a nearby forest. Without effective monitoring and punishment capacity, free-riding, or "shirking" becomes rational individual behavior, rendering all who cooperate "suckers". This initial thinking suggested that communities were incapable of managing and protecting their own resources; either privatization or state coercive power was necessary to manage, enforce, and protect resources. The resulting policies were those of command and control and frequent nationalization of forests and other natural resources.¹⁹⁴

Community Management of Common Pool Resources

Critics of the perceived necessity of state intervention contend that Hardin's critiques of communal management should be applied to "open access" rather than "communal" or "common" land; the former entails an absence of property rights, while the latter is a shared distribution of property rights across multiple groups.¹⁹⁵ Ostrom (1990) challenges the idea that local communities are incapable of developing and implementing institutions to effectively and sustainably regulate CPRs; she contends that CPRs are a repeated game, not a one-off Prisoner's

¹⁹³ The Tanzanian government has undertaken a small degree of forest decentralization (starting in 1998) with two types of Participatory Forest Management (PFM) schemes: Joint Forest Management (JFM) and Community Based Forest Management (CBFM). Under JFMs, communities are granted greater management rights over the forests; managerial and ownership rights under CBFM forests, on the other hand, fall to the communities the forests (Mbwambo et al, 2012). These two schemes together made up an estimated 20% (Gross-Camp, 2017) of Tanzanian forests (or, according to CIFOR (2015), only 2%); of the remaining forested land (46.1 million ha in 2015 (FAO, 2015) or 24.7 million ha of natural forest in 2010 (Hansen, 2013)) is owned and, to varying degrees, managed by the Tanzanian Forest Service (TFS).

¹⁹⁴ Cole and Grossman (1999) note also that the relatively low technological advancements for monitoring and enforcement of the 1970s rendered non-command and control schemes (e.g., market-oriented approaches) impractical. According to the authors, market-oriented and mixed approaches become more plausible in the 1990s when monitoring costs were lowered.

¹⁹⁵ Lawry, 1990

Dilemma as it is portrayed in Hardin (1968) and in so doing starts the shift in thinking on the capabilities of local communities to regulate their resources without outside intervention.

With case studies spanning diverse regions and resources, Ostrom demonstrates that local users can and do regularly combat collective action problems.¹⁹⁶ Unfortunately, due to a failure to recognize this and as a result of state governments' low capacity for regulation, including low salaries and corruption, "nationalization [of forests] created open-access resources where limited-access common property resources had previously existed (23)." Ostrom looks at the conditions where institutions to combat CPR collective action problems are most likely to arise, finding that smaller groups with shared interests who rely heavily on the resource for their livelihoods or subsistence are more likely to develop institutions to effectively combat collective action problems and maintain resources sustainably. These elements find overlap with Olson (1965), who too contends that collective action is more likely among smaller groups who are more easily monitored by the group, share preferences, and who stand to gain, or lose, relatively more.

Libecap (2009) and others have criticized the generalizability of Ostrom's argument and the ability for communities to "informally" (i.e., "if they do not receive recognition and enforcement from the state (131)"), combat collective action because the scope conditions are too high. Relatedly, community institutions are particularly vulnerable to exogenous factors (e.g., price increases, globalization, new production technologies, and increased heterogeneity¹⁹⁷). Lawry (1990) argues that, even thirty years ago, communities were losing their ability to maintain effective local collective action in response to elements of modernity: a declining reliance on communal resources, a greater source of income in agricultural areas coming from crop production and not from the commons, and the pursuance of non-agricultural income.

In the case of Tanzania (and SSA more broadly), tobacco, timber, and charcoal trade link international and domestic markets with forest resources; both increase challenges for successful CPR management.¹⁹⁸ On the other hand, globalization is not new; markets, for instance, have been intrusive for thousands of years and yet traditional systems persist so long as there are rules within the system to respond to exogenous shocks.

Homogeneity is one factor that will be increasingly challenging for communities to hold onto. In the Kilombero Valley of Tanzania, as well as throughout the country, there has been and continues to be incredibly high levels of population growth, propelled primarily by fertile soils.

¹⁹⁶ Ostrom, 1990; Ostrom, 1998.

¹⁹⁷ Schlager and Ostrom (1992) suggests also that technology or market expansion can disrupt proprietor systems and institutions.

¹⁹⁸ Tobacco is highly lucrative in international markets and requires firewood for the drying process (CIFOR 2015, p. 12). Charcoal, for its part, supplies 85% of urban populations with their household cooking and energy (CIFOR 2015, p. 9); by some estimates, "for each 1% increase in urbanization (i.e. increase in urban wealth and thus per capita consumption) there is a 14% increase in charcoal consumption (Hosier et al. 1993) (9)." Urbanization without industrialization is a key structural factor that perpetuates high urban tobacco use (Rudel 2013, p. 10). International markets (especially with China, India, Japan, and Kenya) are a primary driver of the legal and illegal timber sector, the bulk of which goes unreported. According to CIFOR 2015, "between 2002 and 2005 China imported 4–10 times more timber products from Tanzania than appear on official Tanzanian export records (Milledge et al. 2007; Mwananchi 2010) (8-9)."

Land is growing increasingly scarce and will only stay fertile if not over-used by villagers and if the nearby forest (which plays a key role in maintaining soil fertility and generating rainfall) remains intact, something that is becoming all the more challenging with the growing forest-proximate population.¹⁹⁹ These same factors are leading to increased ethnic, linguistic, religious, and other heterogeneity in forested regions throughout the continent. As a result, Ostrom's condition of relative homogeneity for successful CPR management will become increasingly scarce, further necessitating research on the intra-community variations in the costs and benefits of illegal forest use.

Market Mechanisms and Community Empowerment

Inspired by the market mentality of the 1990s, a corresponding interest in property rights to incentivize rational behavior,²⁰⁰ and a greater faith in local community capacity, the UN initiated REDD in 2008. Payment for environmental services (PES) schemes in general, of which REDD is one, seek to incentivize rather than force behavioral shifts at the local level.²⁰¹ In theory, ownership rights, including tenure security, increase incentives to invest in profit-enhancing inputs, infrastructure, and long-term sustainability.²⁰² Unfortunately, PES programs, and REDD+ in particular, have run into difficulties stemming primarily from poorly defined property rights, insufficient incentives, and the continuation of corruption.²⁰³ As Robinson (2014), "there is increasing evidence that indigenous groups and those acting collectively can be successful at managing forest resources, but this also requires security in their land claims (4)."

Because REDD is imperfect and challenging to implement in tenure-insecure and low enforcement capacity environments,²⁰⁴ it may not be appropriate for the vast majority of forest-proximate communities in SSA.²⁰⁵ Further, the dependence on donor funding makes the future of any such program precarious;²⁰⁶ the lack of adequate compensation in current programs in Tanzania has meant that the economic gains at the community level have fallen short of

¹⁹⁹ Many newcomers report having emigrated from their previous region precisely because the razing of their forest had led to soil infertility and less predictable rains.

²⁰⁰ North (1990); Libecap (2009); Ostrom (2003).

²⁰¹ REDD+ is an attempt to address a global market failure. Prices for forest resources do not include the costliness of forest degradation in the long term. Uncertainty over appropriate pricing strategies for such a calculation, heavy discounting of the future, and collective action challenges, stemming especially from free-riding realities and low enforcement capacity, create an unsustainable scenario and market failure that will not self-correct.

²⁰² Research on tenure security in agricultural land has shown this to include physical inputs such as the construction of brick houses and irrigation infrastructure as well as soil-enhancing inputs (including fertilizer, regenerative fallow periods, and crop selection, such as the planting of tree crops or perennials (Besley, 1995; Chimhowu and Woodhouse, 2006; Migot-Adholla *et al*, 1991; Goldstein and Udry, 2008; Clay, Reardon and Kangasniemi, 1998; Abdulai *et al*, 2011).

²⁰³ Lund *et al*, 2016; Unruh, 2008; CIFOR, 2015

²⁰⁴ CIFOR, 2015; Unruh, 2008; Lund *et al*, 2016

²⁰⁵ Additionally, PES programs can have the perverse incentive of encouraging a lot of deforestation rapidly, so as to alter the baseline ecosystem conditions and achieve maximum gains from the program down the line (Pattanayak, Wunder, and Ferraro, 2010).

²⁰⁶ Leblois, Damette, and Wolfersberger argue that it will become increasingly, and perhaps prohibitively, costly for REDD+ to adequately compensate trade losses in a world with increasing global demand for agricultural commodities.

expectations, and that in many cases communities have been left economically worse off.²⁰⁷ In light of these realities, the initial hope for these programs has largely worn off among international development and conservation professionals, though out of perceived structural failures, not due to any diminishing appreciation for local community capacity. A key objective today is shifting structural inequalities so as to bestow greater power in local communities; property rights continue to be a primary focus.

Inter-group Power Dynamics

Any comprehensive assessment of inter-group forest use must incorporate dimensions of relative political, economic, and social power. Bates (1989) shows that those who control economic institutions wield disproportionate political power and are thus able to restructure property rights to their own advantage (in his case, mostly white dairy farmers in Kenya). Regarding Tanzanian forest use, bribery, corruption, and vested interests of a powerful elite undermine the management of forest resources; in areas of powerful political opposition to forest regulation, usually coming from large-scale agricultural interests, “there appears to be little interest in monitoring illegal logging and encroachment or in providing the private sector and communities with the access rights and capacity to utilize the resources in a sustainable manner.”²⁰⁸ Central government forest officers in Tanzania have given surplus logging license quotas, accepted bribes, and allowed for timber export during explicit export bans.²⁰⁹ Indeed, CIFOR suggests that deforestation trends in Tanzania are “compounded by strong interest facilitating collusive behavior, corruption, and entrenched bureaucratic interests and practices (25).”

This consideration of power dynamics has led to a slight pushback in the ‘locals as stewards of the forest’ mentality. Some have found that local power bestows local groups with disproportionate power over forest use and management relative newer in-migrants. Coleman and Liebertz (2014) find that those individuals wielding more community-level power, e.g., landholders and ethnic majorities, have a greater say in local institution-building and rulemaking, strengthening their ability to write forest use laws that serve their personal benefit at the exclusion of others. Their political strength may also make them relatively immune to government enforcement. With case studies of community-based natural resource management schemes in India, South Africa, and Ghana, Leach et al. (1999) similarly find that more powerful social actors disproportionately benefit from resource goods and services. Regarding land rights, Goldstein and Udry (2008) find that, in Ghana, those with local political power have more secure tenure rights over their land. Bubb (2013) finds that households who own more land are more likely to report land transfer rights (a measure he uses to indicate de facto individualized property rights and a push away from customary property rights regimes).²¹⁰

²⁰⁷ CIFOR, 2015; Lund *et al.*, 2016.

²⁰⁸ CIFOR, 2015; 18.

²⁰⁹ Mustalahti and Lund, 2009.

²¹⁰ Bubb, 2013; 567.

The next section follows in this vein of research, seeking to better understand how power dynamics shape intra-community variation in access to state-owned and managed forest resources.

4.3 Local Power to Confront Barriers to Entry

This paper explores a case where users have no ownership or managerial rights over their forests and where cutting of any kind is illegal per central government law. Without ownership or use rights over the forests, predominant theories stemming from Ostrom's work on community forest groups do not apply. Variables identified in the literature that increase the likelihood of resource-users' ability to overcome CPR dilemmas include: resource attributes (e.g., size, productivity, predictability, and mobility), institution attributes (e.g., the degree of user input in rule-making, monitoring, sanctioning, and conflict-resolution), as well as user attributes (e.g., group size, the existence of leadership, knowledge, and resource-dependence).²¹¹ None of these core factors speaks to user political power *independent from the resource*, i.e., in cases where users have no managerial or ownership rights over the forest itself.

