

Results from USAID Impact Evaluations in Zambia: The Effect of Improving Security over Land on Access to Credit and Rental Markets

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Introduction

Increased tenure security has long been hypothesized to incentivize greater land investment and improved household economic outcomes. A main pathway for these outcomes is through the increased ability to obtain credit and increased engagement in land transactions such as through land rental markets (Besley, 1995; Brasselle et al., 2002; Fenske, 2011). However, the empirical support for a strong and positive link between stronger tenure security and household obtainment of credit or engagement in land rental markets has been tenuous (Lawry et al., 2014). This mixed empirical base draws mostly upon studies that are non-experimental or quasi-experimental in nature, leading to potential endogeneity bias: is it tenure security that leads to investment, or investment that leads to tenure security? (Besley, 1995; Otsuka and Place, 2001; Deininger and Jin 2006). This endogeneity concern is part of a broader lack of clarity on the various factors that impact household ability to access credit or engage in land rental activity, especially in strong customary or communal land settings and statutory contexts of much of sub-Saharan Africa, where land is not always collateralizable (Lawry et al., 2014). Another problem with the current evidence base is that it proxies for improved land tenure security with certification. It thus assumes rather than verifies that the existence of titles increases perceptions of tenure security. Despite the limitations of the evidence, development programming often continues to draw on conventional assumptions, or apply them to settings that are further removed from those captured in the current evidence base.

This research paper provides some of the first experimental evidence for whether increased land tenure security also increases use of credit and rental markets, with the aim of providing policy relevant programming recommendations. We use the results of a randomized control trial in Zambia to analyze the intersection of land tenure security, agroforestry promotion, and household credit taking along with household engagement in land rental markets. A key aim of the analysis is to combine this data with a second dataset from a the same province of Zambia to identify moderating factors and how they differ across districts when shaping relationships among (1) tenure security and credit taking or amount obtained and (2) tenure security and engagement in land rental markets. This includes analysis of village geographic factors such as market access and distance to urban centers; household demographic factors such as age, gender, residency, livelihoods and wealth status of households or household heads; and other key household contextual factors.

The specific questions the research will address include:

1. How are land tenure security and credit behavior related? What are key demographic factors that influence variations in this relationship?

2. How does land tenure security shape household likelihood to engage in land rental markets? What are key demographic factors that influence variations in this relationship?

To provide rigorous data on the relationship between tenure security and these two development outcomes, the analysis draws on two large-scale, USAID-funded household surveys from impact evaluations in Zambia's Eastern Province. First, the paper relies primarily on a panel dataset of baseline and endline data from a randomized control trial evaluating the Tenure and Global Climate Change (TGCC) intervention in the Chipata district of Eastern Province. Second, the paper supplements this analysis with a cross-sectional baseline dataset that is formed from merging the TGCC baseline data from Chipata district with comprehensive household and village baseline data from a separate impact evaluation called the Community Forest Management (CFM) in Zambia's Eastern Province. These impact evaluations are focused on tenure security and local governance settings across five districts, and they provide a wealth of indicators that can be used to explore the linkages between credit and rental markets with tenure security measures as well as how they vary over the two study areas. As such, this paper contributes to the existing literature through providing a robust assessment of the relationship between tenure security and participation in credit and rental markets.

The paper is organized as follows. First, we describe the theoretical and empirical literature on the linkages between tenure security and credit seeking behavior and rental market engagement. Next, we present the key features of the rental and credit market context in Zambia. This overview integrates both the general state of credit and rental markets in Zambia using secondary data, along with an examination of primary data from the study on Eastern Province. Third, we discuss the data and methodological approach. The fourth and fifth sections describe the estimation results and discussion. The final section discusses policy recommendations and conclusions.

Literature Review/Conceptual framework

Land tenure security is variously understood in the literature as a continuum of specific property rights held by one or more people on a parcel of land or as the perception of security by landholders of their future ability to access and benefit from the land (Arnot et al., 2011, Persha & Huntington, 2016). Using the latter characterization – an assurance-based definition of tenure security – is thought to provide a more accurate measure of the rights and perceptions that researchers would like to measure together as 'tenure security' (Arnot et al., 2011; Sjaastad & Bromley, 2000; Smith, 2004).