Forest Barriers to Entry in the Kilombero Valley, Tanzania

Coleman and Liebertz (2014), among others, argue that local groups are better able to partake in the fruits of the forest *because of their rule-writing power*. In Tanzania, where the central government is responsible for all forest ownership and nearly all forest management, local groups do not hold this power, but that does preclude them from holding other types of power that would allow them disproportionate access to forest resources. This question, i.e., whether locals hold more power than newer migrants in terms of their ability to evade forest laws *despite a lack in ownership or managerial rights*, is precisely what this paper seeks to test.

I argue, simply, that local knowledge and familiarity with the forest, including knowledge of the primary pathways into the forest and, potentially, how to avoid and spot dangerous encounters with animals, or at least more comfort with the possibility of such an encounter, reduces the costs of forest use for locals, leading to increased rates of forest cutting relative non-locals. I additionally demonstrate that patterns of local use differ between the two institutional settings of Magombera Forest and the Udzungwa Scarp and that these patterns speak to the more specific nature of barriers to entry in each forest area.

Barrier to Entry: Knowledge Gap (Magombera Forest)

Due to the illegality of the activity (all use, including entry, is illegal at all times), forest use in Magombera Forest is done in secret and, often, at night. As a result, locals (who are more likely to be more familiar with the forest and possess key knowledge about its access) are much more likely than non-locals to illegally cut; it is, understandably, intimidating for non-locals who

²¹¹ Ostrom, 1990; Ostrom, 2010

have not been shown the way, so to speak. Those who might typically be heavier forest-users (more vulnerable, land scarce or insecure households), are not given an “in” because information about forest access is kept secret from newcomers.

The fact that people have to be so secretive means that relative forest-exclusivity is, to some degree, inevitable. It would be suspicious of a newcomer to inquire about forest access and potentially dangerous for a local to offer such information. Survey evidence shows that villagers in Magombera are especially mistrustful of their fellow villagers (65% believe their fellow villagers would report on them for illegal forest use);²¹² keeping forest secrets is likely a question of trust rather than a desire to hoard their power to preserve more of the resource for themselves.

Due to the illegal nature of cutting and high levels of distrust among villagers, newcomers are not able to openly ask locals for advice regarding forest use; likewise, locals hide their forest use from fellow villagers. With this uncertainty, non-locals have higher real costs and perceived risk of forest use. They face real costs in terms of gathering information about safe forest access in terms of both personal safety and to avoid detection; stemming from their uncertainty of the forest, their perceived risk of forest use (including exaggerating likelihood of being injured or caught by a patroller) is also higher.

Interview evidence in the villages around Magombera Forest supports these assertions. Both newer migrants and locals are well aware of the dynamics at play. For instance, regarding the knowledge gap, one woman noted, “It’s very difficult and impossible for a migrant to use the forest. They don’t know the entrances locals use. There are many entrances.” Many talked about how only locals were familiar with or understood the “geography” or the “environment” of the forest. Some noted more specifically that only locals use the forest because “migrants might be scared of being caught.” And both locals and non-locals referenced the secrecy behind forest access. One newer migrant who felt that she had been generally welcomed by the community said, despite her warm welcome, that “locals don’t share information with migrants – they keep it secret.”

²¹² Among villagers around the Udzungwa Scarp, a slightly lower 53% believe their fellow villagers would report on them for illegal forest use.

	Forest Laws	Forest Barriers to Entry
Magombera Forest	Forest entry is illegal at all times for all reasons.	Knowledge gap; secrecy is paramount
Udzungwa Scarp Forest	Cutting is always illegal; villagers are permitted to enter the forest on weekends to collect dry, fallen branches only	Physicality of forest entry; unfamiliarity with and intimidation of forest incline

Figure 4.1: Barriers to forest entry in Magombera Forest and the Udzungwa Scarp Forest

Barrier to Entry: Physicality of Forest Entry (Udzungwa Scarp Forest)

The Udzungwa Scarp presents a slightly different story. Though cutting is always illegal, all households are legally allowed to collect fallen branches from the forest on Saturdays and Sundays. Because weekend entry (*not* cutting) is legal, information about forest access and how to navigate potential physical dangers of the forest need not be kept secret. Still, newcomers are much less likely to engage in forest use, illegal or otherwise.

Unlike Magombera Forest, the Udzungwa Scarp Forest is on a relatively steep and intimidating hill. Around Magombera Forest, people rarely, if ever, report fear or inability to use the forest due to personal strength. Though this may be due to the villagers’ inability to express even a potential interest in forest use, nearly all Magombera interviewees affirmed that villagers, their household included, would use the forest if it were opened to them; no physical barriers to forest entry were mentioned and only some respondents spoke to concerns over wild animals. This was not the case around the Udzungwa Scarp, where, though in some ways already “open”, many villagers felt they lacked the strength to use the forest and that it might be unsafe for them to do so.

While locals are mostly seemingly undaunted by the forest (e.g., women note that they started collecting as children, as early as six years old in some cases), many newcomers report being intimidated by the forest as well as being hesitant to talk to locals about forest use, even to ask for help in using the forest legally. Even women who arrived in the early 2000s noted, e.g., “I don’t go to the forest – I’m afraid to go there,” “I can’t climb the mountain even if locals go there,” and, what I heard most commonly, simply, “I can’t go – I’m not used to it.”

It was common for villagers in that area to report waiting to use the forest for the first few (if not more) years living in the village, primarily out of intimidation of the physicality of entry

and out of fear of the dangers and unknowns of the forest (fear of injury, assault, and even general fear of the dense and tall trees), as well as out of not feeling comfortable asking locals for help. One woman who waited ten years to ask a local said, “I was new and scared... too scared. I wasn’t scared of animals, only other people. But after getting used to it, I go there.” Locals, for their part, don’t seem to readily offer advice on accessing the forest; women either work up the nerve to ask for help (after a surprising number of years) or just forego forest resources altogether. Newcomers from areas with forests have a notably lesser problem accessing the forest or asking for help to do so. One woman with previous forest experience said, “When I arrived, I stayed six months not going to the forest, only watching locals go. After getting along with them, I went to collect with them.” For others, it is clearly not so easy.

Importantly, for all their fears about being attacked, robbed, or bitten by insects, these seem to be extremely rare events; aside from one woman’s woodpile being stolen on one occasion, I did not hear any reports of wrongdoing or serious danger in the forest by the women who use it regularly.

Opting out of forest use (legal or otherwise) represents a serious economic hit to any household, as buying firewood (the only alternative or at least necessary supplement for most households as tree-planting is rare and farm brush is largely insufficient) represents a large share of a household’s expenses; so intimidating is the forest that poor households are opting to pay heavily not to enter it.

Hypotheses and Observable Implications

Due to the abovementioned legal and physical barriers to forest entry, I first hypothesize that:

Hypothesis 1: In both sites, more local households illegally cut from the neighboring forest than do non-local households.

In order to tease out the more specific mechanisms through which barriers to entry are overcome by locals and non-locals differently in the two forests, I compare two slightly different measures of “local” status. Measure 1 captures whether *either* the respondent or the respondent’s spouse is a local (measured by either being born in the village or having arrived prior to 1996 (for Magombera Forest) and 2000 (for the Udzungwa Scarp Forest));²¹³ Measure 2 captures whether the *female*²¹⁴ specifically is from a local family (the husband’s origin does not factor into this second measure in any way).²¹⁵ Because women are largely responsible for firewood collection

²¹³ In both forests, the year is linked to the official designation by the state of the area as a village. These years were chosen intentionally to capture which families were living in the respective villages before large numbers of migrants started arriving. For robustness, all statistical analyses were also conducted using alternate measures for local year with no shift in the significance of either variables of interest or control measures.

²¹⁴ This is either the wife of the head of household or the female head of household in the case that she is unmarried.

²¹⁵ Unmarried men were dropped from all analysis with the second, female-centric measure of locals (12 Magombera Forest cases and 20 Udzungwa Scarp cases were dropped for this reason).

(especially if in the forest),²¹⁶ this female-centric measure of local status will help tease out under which conditions the barriers to entry for non-locals are based on a knowledge gap and under which conditions it is based on an experience or familiarity gap.

Measuring "Local" Status	
Measure 1 <i>(either)</i>	<u>A household has local status if either spouse is local</u> (i.e., they or their family arrived in the village prior to 1996 or 2000, for Magombera Forest and the Udzungwa Scarp, respectively)
Measure 2 <i>(female)</i>	<u>A household has local status if the female head is local</u> (i.e., she or her family arrived in the village prior to 1996 or 2000, for Magombera Forest and the Udzungwa Scarp, respectively)

Figure 4.2: Measures of local status

Due to a need for greater secrecy surrounding forest use in Magombera Forest, I hypothesize that:

Hypothesis 2: Around Magombera Forest, having local *knowledge* is what determines illegal forest use, not the potential forest user (who is almost exclusively female) being a local herself.

Because local knowledge is something that can be passed to trusted kin or in-laws, I expect Measure 1, i.e., whether *either* spouse is from a local family, to be the more relevant measure for local status around Magombera forest. If this is true, we should see the following:

Observable Implication (H2): *Non-locals by Measure 2 will have a higher rate of forest cutting than non-locals by Measure 1*, simply because 52% of non-locals (by Measure 2's count) have married local families and have thus been made privy to local knowledge about the forest.

Villagers bordering the Udzungwa Scarp do not face the same needs for extreme secrecy as do the villagers bordering Magombera Forest; it is legal to physically enter the forest, even if only on the weekends and only to collect dry fallen branches. Newcomers, or “non-locals” are given an “in”; they can inquire about forest safety and forest access points without inspiring

²¹⁶ If men are to take part in getting firewood, it is more often buying firewood; an additional few may occasionally help collect and carry pruned branches from their farms. They are very rarely seen collecting firewood from the forest. In general, fuel is seen as part of the overall duty of cooking and thus falls squarely within the domain of women. Illustrative of how firmly forest firewood collection is in the female domain, a couple single men in the Udzungwa Scarp were under the impression that only women had the right to enter the forest. One noted that the only way he could get firewood was to buy it from women. Though some men do report having gone to the forest on occasion, perhaps to help collect if one's wife is sick, it is quite rare.

suspicion (though, interestingly, they do often report nervousness to do this for at least the first few years).

However, because of the greater physicality of forest use in the Udzungwa Scarp (due to the steeper slopes and the increasing amount of time one needs to spend hiking in order to collect sufficient firewood²¹⁷), newer migrants are much more likely to be intimidated by the forest. *It is not a knowledge gap, but a confidence or familiarity gap that separates locals from non-locals.* While this logic speaks to whether a household is likely to use the forest in any capacity, legal or otherwise, the DV of concern for this research is whether households have cut *illegally*. I make the assumption that if a group, e.g., locals, is more likely to use the forest in general, it is also more likely to use it illegally; non-locals face the same barriers to entry for illegal forest use as they do for legal forest use. Accordingly, I hypothesize the following:

Hypothesis 3: Around the Udzungwa Scarp Forest, it is not one's knowledge but one's past *experience* that determines likelihood of illegal forest use.

Because, throughout Tanzania, it is almost always the women who are responsible for firewood collection, I expect Measure 2, i.e., whether the *female* household head is from a local family, to be the more relevant measure of local status for forest use around the Udzungwa Scarp. Being married to a local is less of a predictor of forest use than having grown up using the forest. If this is true, we should see the following:

Observable Implication (H3): *Locals by Measure 1 will have a lower rate of forest cutting than locals by Measure 2*, because 22% of households who are locals by Measure 1 are comprised of households where the key person in charge of firewood collection (the wife) did not grow up in the area.

4.4 Methods

For information on data collection, site selection, and sampling methods, see section 1.3.

Statistical Analysis

To test my hypotheses, I conduct two types of analysis. First, I run analyses on a list experiment to determine rates of illegal forest cutting among locals and non-locals in the previous year (Hypothesis 1). Second, in order to rule out alternative explanations, I run a series of t-tests with normalized differences comparing non-local and locals on a series of key variables that might otherwise explain locals' increased propensity to use the forest. Last, I compare list experiment results across the two separate measures of "local" status in order to tease out how

²¹⁷ The latter, according to respondents, due to general overuse and population growth (including in-migration). Both factors are consistently reported as key challenges to wood collection by respondents in both villages bordering the Udzungwa Scarp.

the different barriers to entry of the two forest sites influence forest use among locals and non-locals (Hypotheses 2 and 3).

List Experiment

I used a list experiment to capture the percentage of households having illegally cut from the forest in the previous year. See the Section 1.3 for more detail and Appendix I for the specific wording of the list experiment.

To delve more deeply into questions of how information about forest use (including detecting and evading patrollers as well as possible threats from the forest) is shared, I look at rates of illegal forest cutting (using results from the list experiment) according to the two different measures of “local” status: *either* spouse as local and just the *female* as local (see Figure 4.2).²¹⁸ Collecting firewood is almost exclusively within the domain of women; if it doesn’t matter whether it is the woman or the man who is local, then we can assume that knowledge about forest access is passed to new migrant women who marry into local families (I expect this to be the case around Magombera Forest – Hypothesis 2). If, on the other hand, the woman being local is what matters, this suggests that the ability to overcome forest barriers to entry is not being passed to women who marry into local families (as I expect to be the case around the Udzungwa Scarp Forest – Hypothesis 3).

Statistical Analysis

I argue that locals in the Kilombero Valley continue to use the forest illegally at higher rates than non-locals and that they do so because of 1) the necessary secrecy and lack of knowledge-sharing in Magombera Forest and 2) the greater familiarity and relative lack of intimidation by the physicality of wood collection in the Udzungwa Scarp. To rule out alternative explanations, I conduct a series of t-tests to determine whether, or in what ways, local households differ from non-local households. I further calculate normalized differences for each of the covariates in order to capture the *magnitude* of difference between the two groups (locals and non-locals) according to each of the covariates. I use the *either* measure of local for these local versus non-local group comparisons as the objective is to determine whether local households have greater power or need and not whether the female head of household is familiar with the forest.

Variables of interest are divided into four categories: power, forest need, perception (of forest and general governance), and knowledge (of patrolling) variables.²¹⁹ I will briefly discuss

²¹⁸ Under the first measure of local, i.e., whether *either* spouse is local, unmarried women are considered local only if they are themselves locals; this does slightly undercount locals by this measure as it’s conceivable (and likely) that some widowed or divorced, and so “unmarried”, non-locals were at one point married to locals, though our data will not show it. When using the second measure of local, i.e., whether the *female* is local, single men have been removed from the analysis. There are 12 cases in Magombera Forest and 20 cases in the Udzungwa Scarp that have been removed for this reason.

²¹⁹ This in addition to one key control variable of whether the respondent is from Katurukila as the village of Katurukila has a higher proportion of locals to non-locals than do the other three villages.

the logic behind each of these variable groups. See Appendix 4.1 for descriptive statistics and Appendix 5.1 for the wording and translations of all relevant survey questions.

First, economic and social power variables include: income (*logged*); access to community group loans; access to bank loans; highest level of education achieved in the household; total agricultural land (*ha*); owned agricultural land (*ha*); total land per person in the household; whether anyone in the household owns a phone; whether anyone in the households owns a radio; reported household food sufficiency; amount of money given to leaders in the previous year; time spent with leaders in the previous year; and whether the household is of the dominant tribe of the village. Comparisons of locals and non-locals along these variables *test whether locals have more power and so are potentially more able to skirt the law*. For instance, do locals have more money to pay off patrollers or more contact with village leaders and so potentially more local political power?

Next, need variables *test whether different household types differ in their need for forest resources*, i.e., to test whether being a local is correlated with a greater need for forest resources, which would explain their greater rate of use. Here, I look at reported insufficiency in wood for fuel; reported insufficiency in wood for timber; number of trees planted (*binned*); and whether the household planted trees in the previous year. Land per person (noted above as a power variable) does double duty as a forest need variable; if a household has more land per person, they are more able to dedicate some of their land to tree production or income-generating (as opposed to subsistence) crops (and thus have a lesser need for forest resources via more homegrown firewood or income to purchase it).

Perception variables test whether being a local is associated with different perceptions of state capacity. I test whether locals are more likely to fear future land expropriation, to report central government patrollers as the primary fear of illegal forest use, and to fear that their fellow villagers (acting as informants) would report their illegal behavior. Regarding perceptions of environmental conservation, I test whether locals are more likely than non-locals to have had environmental education.

Last, knowledge variables are used to identify whether locals are hoarding (intentionally or due to fear of openly discussing forest use) knowledge about patroller frequencies and fine realities. Overall, there is a general overestimation for forest patrolling capacity (see Figure 2.1). In reality, government patrollers patrol the forests approximately once every three months, while the majority of villagers believe they patrol either every day or at least a few times a week.²²⁰ Further, if caught cutting firewood (and not doing something more egregious like timber-making or poaching) by a community monitor, which is much more likely than being caught by a state patroller,²²¹ one is most commonly let off with a fine closer to 1/10th of the official fine amount

²²⁰ Only 14% of all respondents estimate *correctly* that the frequency of state forest patrols is about once every three months (as reported in interviews by forest patrollers and government officials in charge of the sector); 50% incorrectly believe the state patrols every day while another 16% believe patrolling happens once a week.

²²¹ While being caught by a community patroller is *more* likely than being caught by a central patroller, either is quite rare. Community patrollers report catching villager from around twice a month to once every few months.

(if one is fined at all and not just educated on the importance of the forest).²²² Overall, there is a general overestimation for forest patrolling capacity; *are locals, who have necessarily been in the area for a longer time, more aware of real forest patrolling capabilities?* That is, have locals updated their perceptions (and, accordingly, their behavior) to reflect the realities of low government capacity, while newer migrants have not yet done so?

4.5 Results and Discussion

In this section, I present and discuss results of from both the list experiment and the t-tests (with normalized differences) as they inform the three hypotheses of this paper.

Rates of Local and Non-Local Cutting

First, as the list experiment results make clear, being a local matters in both forest areas. Figure 4.3 visualizes the results of the list experiment analysis in both forest sites together.²²³ Local villagers cut at approximately twice the rate of non-locals: an estimated 52% compared to an estimated 25% (showing support for Hypothesis 1). With a t-test p-value of 0.017, the difference between each of the groups is significant at the 0.05 level (i.e., local and non-local households are statistically different groups in terms of their rates of cutting).

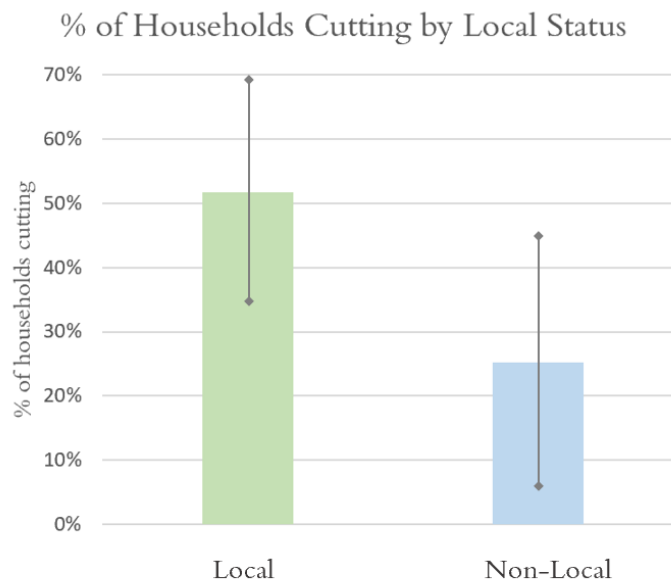


Figure 4.3. Locals and Non-Locals are statistically distinct from one another with a p-value of 0.017.

²²² Clay, 2020.

²²³ I determine local status according to whether either spouse is local here, though, as I would expect, looking at only the female's local status gives consistent results.

How Do Local Households Differ?

The series of t-tests serve three purposes: 1) to rule out alternative explanations as to why locals are more likely to illegally cut from the forest in both sites (i.e., greater need or greater power); 2) to show that though locals are in some ways statistically different from non-locals, these differences are consistent across the two study sites; and 3) to test whether locals have more accurate information regarding government capacity and patrolling behavior (e.g., are they more aware of the infrequency of government patrols?).

Figure 4.4 shows the t-test results and normalized differences for each covariate across the two groups (locals and non-locals). The t-test p-value demonstrates whether the differences between locals and non-locals across each of the covariates is statistically significant; the normalized differences reveal the magnitude of difference between the two groups. Per Imbens and Rubin (2015), absolute values below 0.25 can be considered generally inconsequential. P-values (showing the calculated probability of the T statistic) and normalized differences that are either significant at the 0.10 level or of consequential magnitude are highlighted in gray in table 4.1. Results show support for my hypotheses; though there are some differences between locals and non-locals, none can explain the greater rates of illegal forest cutting among locals. Below, I discuss the differences between locals and non-locals along dimensions of power, forest need, perception, and knowledge.