Proponents of land tenure development and policy interventions argue that enhanced tenure security and property rights may lead to a number of positive social and economic outcomes. Commonly cited benefits as a result of secure and well-defined land rights include increased land-related investment, enhanced agricultural productivity, improved access to credit, and enhanced operation of land markets. (De Soto, 2000; Deininger & Feder, 2009; Feder et al., 1988; Sitko et al., 2014; Besley, 1995)

Tenure security and credit market participation

A fundamental link in the theory surrounding property rights and economic development is the assumption that formalized ownership rights improve the ability to use land as collateral for credit, thereby improving credit access among landholders to facilitate increased land investment (Besley, 1995; Feder, 1985; De Soto, 2000). Often referred to as the ‘credit access effect’, theorists argue that when land offered as collateral is secure and free from competing claims, lenders face less risk and are therefore more willing to make loans (Holden & Ghebru, 2016; Carter & Olinto, 2003; Field & Torero, 2006). Furthermore, financial institutions regularly cite the absence of land titles or formal land documentation as a constraint to issuing finance.¹ Public finance (which can be a sizeable portion of finance, especially for agriculture) in many countries is restricted to those with formal land rights.² Accordingly, it is widely believed that the widespread lack of formal ownership rights in the developing world and the inability of borrowers to offer secure land as collateral for loans is a critical barrier to credit access (Holden, 1997; Feder et al., 1988; Feder & Feeny, 1991).

There may be other benefits to land titling via reducing the risk for banks or institutions provided loans apart from using land as collateral, although discussion of such mechanisms are rarer in the literature. Formal banking may reduce the cost of lending by acting as screening device for potential borrowers (Petracco and Pender, 2009). Dower and Potamides (2010) explain that “having a formal land title can provide information about unobservable characteristics, such as an ability to interact within formal rules, the degree of integration into formal markets, business-minded characteristics or the condition of the asset” (p. 4). Field et al. (2004) also speculates that private sector banks who do not find it profitable to use land as collateral infer a lower risk of default from borrowers who possess a property title. The ELTAP/ELAP impact evaluation in Ethiopia found some evidence of improved access to credit, likely from informal or microfinance institutions, after land certification even though land cannot be used as collateral (Persha et al., 2017).

Other studies point out that contextual and demographic factors, not only tenure security, are vital to securing credit (Deininger and Feder, 2009); land size and/or asset wealth are particularly important factors (Feder et al., 1988). In their exploration of the impact of land titling in rural Thailand, Feder et al. (1988) find that land titling improved the amount of credit offered to farmers but that large-scale farmers with higher land values and more capital were more likely to use land as collateral than small-scale farmers. Using panel data from Paraguay to explore the impact of land titling on credit access, Carter and Olinto (2003) also find a credit supply effect among medium and large farms. They find no evidence of a credit supply effect among small farms (less than 15 hectares of land), further suggesting the relationship between

¹Multiple conversations with US and developing country financial institutions in Colombia, Brazil and other countries from 2012-2017.

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land titling and access to credit varies systematically with farm size, or possibly with wealth as demonstrated by farm size. Relatedly, Besley, Burchardi, and Ghatak (2012) test a theoretical model on a dataset from Sri Lanka to show that the benefits from improvements in property rights are concentrated amongst the wealthiest borrowers. They conclude that when credit markets are monopolistic and borrowers are poor, reforming property rights will have little impact on efficiency and rather lenders will gain at the expense of borrowers.

Indeed, current evidence suggests that the creditworthiness of prospective borrowers along with other transaction costs are crucial factors influencing credit access, regardless of land rights status and these issues are likely why some studies fail to find credit impacts as a result of land tenure reform (Lawry et al., 2014; see p. 42 of Dower and Potamites, 2010 for a list). Carter (1988) argues that credit markets tend to persistently exclude asset-impoorished households regardless of their legal ability to use land as collateral (Carter and Olinto, 2003). Others similarly argue that if borrowers are not bankable (i.e., their income is too low or land holdings too small), a land title alone will not improve access to credit (Sanjak, 2003; Boucher et al., 2008). Buckley, R.M. and J. Kalarickal (2004) found that even if a formal financial sector is functioning, very often many of those who live in informal housing are self-employed or work in the informal sector, with the result that it is difficult for them to show proof of income – a necessary condition to obtaining credit from formal financial institutions. The result is that in most of the developing world the collateral value of property title remains low.