Table 4.1 T-test results and normalized differences between locals and non-locals, by covariate

<i>Covariate</i>	<i>df</i>	<i>mean non-locals</i>	<i>mean locals</i>	<i>mean difference</i>	<i>T</i>	<i>p</i>	<i>normalized difference</i>
Power							
HH income	518.35	114.59	96.14	-18.45	1.205	0.229	-0.10
Credit - village group	552.85	0.50	0.58	0.08	-1.940	0.053*	0.16
Credit - bank	576.93	0.07	0.09	0.02	-0.776	0.438	0.06
HH education	553.30	1.26	1.29	0.02	-0.419	0.676	0.03
Ag land (<i>ha</i>)	503.24	2.78	3.09	0.31	-0.931	0.352	0.08
Owned ag land (<i>ha</i>)	506.32	1.48	2.09	0.61	-1.852	0.065*	0.15
Ag land/ person	562.59	0.78	0.80	0.02	-0.249	0.804	0.02
Own a phone	534.60	1.09	1.05	-0.03	0.804	0.422	-0.07
Own a radio	522.46	0.58	0.55	-0.04	0.855	0.393	-0.07
Food sufficiency	555.83	1.71	1.60	-0.11	2.193	0.029**	-0.18
Leader Gift (<i>TSH</i>)	329.11	0.76	45.84	45.07	-0.992	0.322	0.08
Leader Meetings (<i>hrs</i>)	584.59	0.38	0.58	0.20	-1.657	0.098*	0.13
Dominant tribe	588.00	0.20	0.40	0.20	-5.343	0.000***	0.44
Need							
Fuel sufficiency	507.94	0.08	0.07	-0.01	0.389	0.697	-0.03
Timber sufficiency	538.53	0.04	0.05	0.01	-0.355	0.723	0.03
Planted trees on land	319.37	0.41	0.36	-0.04	0.847	0.398	-0.09
Planted trees in last year	289.29	0.09	0.07	-0.02	0.763	0.446	-0.08
Perception							
Magufuli - increased forest protection	461.50	0.39	0.48	0.08	-1.801	0.072*	0.16
Fear of expropriation	553.67	0.98	1.39	0.41	-3.568	0.000***	0.30
Forest fear - central gov patrollers	524.31	0.63	0.73	0.10	-2.582	0.010***	0.22
Villager trust (not to report)	556.74	1.66	1.61	-0.05	0.700	0.484	-0.06
Environmental education	563.19	0.26	0.29	0.03	-0.689	0.491	0.06
Knowledge							
Reduced fine possible	490.16	0.40	0.45	0.05	-1.053	0.293	0.09
Central gov patrol frequency	296.08	3.91	4.16	0.26	-2.086	0.038**	0.23

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

T-test results and normalized differences for each covariate across the two groups (locals and non-locals). For the normalized differences, as a rule of thumb, absolute values smaller than 0.25 indicate substantively insignificant differences between the two groups (Imbens and Rubin, 2015). All statistically significant differences between locals and non-locals at the 0.1 level or greater (demonstrated in p , the calculated probability of the T statistic) and substantively consequential normalized differences are highlighted in gray.

Forest Need

First, do locals have more of a need for firewood or timber from the forest? In short: no. There is no indication that locals have greater fuel or timber insufficiency, nor that local households are more likely to have planted trees on their owned land at any point or in the last year specifically. There is also no indication that they have lower incomes and so would be less able to buy firewood from the village than a non-local. They are statistically more likely to have access to credit through a village community group (which could in theory provide local

households with greater cash flow, thus giving them a greater ability to buy fuelwood), though this difference is substantively inconsequential.

Political, Economic, and Social Power

Next, are locals more powerful, such that they might be better able to evade state and village law? In one respect, reported food sufficiency, locals are statistically significantly *worse* off (significant at the .05 level), though this is not substantively significant (normalized difference of -0.18). There are four variables that suggest a certain degree of “power” held by locals (only one of which, being of the dominant tribe, is substantively consequential in addition to being statistically significant), though there is little indication that locals have used this potential power for any economic or political gain. I will briefly discuss each of these covariates in turn.

First, as noted above, locals are more likely to report having access to credit through a village community group (significant at the 0.1 level), though with a normalized difference of 0.16, the difference between locals and non-locals is not substantively important (access to credit through community groups is not rare for either group: 50% of non-locals and 58% of locals report having access). Locals do not differ in their reported incomes or possession of household goods, such as a radio or a phone; additional access to credit seems not to have had an impact on locals’ relative economic power.

Second, local households spent more hours meeting with local leaders in the previous six months (significant at the 0.1 level), though the difference between the two groups is also substantively insignificant (normalized difference of 0.13). In general, very few respondents reported household members having spent considerable time with a leader. Approximately 80% of all villagers reported household members spending no time meeting with leaders in the previous year whatsoever; only 4% (or 24 households) reported more than three hours spent with village leaders over the previous six months.

Third, locals and non-locals are statistically distinct groups (at the 0.1 level) regarding the amount of agricultural land they own (with a mean difference of .61 hectares). Along this covariate, too, the difference is not substantively important (normalized difference of 0.15). This difference between locals and non-locals is not unexpected; the vast majority of locals arrived during a time when land was still being allocated by village governments and so before rental markets for land would have been particularly relevant. In Tanzania, allocated land, also referred to as given land, is not returned to the village government,²²⁴ but is henceforth considered “owned” by the recipient and can be passed down to his family in the future, just as purchased land can be. Despite a larger amount of total owned land, locals and non-locals do not differ in total agricultural land (including owned and rented land), nor in land per household member.

²²⁴ A technical exception to this is that households lose rights over agricultural land if they leave it fallow for more than three years. This does not seem to be relevant in practice as the overwhelming majority of households cannot afford to leave land fallow for so long. The remaining few wealthy landowners who are able to do this (of which I heard of only one in all four villages), typically have formal land titles and other forms of power that allow them to skirt this rule, evoking much ire among land-scarce villagers.

Last, locals and non-locals are also statistically distinct groups (at the .01 level) when it comes to being of the village's dominant tribe; this is the only power covariate to show substantive differences between the two groups (with a normalized difference of 0.44). This is perhaps not an unexpected finding given early settlement patterns.

Importantly, locals do not appear to have translated initial potential sources of power, more owned land and being of the dominant tribe, in particular, into any kind of observable economic, social, or political gain. This finding is consistent with interviewee perceptions, i.e., that locals do not hold a greater social, political, or economic status in any of the villages. For instance, given that one can typically only plant trees (often an important source of income and fuel) on owned land,²²⁵ locals, who have statistically more owned land, should have a greater *ability* to plant trees and to reap the economic benefits of doing so; however, they appear not to have done so. As discussed in the *Need* section above, locals are not distinct from non-locals in their propensity to plant trees or in their self-reported fuel or timber sufficiency. Further, locals do not have greater reported household incomes (which one also might expect would follow from having more owned land), education levels, or rates of phone or radio ownership.

Given Tanzanian culture and history, it unsurprising that members of the dominant tribe are not more likely to be wealthier or more powerful by other measures. Nyerere's social and economic programs of the 1960s – 1980s sought to actively unify and so de-tribalize Tanzanian social and other institutions; the results of those efforts are evident today. As Boone and Nyeme (2015) and Boone (2014) demonstrate, ethnic groups in Tanzania have little political salience due to Tanzania's post-colonial statist land tenure institutions, including a "near absence of state-recognized ethnic homelands and ethnicity-based land entitlements (Boone, 2014; 318-319)."

Perceptions of State Capacity and Forest Governance

There is some evidence that locals have *higher* perceptions of government capacity in general (which would in theory make them *more* fearful of forest use) and no greater (or lesser) knowledge about or support for environmental conservation. Locals are statistically distinct from non-locals (at the 0.1 level) in their belief that President Magufuli, elected in 2015, had increased forest protection and in reporting that fear of central government patrollers represents the primary fear of forest use (though both are substantively inconsequential with normalized differences of 0.16 and 0.22, respectively). Locals are statistically (and substantively) more likely to report a higher expectation for future expropriation.²²⁶ This is not surprising as all sites had experienced relatively pronounced episodes of agricultural land expropriation in the past, either by the hands of the head government, the Tanzanian military, or private large-scale agricultural industry (largely seen as being facilitated by the central government). A greater fear of government expropriation would suggest a possible *greater* need for forest use due to shift in

²²⁵ Per common agreements between landowners and renters and according to sound economic rationale.

²²⁶ Importantly, though land renters might not lose ownership over rented land should the land be expropriated, renters do see it as possible and have experience with land expropriation; though it will affect them differently, expropriation is not something that can happen exclusively to landowners.

the calculation of whether to plant trees,²²⁷ but no models suggest that locals are any less likely to plant trees than non-locals.

Knowledge Hoarding or Updating

Last, and importantly, locals are not more likely to be correct about the infrequency of government forest patrols. This rules out the alternative explanation that locals, by virtue of their having necessarily lived in the area for a longer time, may have updated their knowledge, and adjusted their behavior accordingly, in response to the learned reality that government enforcement capacity is low and patrolling infrequent. Only 14% of all respondents estimate *correctly* that the frequency of state forest patrols is about once every three months (as reported in interviews by forest patrollers and government officials in charge of the sector); 50% incorrectly believe the state patrols every day while another 16% believe patrolling happens once a week. Locals show no indication of being more correct about this widely misunderstood reality. Relatedly, though locals are more likely to be of the dominant ethnic group in both forests, in neither forest is identifying with the dominant ethnic group significantly correlated with correct estimation of patrolling frequencies.

In sum, locals do tend to be of the dominant tribe and are more likely to own more agricultural land (though not have more total agricultural land or land per person). However, there is no suggestion that locals have more economic or political power (such that they could better evade forest laws, e.g., through bribery), nor that they are more vulnerable (such that they may have more forest need). Further, there is no evidence that their behavior is a reflection of updated knowledge about forest patrol frequencies. On the other hand, there is some evidence that they have *greater* fear of the government or at least a greater perception of government capacity (i.e., greater fear of future expropriation, greater fear of head government forest patrolling, and more widespread belief that President Magufuli had increase forest protections); one might expect that this would lead locals to be *less* likely to use the forest illegally.

Overall, there seems to be no clear reason as to why locals should be illegally cutting from the forest at approximately twice the rate of non-locals based on these qualities alone; if anything, one might expect them to be less likely to use the forest given that they are ostensibly more able to plant trees (as they own slightly, if not substantively, more agricultural land) and have a greater fear of central government expropriation.

An Attempt to Tease out Forest Barriers to Entry

This paper has argued, supported by interview evidence, that around Magombera Forest, locals use forests more because of their access to “secret” knowledge (information that can be passed by marriage), while around the Udzungwa Scarp Forest, locals use more simply because

²²⁷ As with property rights, tenure security is consistently linked with changes in land use behavior, especially in tree-planting (Besley, 1995; Chimhowu and Woodhouse, 2006; Migot-Adholla *et al*, 1991; Goldstein and Udry, 2008; Clay, Reardon and Kangasniemi, 1998; Abdulai *et al*, 2011; Otsuka and Place, 2001),

they are more familiar with and thus less intimidated by the terrain (this takes regular exposure and is not information that can be easily passed by word of mouth). In this section, I revisit the list experiment (here comparing the two binary measures of local status) to explore these questions and, in particular, the nuances of how forest knowledge may be communicated under the two different institutional and geographic settings of Magombera Forest and the Udzungwa Scarp (Hypotheses 2 and 3). While the *estimated* rates of illegal forest cutting support each hypothesis, the differences between the two groups compared are not statistically significant. The results, then, do not support or contradict Hypotheses 2 and 3; more data is needed to properly test these questions statistically. That being said, because Hypotheses 2 and 3 are supported by extensive qualitative data, I lay out my (ultimately unsuccessful) approach to statistically test them here.

Recall that around Magombera Forest, the primary barrier to forest access is the need for secrecy surrounding all forest knowledge (due to the fact that forest entry is illegal at all times and for all reasons); for the villagers surrounding the Udzungwa Scarp, the primary barrier to forest access is forest intimidation and unfamiliarity (due to the steeper forest slope and a need to walk some distance to collect sufficient firewood). Note that in both cases, women (occasionally helped by their children) are primarily responsible for firewood acquisition (whether that be by cutting or collecting). If these barriers to entry are indeed shaping illegal forest use in Magombera and the Udzungwa Scarp Forests, we would expect two empirical observations when comparing distinct measures of “local status”.

First, as Hypothesis 2 predicts, for villagers around Magombera Forest, it is having access to secret forest knowledge that best determines a household’s likelihood of illegal forest use, not the woman’s familiarity with the forest (the terrain is flat and so entry is less intimidating and physically demanding than it is near the Udzungwa Scarp). Because this knowledge can be passed via marriage, forest cutting rates should be best determined by whether *either* spouse is local (Measure 1) than by whether the *female* specifically is local (Measure 2). In support of Hypothesis 2, *estimates* of non-local cutting rates across the two measures do indeed reflect this, though the differences between the two groups are not statistically significant.

As Figure 4.4 demonstrates, if we assume “non-local” to be based on the woman’s status (and thus include households where the female has married into a local family, as Measure 2 does), the estimated rate of non-local cutting is substantively higher (54% versus 39%), though the difference between the two groups is not statistically significant (p-value of 0.185).²²⁸ Still, I argue that measuring locals according to only whether the female is local is misleading. 52% of “non-local” women by this woman-centric measure have married into local families and have thus been made privy to local forest knowledge (including, where and how to enter, evade detection, avoid injury, etc.). Assuming such households to be “non-local” is missing a key element of the story.

²²⁸ See Appendix 4.2 for statistical analysis of the list experiment, including t-test results.

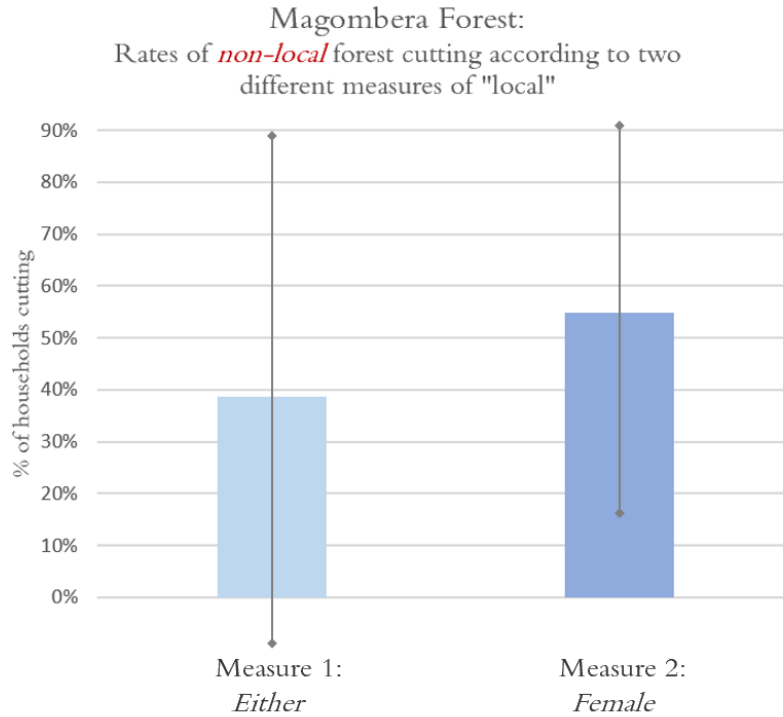


Figure 4.4: Comparing rates of forest cutting by non-locals across the *Either* and *Female* measures of local status. Groups not statistically distinct (p-value of 0.185).

Second, for the villages abutting the Udzungwa Scarp, though locals are nearly twice as likely as non-locals to cut according to either measure, households are even more likely to have cut when we consider the local status of the *female* respondent or spouse only (thus supporting Hypothesis 3); however, once again, the difference between the two measurements is not statistically significant (p-value of 0.608).²²⁹

²²⁹ See Appendix 4.2 for statistical analysis of the list experiment, including t-test results.

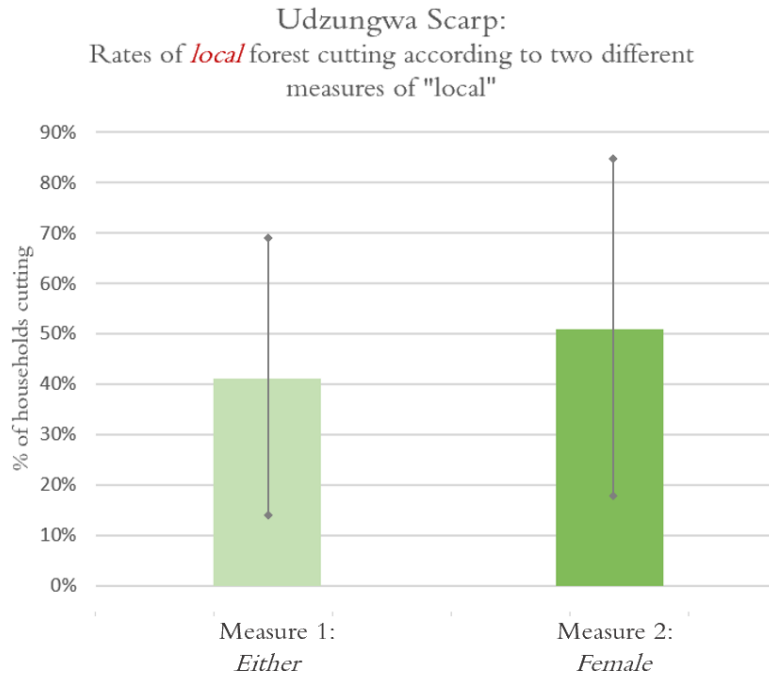


Figure 4.5: Comparing rates of forest cutting by locals across the *Either* and *Female* measures of local status. Groups not statistically distinct (p-value of 0.608).

By the *either* spouse measure, an estimated 41% of locals illegally cut in the previous year; according to the *female* measure of local, an estimated 51% of locals illegally cut in the previous year. That the forest is an intimidating place is corroborated by interviews with villagers; women are much less likely to collect wood from the forest (let alone cut or “steal” from it) if it is something that is unfamiliar to them. Factoring men’s local status into the equation only dampens the effect of being local. A wife is no more likely to use the forest if she has a local husband than if she does not; her decision-making regarding forest use is influenced primarily by her own comfort levels with the forest rather than her husband’s local status (as she is the one expected to collect firewood). It is not a lack of information about forest access, but a lack of familiarity and an increased intimidation that keep her out.

Further supporting Hypothesis 3, regardless of the measure used, 23% of non-locals in the Udzungwa Scarp cut illegally in the last year. There is no difference in cutting rates between groups where neither spouse is local and groups where only the male is local; the male’s local status has no impact on household cutting rates.

As noted above, while the estimates of forest cutting do correspond with Hypotheses 2 and 3, there is ultimately little we can take from these results (Figures 4.4 and 4.5) as the differences between the groups are not statistically significant. The differences in estimated results, however, do demonstrate the importance of paying attention to measurement; in both forests, estimated rates of locals cutting differ according to how one chooses to conceive of and measure “locals”.

The Different Roles and Importance of Villager Trust

Also illustrative of the role secrecy plays in the respective sites, is the degree to which this concept of trust in one's fellow villagers matters across the two forest sites studied here (figure 4.6).²³⁰

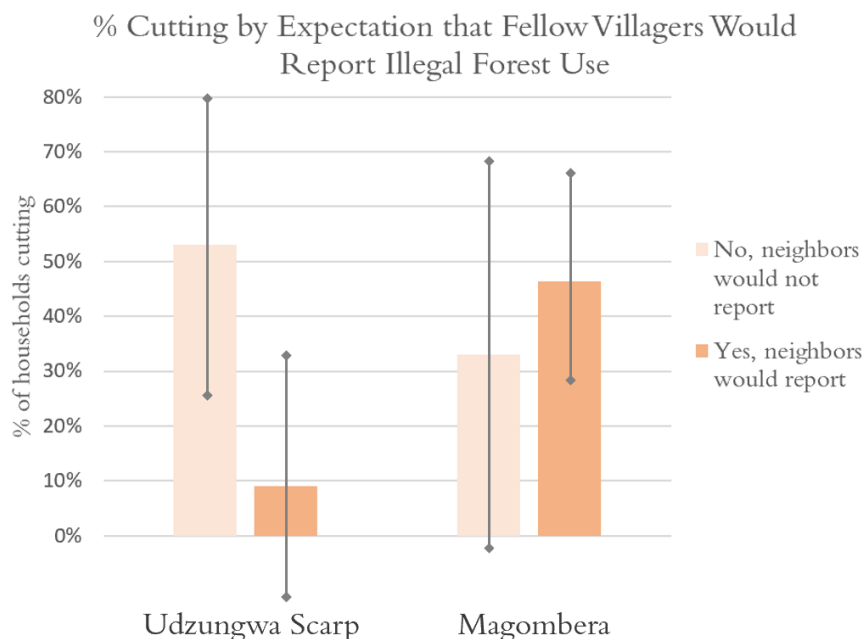


Figure 4.6: Forest use rates according to whether the respondent trusts other villagers not to report on him or her for illegal forest use. Udzungwa groups are statistically distinct with a p-value of 0.006; Magombera groups are not statistically distinct (p-value of 0.266).

Around the Udzungwa Scarp, those who do not believe fellow villagers would report on them for illegal cutting show a greater rate of illegal cutting (the difference between the groups is significant at the 0.05 level with a p-value of 0.006²³¹). This seems logical; a lack of fear about other villagers reporting one's behavior should increase the likelihood of illegal cutting. In the case of the Udzungwa Scarp, most forest use happens on the legal entry days of Saturday and Sunday during the daytime; it would not be surprising for another villager to see should someone choose to illegally bring a weapon²³² and cut branches.

Around Magombera Forest, we cannot confirm or disconfirm this same relationship: believing your neighbors would report on you for illegal forest use is linked with being *more* likely to cut (though the difference is not large nor statistically significant). This may speak to the role that secrecy plays in areas where any form of use is illegal; forest-users may be the most

²³⁰ For a more detailed analysis of how trust in one's fellow villagers shapes decisions to cut illegally from the forest, see Clay (2020).

²³¹ See Appendix 4.2 for statistical analysis of the list experiment, including t-test results.

²³² Typically, either an axe or a large knife.

nervous and least trusting of all villagers, hence their motivation to keep their forest use knowledge a secret. More data is needed to tease out whether there is indeed a statistical difference in forest use between those believing and not believing neighbors would report on illegal forest use in Magombera Forest.

4.6 Conclusion

In this paper, I have argued for a more nuanced view of the role “local”, or longstanding, families play in continued forest use, showing that in the case of complete state ownership over forests and forest resources in Tanzania, local families continue to illegally cut from protected forests at rates that are estimated to be nearly double those of non-local families. I show that while local families do not have a greater need for forest resources, they do have an increased knowledge of and familiarity with the forest, heightening their ability to evade legal restrictions against cutting.

Locals are not inherently conservationist and newcomers are not inherently destructive. While local knowledge is often seen as something to be nurtured and to learn from, I show here that local knowledge can also, in certain contexts, enable those who possess it to work around and perhaps even manipulate the system to their benefit. Local knowledge may indeed be a double-edged sword when it comes to resource conservation.

I have further attempted to tease out the mechanisms behind locals’ heightened illegal use under two different institutional and geographic settings. In doing so, I draw attention to the importance of the institutions that shape barriers to entry, or perceived and real costs of forest use, especially when groups are affected differentially by those barriers to entry. Forest-use policies have strong effects on what types of households are able to partake of forest resources, albeit illegally. Considerations of equity necessitate that we pay close attention to the differential impacts of these policies within and across communities.

One important question to come out of these findings is: how long does one need to live in one particular area to be privy to insider secrets or to be considered a local? This will certainly depend on what the specific barriers to entry are. For example, as in the case of Magombera Forest, a non-local may never get an “in” if she was not there before the forest was effectively closed and is not married to a local. For the case of Udzungwa Scarp, on the other hand, a hard year cutoff of, e.g., 2000, as I have used here, probably makes less sense than the amount of time spent in the village. It might take an average of six years to feel comfortable asking a local for help with forest access *if* one is to work up the courage to use the forest at all; as such, year of arrival may be a better indicator of “local behavior” vis-à-vis the forest than whether the household was in the village before a particular year.

Norms of behavior and gendered experiences, in particular, need to be paid greater attention; for instance, the barrier to entry faced by women in the Udzungwa Scarp is only fully understood when seen in conjunction with the knowledge that it is women who are responsible for firewood collection. Culture, topography, and forest policy present overlapping institutions; it

is only when looking comprehensively and from the perspective of resource users that we can better understand the multitude of factors that either inhibit or encourage illegal resource use.

This paper cannot speak to whether the respective laws in place are efficient or effective from a forest conservation perspective; I analyze only how those laws influence household decision-making differentially within the communities affected. The results do, however, indicate that community-based forest management that involves villagers more equally in the management and decision-making of forest resources would likely be a more equitable forest policy than the outright ban of forest access seen in Magombera Forest, where the need for secrecy leads to greater exclusivity in access.

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Appendix 4.1

Descriptive Statistics - All Variables

	Obs	Mean	Std Dev	Min	Max
Local (<i>binary</i>)	592	0.56	0.50	0	1
Owner type	682	1.44	0.65	0	2
Title Registration	351	0.59	0.53	0	2
Income (\$)	643	103.00	176.47	0	999
HH Education	682	1.28	0.67	0	3
Land Per Person	681	0.81	1.00	0	7
Radio	635	0.58	0.49	0	1
Food Sufficiency	676	1.62	0.62	1	3
Leader Gift (\$)	681	22.68	574.82	0	15000
Leader Meetings (<i>hrs</i>)	677	0.55	1.88	0	24
Dominant Tribe	681	0.30	0.46	0	1
Fuel Sufficiency	652	0.08	0.27	0	1
Timber Sufficiency	652	0.05	0.22	0	1
Trees Owned	442	0.66	1.06	0	4
Fear of Future Land Expropriation	646	1.23	1.41	0	4
Any Environmental Education	681	0.29	0.46	0	1
Forest Fear (Central Gov Patrollers)	673	0.71	0.45	0	1
Villager Trust (to not report)	670	1.60	0.80	1	3
Village Patroller Suport	681	1.62	0.68	0	2
Reduced Fine Possible	611	0.40	0.49	0	1
State Patrol Frequency	435	1.86	1.10	1	5
Katurukila	682	0.40	0.49	0	1

Appendix 4.2

List Experiment Difference in Means

Figure	Forest	Variable	N	Est	SE	90% CI		t-test (<i>p</i>)
4.3	Both	Local	290	52%	11%	34%	69%	0.017
	Both	Non-Local	237	25%	12%	5%	45%	
4.6	Magombera	Non-Local - <i>Either</i>	36	39%	30%	-11%	89%	0.185
	Magombera	Non-Local - <i>Female</i>	62	54%	23%	15%	92%	
4.7	Udzungwa Scarp	Local - <i>Either</i>	131	41%	17%	13%	69%	0.608
	Udzungwa Scarp	Local - <i>Female</i>	93	51%	20%	17%	85%	
4.8	Udzungwa Scarp	No, would not report	219	53%	17%	25%	80%	0.006
	Udzungwa Scarp	Yes, would report	119	9%	15%	-16%	34%	
	Magombera	No, would not report	179	33%	22%	-4%	69%	0.266
	Magombera	Yes, would report	153	46%	12%	27%	66%	

CONCLUSION

The three essays presented here have employed a political economy framework to think about the perceived costs of illegal resource use from the perspective of potential users. The primary objective of this approach has been to elucidate important intracommunity variation in illegal behavior, an important dimension to natural resource governance that forest health assessments cannot reveal. I have explored: 1) how and under what conditions community monitoring programs influence illegal forest use when monitors exist but are inactive; 2) how land titling processes, which are increasingly common throughout SSA, send signals of state capacity that spill over onto the forest sector, engendering forest policy compliance; and 3) how local knowledge and experience can be thought of as a form of power enabling locals to better evade forest restrictions.

Each of these essays seeks to explain a curious observation: a seemingly irrational fear of forest patrollers in Tanzania's Kilombero Valley. In reality, neither community monitors nor central government patrollers are active in Magombera or the Udzungwa Scarp forests with great frequency (respectively, patrolling a few times a month and once every few months); when they do patrol, they are largely unconcerned with villagers collecting subsistence firewood. Subsistence users, most commonly women, are regularly let off with a lesson about the importance of the environment or a reduced fine of approximately one tenth of official fine amount. Despite these realities, the majority of villagers around both forests report great fear of patrollers (especially those of the central government) and dramatically overestimate their monitoring and enforcement activities.

Survey results reveal that only 14% of all respondents estimate correctly that the frequency of state forest patrols is about once every three months; 50% incorrectly believe the state patrols every day while another 16% believe patrolling happens once a week. Further, as seen in Figure 2.1, while 97% of all villagers report that they would expect a fine if caught using the forest illegally, only 4% report anyone in their household ever having received one. While it is of course plausible that respondents underreported their own household's past experiences with enforcement, this is still a huge difference, especially as we know that approximately 34% of all survey respondents illegally cut from the forest.²³³ Further, as Figure 2.2 shows, only 40% of all villagers are aware that it's possible to be let off with only a reduced fine. Interestingly, there is gross overreporting of forest punishment expectations even among forest users. They must assume that they are either particularly lucky or particularly skilled at evading patrollers.

These essays aim to make sense of these gross misunderstandings, that is, to explain why so many villagers are misinformed and fearful of a near non-existent threat. To do so, they explore less obvious notions of power: 1) the *stealth* power of community monitoring networks, i.e., the power of the myth of surveillance; 2) the very visible but *indirect* power of the state as it spills over from the land to the forest sector; and 3) the unique and multifaceted power of locals to circumvent forest restrictions, i.e., the power of *knowledge* and *experience*. Together, these

²³³ This is according to the list experiment results, discussed in greater detail in Section 1.3.

essays help explain, from the perspective of the users, the signals that influence perceptions of state coercive capacity.

In this conclusion, I will speak briefly to how these essays contribute to thinking on natural resource governance more broadly. First, I discuss how the experience of forest-proximate villagers in Tanzania calls into question the role of legitimacy in natural resource management. Next, I discuss how the Tanzanian experience complicates the meaning of “local” and “local governance”, showing that, in the case of statist regimes, such as Tanzania, central versus local governance presents a false dichotomy. I conclude with thoughts on policymaking and future research.

On the Role of Legitimacy

These essays call into question the role of legitimacy, or perceived trust and fairness, in shaping individual decisions to obey. While legitimacy is undoubtedly an important factor in natural resource management under many contexts,²³⁴ perceived state coercive capacity does a better job of explaining behavioral trends and perception shifts regarding illegal use of Tanzania’s public forests.

It is often assumed that communities are more effective forest managers than central governments due in part to their greater legitimacy in the eyes of resource users.²³⁵ As the argument goes, if some users participate in the design and implementation of the rules, the rules will more likely be seen as fair and, accordingly, will be more likely obeyed.²³⁶ These dynamics are not exclusive to natural resource management; legitimacy should facilitate all realms of governance. Weber argues that because rulers are limited in their real capacity for monitoring and enforcement, there must be an implicit understanding, or a compact, between those exercising authority and those obeying it. Legitimacy is a foundational element of that compact. Levi’s notion of quasi-voluntary compliance suggests that the contract must go both ways; citizens will comply with unpopular policies under the condition that the state punishes free-riders who do not comply. Governments that can be trusted or are perceived to act fairly are thought to be more legitimate and this legitimacy facilitates effective and more efficient governance.²³⁷ As North (1990) notes, the costs of governance are inversely related to the regime’s legitimacy.

Regimes that delegate some resource monitoring to local communities (chapter 2) and ensure agricultural property rights (chapter 3) might in theory be seen as more legitimate in the eyes of their citizens; perceiving the government and legal framework to be more legitimate, we might expect citizens to be more willing to obey the law (e.g., regarding forest restrictions).

²³⁴ Tanner et al., 2010; Pretty, 2003; Armitage et al., 2009;

²³⁵ Aligica and Tarko, 2013

²³⁶ Armitage et al., 2009; Levi, 1988; Levi, Sacks, and Tyler, 2009.

²³⁷ Levi, Sacks, and Tyler, 2009; Lockwood, 2010; Turner et al, 2016.

These essays, however, suggest a relationship between villagers and the central government based more on fear and coercion than on a legitimacy inspired by fairness.

First, as seen in chapter 3, one might assume that registering for a title might augment the government's legitimacy in the eyes of the title-holders,²³⁸ thereby engendering greater forest policy compliance. This potential newfound legitimacy cannot, however, account for the shift in perceptions among Registered households we see in chapter 3. Registered households are more likely than Non-Registered households to overestimate state patrol frequencies despite the fact that households were registered as if randomly and do not otherwise differ from Non-Registered households (Figure 3.3).²³⁹ Legitimacy cannot explain this the way that an enhanced perceived coercive capacity can. Interview evidence supports that registered villagers have a heightened fear of the central government rather than greater support of it.

Second, as chapter 2 demonstrates, legitimacy is not the only mechanism through which local participation in natural resource management engenders compliance; there are more coercive mechanisms through which local participation works. Under a de facto polycentric scheme, local involvement effectively gives the central government boots on the ground; further, the community is uniquely able, due to its proximity, to engender a feeling of constant surveillance that would be more challenging for the near-absentee central government patrollers to cultivate on their own. This does not discount the role legitimacy might play, but it does bring it into question. In the case of Tanzania, community monitors do not have de jure rule-making power (even if, in practice they enforce forest laws according to their own discretion); accordingly, it may not be a good case study of community legitimacy. However, given that community monitoring has an important role to play even absent feelings of legitimacy, there are clearly more coercive mechanisms through which community monitoring can work.

Most regimes function with a cocktail of coercion and legitimacy; they are certainly not mutually-exclusive. What these essays demonstrate is that 1) legitimacy is likely given more credit than it's due and 2) local institutions have much more capacity for coercion than they are typically given credit for. Each of the behavioral shifts in the scenarios presented here (land titling and community monitoring) might be readily concluded to function through enhanced legitimacy, when in reality there is little evidence for it.

Questioning the Meaning of “Local”

Next, this work challenges the meaning and relevance of “local” and “local governance”. First, Chapter 4 questions which characteristics of being local are most relevant for understanding forest law evasion and highlights the need to incorporate gender and gender norms in our understanding of local. As Chapter 4 argues, “local” is a multifaceted concept, comprised of cultural, economic, and political dimensions. Each of these dimensions will vary in their relevance to any given location and context. For instance, though “locals” are more able to

²³⁸ Lockwood (2010).

²³⁹ One likely uninteresting exception is that Registered households are less likely than Non-Registered households to own a radio (significant at the 0.10 level); they do not differ on any other measure of income or assets.

surmount forest barriers to entry in both Magombera and the Udzungwa Scarp forests, they are able to do so differently, or via two different mechanisms, in each institutional environment. In Magombera Forest, the local population of interest regarding illegal forest use entails all households that have access to local knowledge; local households in this context must have at least one local spouse. In the Udzungwa Scarp, on the other hand, “local” seeks to capture local experience with forest use, rather than knowledge; the local population of particular interest here comprises only those households where the female spouse is local, given that it is women who are responsible for firewood collection. The cases presented here are not meant to be comprehensive or exhaustive, but to elucidate that local is both a multidimensional and a fluid term; depending on the question of interest, one may be best off tailoring its measurement accordingly.

Further, the essays together demonstrate that, in Tanzania (due to its statist regime structure), the idea of central versus local governance presents a false dichotomy. State power works through local institutions to powerful effect; the local is more a hand of the state than something distinct. This is an important factor that greatly complicates our ability to compare local and state natural resource management schemes.

As I set about thinking about this project and writing my surveys, I originally borrowed language from two key Afrobarometer questions, thinking this would allow me to compare my cases to a representative sample of SSA more broadly. Specifically, I asked which institution was responsible for land allocation and natural resource protection: the central government, the local government, traditional leaders, or members of the community.²⁴⁰ According to Afrobarometer survey data, there is great inconsistency across and within all regions in how Tanzanians think about each of these questions.²⁴¹ In conducting research on the ground, however, it became immediately apparent that this variation stemmed more from how the questions were worded than a true collective uncertainty.

While discrete response formulations are likely appropriate in other contexts, the overlap between state and local governance in Tanzania renders such response categories difficult to interpret. In interviews, for instance, respondents very consistently and emphatically report that the central government holds more power than local governments in general and regarding the forest in particular, but that “the village government works with the central” or “the village government needs instructions from the upper government.” Indeed, one of the two highest “local” leaders, the VEO (known as the mtendaji), is centrally appointed; he is not from the village nor will he likely stay there after his five-year term. Exploring concepts of locals and local governance under a statist regime adds needed nuance to debates on and understandings of natural resource management.

²⁴⁰ Afrobarometer round 4, questions 58F and 58G.

²⁴¹ Across all regions of Tanzania, anywhere from 22% to 94% reported the central government was responsible for land allocation, while 6% to 75% had it in the hands of local government. 8% to 81% had “protecting our rivers and forests” in the hands of the central government, with 6% to 75% believing that task fell to local governments.

Policy Thoughts

Beyond providing some justification for villager overestimations of the costs of illegal forest use, looking at perceived costs from the perspective of users elucidates pronounced intracommunity variation in how government and community powers manifest or are perceived. In revealing that household types are influenced differentially by state and local institutions, they shed light on and beget further questions on issues of efficacy and equity in forest policy.

From a conservationist perspective, this intracommunity variation highlights that serious effort needs to be put into understanding who is continuing to evade forest laws and why, e.g., is it the most powerful and so the most able to evade restrictions or is it the most vulnerable who have no alternative sources of fuel? Answers to that basic question, which will inevitably vary by context, will call for drastically different policy foci, e.g., paying monitors an appropriate salary to induce more regular patrolling²⁴² versus focusing efforts on making alternative sources of fuel more available. In low resource and low capacity countries, it may not be possible to tackle the issue from both sides. Paying close attention to who is continuing to evade forest laws will help create more targeted policies that are both less costly and more effective.

In seeking to avoid thinking of communities as one homogenous group, this work has admittedly depicted ‘household types’ in a similarly homogenous light. While individuals will undoubtedly differ according to an infinite list of factors, from a policy perspective, it behooves us to isolate factors of particular relevance to measurable behavioral trends. To do that requires thinking strategically about context-specific overt and subtle sources of and experiences with power.

From an equity perspective, the question is less about who does use the forest and more about who is excluded from it, either due to real or perceived barriers. For example, are certain types of households (e.g., those with lower social capital, such as newcomers or ethnic minorities²⁴³) more likely to buy into the “myth of monitoring” and so be disproportionately disadvantaged as a result? The challenge is not only figuring out how we can best protect natural resources but how can best do so equitably. Without doing so, natural resource policymakers will be in the game of choosing winners and losers, intentionally or otherwise.

Future Research

This research, as most research, begs more questions than it answers. Among them, are, first and foremost, how do the policies and institutions explored here affect overall forest health? An effort needs to be made to link the questions posed here more directly with 1) research from

²⁴² As well as to discourage taking off-the-books side payments from forest offenders, a system which is beneficial to both the user and the monitor but at the expense of real monitoring. It is unclear whether this happens in the cases presented here, but it should undoubtedly be a consideration.

²⁴³ While ethnicity does not appear to play such a role in the research sites discussed here nor in Tanzania more broadly, it is sure to elsewhere (Boone, 2014; Boone and Nyeme, 2015).

sciences measuring forest and habitat degradation and 2) analyses of local firewood markets in response to the demonstrated shifts in user activity.

To the first point, these essays are meant to serve as a complement to research focused on comparative forest health, e.g., across different institutional environments. They add a needed behavioral component and allow for a teasing out of intracommunity variation. There is a need, however, to carry out this type of behavioral research *alongside* forest health analyses so as to fully capture how different behavioral shifts do or do not have notable impacts on forest health.

Relatedly, there is a great need to capture how the behavioral shifts seen here influence illegal firewood markets. Removing or restricting a resource does not remove demand for it; each household opting not to cut from the forest creates new demand and further incentivizes others cutting from the forest. This may lead to a one-to-one replacement effect, whereby the original forest user switches to buying stolen firewood without there being a net increase in forest cutting. It may also lead to a net reduction of forest cutting if some of that market wood is supplied by local tree farms. On the other hand, community monitors note that as typical subsistence users are discouraged from cutting, new, more destructive players (often men) are entering the game in order to supply the growing demand for firewood. As one Magombera patroller contends, higher fines only lead to more egregious destruction; “because they’re fearing being caught, if they go, they collect until they’re satisfied.” A key questions are: for those shifting from cutting to buying firewood, where does the wood originate? Does the shift in who is actually doing the cutting lead to a net increase in destruction?

Both lines of research, that is, looking at these behavioral questions in conjunction with those of forest health and firewood markets, seek to get at the same fundamental question: do fewer or a shift in users mean less destruction? Each presents important steps forward that will further elucidate best practices for forest governance.

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Appendix 5.1

Survey Questions used in this Dissertation

<i>Variable</i>	<i>Question</i>	<i>Q: Swahili Translation</i>	<i>Response Categories</i>	<i>R: Swahili Translation</i>
Primarily responsible for forest protection?	Who is primarily responsible for patrolling %FOREST% forest?	1 = Mtendaji; 2 = other village leaders; 3 = Villagers; 4 = hired village guards; A = the district government (Kilombero); B = the regional government (Morogoro); 5 = the Tanzanian government; 6 = Selous; 7 = TANAPA; 8 = Udzungwa National Park; 9 = Private company; M = Military; C = other; 0 = nobody/ no organization; U = don't know	Je, ni nani hasa mwenye jukumu la kulinda msitu?	1= Mtendaji; 2 = Viongozi wengine wa kijiji; 3=Wanakijiji; 4 = Walinzi waloajiriwa kutoka kijijini; A = Serikali ya Wilaya ; B = Serikali ya Mkoa ; 5 = Serikali Kuu; 6 =Selous; 7 = TANAPA; 8 = Hifadhi ya taifa ya Udzungwa; 9 = Kampuni binafsi; M = Jeshi; C = Nyingine; 0 = Hakuna mtu/ shirika; U = Sifahamu
HH income	In a good month (e.g., July, August) what is your household's monthly income [in 1000s]?	Kwenye miezi ya baraka/ manufaa/mizuri(mfano, julai na agosti) je, kipato cha kaya yako ni kiasi gani kwa mwezi? [Kwa maelfu, mfano, akisema 4,000, uandike 4]	Numeric	
Credit - village group	Do you have access to credit, either from a	Je, unaweza kupata mkopo, labda kutoka benki	1 = yes, a bank only; 2 = yes, a	1=Ndiyo, benki tu; 2= Ndiyo, vikundi

Credit - bank	bank or a community group? [select one only] [ENUMERATOR: note that this question asks about access - it does not ask whether the respondent has received credit from these institutions, only whether he/she could receive credit if so desired]	au vikundi vya kijamii?[chagua jibu moja tu] [MUULIZAJI: Kumbuka hili swali linauliza kuhusu upatikanaji wa mikopo, haliulizi kama mjibuji ameshawahi kupata mikopo kwenye hizi taasisi, lakini tu kama anaweza kupata mkopo kama atapenda]	community group only; 3 = yes, from both a bank and a community group; 4 = no access	vya kijamii tu; 3= Ndiyo, kutoka benki na vikundi vya kijamii; 4=Hakuna upatikanaji
HH education	What is the highest level of education that someone in your household has completed? [Choose one only]	Je, katika kaya hii ni kiwango gani cha elimu ni cha juu zaidi?	1 = some primary school only; 2 = primary school; 3 = secondary school; 4= Elimu ya ufundi; 5= university; 6= none	1 = Kuhudhuria miaka kadhaa elimu ya msingi bila kuhitimu; 2= Elimu ya msingi; 3= Elimu ya Sekondari; 4= Elimu ya ufundi; 5= Elimu ya chuo; 6= hakuna
Ag land (<i>ha</i>)	How many hekas is your household renting this year?	Je, mwaka huu kaya yako imekodi heka ngapi?	Numeric	
	How many hekas has your household purchased through a private contract?	Je, kaya yako ilinunua heka ngapi kutoka kwa mtu binafsi?	Numeric	
	How many hekas has your household inherited?	Je, kaya yako ilirithi heka ngapi?	Numeric	
Owned ag land (<i>ha</i>)	How many hekas has your household bought from or been given by the government?	Je, kaya yako ilinunua ama ilipewa heka ngapi kutoka kwa serikali?	Numeric	
Ag land/ person	How many total people currently live in your HH, including young children who are away at school?	Je, ni watu wangapi wanaishi katika nyumba hii kwa sasa, ikiwa ni pamoja na watoto waliokwenda shuleni?		
Own a phone	Which of the following does someone in your	Je, kuna mtu katika kaya yako anamiliki vitu	1 = Radio; 2 = cellphone; 3 =	1= Redio; 2= Simu ya mkononi; 3=
Own a radio				

	household own? [check all that apply]	vifuatavyo? [Chagua yote yanayohusika]	cellphone with internet (smart phone); 4 = bicycle; 5 = Pikipiki; 6 = Pawatila; 7 = car; 8 = television	Simu ya mkononi yenye uwezo wa internet ; 4= Baiskeli; 5 = Pikipiki; 6 = Pawatila; 7 = Gari ; 8 = Televisheni/ Runinga/ Video
Food sufficiency	Compared to other households in your village, do you think your household has the same, less, or more nutritious food (including meat, milk, and plentiful beans and vegetables)?	Ukilinganisha na kaya zingine kijijini kwako, je, unadhani kaya yako inapata mlo/lishe bora sawa, kidogo, kubwa (Ikiwemo nyama,maziwa, maharage na mboga za majani)?	1 = household has more than others; 2 = household has less than others; 3 = household has the same as others	1=Kaya yangu ina mlo bora sawa na wengine; 2=Kaya yangu ina mlo duni sawa na wengine ; 3=Kaya yangu ina mlo sawa na wengine
Leader Gift (TSH)	In the past six months, approximately what amount of tithes, tax, or gifts have you paid to a village leader? [In 1000s]	Kwa miezi sita iliyopita, kuna makadirio kiasi gani ya kodi au zawadi umempatia kiongozi wa kijiji? [Kwa maelfu, mfano, akisema 4,000, uandike 4]	Numeric	
Leader Meetings (hrs)	In the past six months, how many hours have you spent meeting with a village leader, outside of community meetings?	Kwa miezi sita iliyopita, umetumia masaa mangapi kukutana na viongozi wa kijiji, nje ya mikutano ya kijiji?	Numeric	
Local	Were you born in this village? If not, when did you move here?	Umezaliwa katika Kijiji hiki? Kama hapana, ulihamia hapa mwaka gani? [Muulizaji: Akizaliwa hospitali katika kijiji kingine lakini wazazi waliishi kijiji hiki, chagua kwamba alizaliwa hapa]	If born here: write 1; If stays here only temporarily/ seasonally: 5; No Response: 99	Kama alizaliwa hapa: andika 1 - Kama anakaa muda mfupi tu - haishi hapa: 5 - Hakuna jibu: 99
	Was your spouse born in this village? If not, when did he move here? [Enumerator: question also applies to deceased and divorced spouses]	Je, mchumba wako amezaliwa katika Kijiji hiki? Kama hapana, aliamia hapa mwaka gani? [Muulizaji: Swali linahusu wajane na waliotengana pia]	If born here: write 1; If stays here only temporarily/ seasonally: 5; No Response: 99	Kama alizaliwa hapa: andika 1 - Kama anakaa muda mfupi tu - haishi hapa: 5 - Hakuna jibu: 99

	Were your parents born in this village?	Je, miongoni mwa wazazi wako wamezaliwa katika Kijiji hiki?	0 = no, neither; 1 = yes, both; 2 = only their mother; 3 = only their father; 4 = Don't Know	0= Hapana; 1= Ndiyo, wote wawili; 2 = mama tu; 3 = baba tu; 4 = Sifahamu
Dominant tribe	To what tribe does the household head belong? [Enumerator: write the number of the correct tribe only]	Je, kiongozi wa kaya ni kabila gani? [Muulizaji: Uandike namba ya kabila tu. Na kama hakuna jibu, andika: 99]	1 = Wabena; 2 = Wapogoro; 3 = Wandamba; 4 = Wangindo; 5 = Wahehe; 6 = Wamasai; 7 = Wasukuma; 8 = Wapare; 9 = Wanyaturu; 10 = Wagogo; 11 = Wanyakyusa; 12 = Waruguru; 13 = Wambunga; 14 = Kabila nyingine; 99 = No Response	1 = Wabena; 2 = Wapogoro; 3 = Wandamba; 4 = Wangindo; 5 = Wahehe; 6 = Wamasai; 7 = Wasukuma; 8 = Wapare; 9 = Wanyaturu; 10 = Wagogo; 11 = Wanyakyusa; 12 = Waruguru; 13 = Wambunga; 14 = Kabila nyingine; 99 = No Response
Fuel sufficiency Timber sufficiency	Do you have enough trees on your land (both owned and rented) to supply your household with sufficient wood for its fuel and pole needs?	Je, una miti ya kutosha kwenye ardhi/shamba lako (Ikiwa ni ile ya kumiliki pamoja na ya kukodi) kuweza kuipatia kaya yako magogo ya kutosha kwa ajili ya kuni/mkaa na mbao?	1 = We have enough trees for our firewood/ charcoal needs only; 2 = We have enough trees for our pole/ timber needs only; 3 = we have enough trees for both our firewood/ charcoal and pole/ timber needs; 4 = we do not have enough trees for either firewood/ charcoal or timber	1=Tuna miti ya kutosha kwa ajili ya matumizi yetu ya kuni/mkaa tu; 2=Tuna miti ya kutosha kwa ajili ya matumizi yetu ya mbao tu; 3 = Tuna miti ya kutosha kwa ajili ya matumizi yetu ya kuni/mkaa na pia kwa ajili ya matumizi yetu ya mbao; 4 = Hatuna miti ya kutosha kwa ajili ya matumizi yetu ya kuni/mkaa ama matumizi yetu ya mbao
Planted trees on land	Do you plant trees on the land that you OWN? If so, how many?	Je, unapanda miti katika ardhi/shamba unalomiliki ? kama ndiyo, ni idadi gani ?	0 = no trees, 1 = yes, 1 to 10 trees; 2 = yes, 10 to 30 trees; 3 = yes, 30 to 50 trees;	0=Hapana ; 1= ndiyo, mti mmoja mpaka miti kumi ; 2=Ndiyo ,miti kumi mpaka miti

			4 = more than 50 trees; 5 = don't know	thelathini ; 3= Ndiyo, miti thelathini mpaka miti hamsini ; 4= Zaidi ya miti hamsini ; 5=Sifahamu
Planted trees in last year	In the past year, how many of the following have you on your owned land (including purchased, inherited, and given land)?	Je, ni yapi kati ya yafuatayo umekuwa ukiyafanya kwenye ardhi yako unayomiliki kwa miaka iliyopita (Ikiwemo ya kununua, kurithi na ya kupewa)? [Chagua yote yanayohusika]	1 = Hired someone to guard your land; 2 = Built a fence on your property; 3 = Put up a new building on your property; 4 = Cut down trees on your land; 5 = Planted trees on your land; 6 = Let land lay fallow; 7 = None of the Above	1=Kuajiri mtu wa kulinda ardhi yako; 2=Kujenga fensi kwenye eneo lako; 3=Kujenga jengo jipya kwenye eneo lako; 4= Kukata miti kwenye ardhi yako; 5 = Kupanda miti kwenye ardhi yako; 6 = Kuacha mashamba bila kulima kwenye ardhi yako; 7=Hakuna jibu kati ya hayo juu
Magufuli - increased forest protection	What effect has President Magufuli had on forest use?	Je, Raisi Magufuli ameleta athari gani kwenye matumizi ya msitu ?	0 = no effect; 1 = he has made punishments for illegal use stronger; 2 = he has made punishments for illegal use weaker; 3= he has increased protection; 4 = he has decreased protection; 5 = his policies make people more afraid of using %FOREST% forest; 6 = his policies make people less afraid of using %FOREST% forest; 7 = don't know	0=Hakuna athari ; 1=Amefanya adhabu kwa matumizi mabaya kuwa kubwa na zenye nguvu zaidi ; 2= Amefanya adhabu kwa matumizi mabaya kuwa ndogo ; 3= Ameongeza ulinzi ; 4= Amepunguza ulinzi ; 5=Polisi wake wamefanya watu kuogopa kutumia msitu ; 6=Polisi wake wamefanya watu kutokuogopa

				kutumia msitu ; 7=Sifahamu
Fear of expropriation	How likely is it that the government will choose to put any of your land to another use in the next 5 years (including, but not limited to, being set aside for conservation, government buildings, or roads)?	Je, kuna uwezekano kiasi gani wa ardhi yako yoyote kuchukuliwa na serikali kwa ajili ya matumizi mengine kwa kipindi cha miaka mitano ijayo? (ikiwemo, ila si hayo tu, kutengwa kwa ajili ya uhifadhi, majengo ya serikali, barabara na mengineyo)	1 = very unlikely (a small % only); 2 = somewhat likely (50%); 3 = highly likely; 4 = this will definitely happen; 0 = not likely at all	1= Kwa kiasi kichache; 2 = Kwa asilimia 50 (50%); 3 =Kwa kiasi kikubwa; 4= Hakika itatokea; 0=Hakuna uwezekano kabisa
Forest fear - central gov patrollers	Which of the following is the biggest fear of using resources from %FOREST% forest?	Je, ni sababu ipi kubwa ambayo inakupa hofu ya kutumia rasilimali za msitu wa %FOREST%?	1 = fear of being caught by a government or Selous patroller; 2 = fear of being caught by a hired village guard; 3 = fear of being caught by a villager; 4 = fear of injury or animal attack; 5 = other ; 6 = I am not fearful of using resources from %FOREST% forest	1= Kuogopa kukamatwa na serikali au walinzi kutoka Selous; 2 = Kuogopa kukamatwa na wanakijiji waloajiriwa kulinda; 3= Kuogopa kukamatwa na wanakijiji; 4= Kuogopa kupata majeraha/kuumia au kuvamiwa na Wanyama; 5= Nyingine; 6 = Siogopi kutumia rasilimali kutoka msitu wa Magombera
Villager trust (not to report)	If someone in your household were to use forest resources in a way that is not allowed, do you think your neighbors would report you?	Je, kama mmojawapo katika kaya yako atatumia rasilimali za msitu kinyume na taratibu, unafikiri majirani zako watatoa taarifa juu ya jambo hili?	1 = Yes, I think that neighbors would report this behavior; 2 = I think that some wouldn't, but others might; 3 = No, I don't think that my neighbors would report this behavior	1=Ndiyo, ninafikiri majirani watatoa taarifa; 2= Ninafikiri baadhi hawatatoa taarifa ila labda wengine watatoa; 3=Hapana, sifikiri majirani zangu watatoa taarifa juu ya jambo hili

Environmental education	Have you received any environmental education? If so, from whom?	Je, umeshawahi kupata elimu yoyote ya mazingira? Kama ndiyo, ulipata kutoka kwa nani?	0 = no; 1 = yes, from the village government; 2 = yes, from the district government; 3 = yes, from the regional government; 4 = yes, from the Tanzanian government; 5 = yes, from TANAPA; 6 = yes, from Udzungwa Parks National Forest; 7 = yes, from Selous; 8 = yes, from an international organization; 9 = yes, from other	0=Hakuna; 1=Ndiyo, kutoka kwa serikali ya Kijiji; 2=Ndiyo, kutoka kwa serikali ya Wilaya; 3=Ndiyo, kutoka kwa serikali ya Mkoa; 4= Ndiyo, kutoka kwa serikali Kuu; 5= Ndiyo, kutoka TANAPA; 6=Ndiyo, kutoka hifadhi ya taifa ya Udzungwa; 7= Ndiyo, kutoka Selous; 8=Ndiyo, kutoka mashirika ya kimataifa; 9=Ndiyo, wengine
Reduced fine possible	If someone is found having used the forest in a way that is not allowed, what types of punishment are possible [used translation: what penalty is given]? [Check all that apply]	Je, ni adhabu gani anapewa mtu endapo anakamatwa kwa kosa la kutumia msitu kinyume na taratibu? [Chagua yote yanayohusika]	1 = a small fine; 2 = a heavy fine; 3 = loss of land; 4 = loss of other property; 5 = going to jail; 6 = other; 7 = there are no punishments; 8 = don't know	1= Kiasi kidogo cha faini ; 2= Kiasi kikubwa cha faini ; 3=Kunyang'anywa ardhi ; 4 = Kunyang'anywa mali nyingine; 5=Kwenda jela ; 6=Nyingine; 7 = hakuna adhabu; 8 = Sifahamu
Central gov patrol frequency	How often do people from the head government (ex TANAPA, UDZ NP, Selous) patrol %FOREST% forest?	Je, ni mara ngapi watu kutoka serikali kuu (mfano, TANAPA, Udzungwa NP) wana kawaida ya kulinda msitu wa %FOREST%?	0 = never; 1 = every day; 2 = once a week; 3 = once a month; 4 = once every few months; 5 = once a year; 6 = don't know	0=Kamwe; 1= Kila siku; 2= Mara moja kwa wiki; 3= Mara moja kwa mwezi; 4= Mara moja kila baada ya miezi kadhaa; 5=Mara moja kwa mwaka; 6=Sifahamu