Transaction costs also hinder access to credit and may lead to some of the null results in the literature (Field and Torero, 2006). Field and Torero (2006) elaborate on this point to explain why studies may not find a strong link between issuing titles and accessing credit for small producers:

“Use of titles to securitize loans may fail in impoverished settings because transaction costs involved – such as those associated with collateral processing, foreclosure and resale – are sizable compared with the average loan sought. Such costs are even higher when political or legal factors impede repossession of property (Deininger et al. 1993). Even when foreclosure is feasible, a high degree of mistrust often exists among lenders as to the validity of ownership documents, and the cost of verification may be prohibitively high even in the context of a formal property system. If poor households are ‘transactions-cost rationed’ in formal credit markets, the lower default risk brought about by collateral provision may be insufficient to facilitate access to loans. Indeed, past research has found the impact of rural titling programs on credit supply and investment demand to be strongly size-differentiated, rationing small producers out of the credit market even when they have titled collateral” (See Carter and Olinto, 1997).

There are important transaction and other costs for banks that limit their interest in providing credit apart from land ownership. If the cost of enforcing contracts is excessive in terms of time or money, banks are less likely to enter into a loan agreement with high-risk, low profit borrowers. The World Bank found that in Zambia, the site of this paper’s evaluations, the average claim took 611 days to resolve and cost 38.7% of the claim, and ranked Zambia 128 out of 190 countries for contract enforceability (The World Bank Group, 2017a). Buckley, R.M. and J. Kalarickal (2004) also discuss the problem of realizing the value of collateral in thin land rental

markets. The paper remarks that in sub-Saharan Africa the formal financial system is often not effective at realizing the value of collateral, which reduces the value of a title.

Tenure security and rental market participation

Functioning land rental markets have been posited to facilitate efficient allocation of land to the most productive user and to be an important means for smallholder farmers to obtain sufficient farm size to reach subsistence production, or conversely, for non-agricultural households to rent out land as an important part of their asset and investment strategy (Holden et al., 2009).

Some posit that secure land tenure is necessary for the efficient operation of land sale and rental markets (Feder et al., 1988). When land rights are insecure, landlords are reluctant to rent out land out of fear that their land may be taken away from them by tenants or other actors such as government officials (Yang, 1997; Holden and Yohannes, 2002). To mitigate the risk of expropriation of their land that is rented out, landlords may shy away from formal contracts or restrict renting to members of the same ethnic or social group (Holden et al., 2009; Swinnen et al., 2006). Vranken and Swinnen (2006) argue that secure property rights in land rental transactions require the transparency and enforceability of rental agreements, and the presence of reliable conflict resolution mechanisms. Deininger et al. (2009; 2011) further suggest that formal documentation of ownership rights can mitigate fears among landowners that land rented out will be lost and lower enforcement costs in cases of dispute, thereby removing the perceived risk of engaging in transactions and encouraging more rental transactions to take place. A study in the Dominican Republic replicates these results and shows that insecure property rights constrain land rental market activity by limiting the possible tenants to people within the landlord's narrow circle of confidence (Macours et al., 2004).

Evidence of positive impacts of land titling on household participation in land rental markets is fairly robust. In Tigray, Ethiopia, land certification contributed to higher levels of land rental market participation, especially among female-headed households (Holden, Deininger, and Ghebru, 2008). Evidence from Vietnam suggests that land registration secured long-term use rights and increased the tendency of households to rent out land to nonrelatives, though not the propensity to rent out land to relatives (Deininger and Jin, 2008). Deininger, Zegarra, and Lavadenz (2003) find that producers with a land title in Nicaragua were significantly more likely to rent out land. In the Dominican Republic, Macours et al. (2004) find that improved tenure security could significantly increase the total area of land rented to the poor and lead to efficiency and equity gains.

However, similar to the evidence on credit access, studies finding a positive relationship between tenure security and household participation in land rental markets point to the significance of household demographic factors affecting whether and for whom a rental response occurs. In their study examining the current status of rural land rental market participation by smallholder farmers and subsequent welfare impacts in Zambia, Chamberlin and Ricker-Gilbert (2016) see evidence that land rental market activity is associated with higher rural population densities. They therefore posit growth in land rental markets may be fueled by perceptions of land unavailability, which are higher in Zambia's higher population density areas. Additionally, Deininger and Jin (2008) use evidence from Ethiopia to argue that under certain

conditions land market participation may be systematically easier for wealthier, land-rich households, and therefore land markets may actually have a regressive impact on equity and efficiency outcomes.

On the other hand, Lunduka, Holden and Oygard (2009) finds that emerging land rental markets, and not only markets in high-density areas, are able to redistribute land from land rich to land poor households. Households with larger land endowments were more likely to rent out land, and households with smaller land endowment were more likely to rent in land. Also, according to their proxy for tenure security, less tenure secure households rent in land more frequently, perhaps has a response to their insecurity, though the inverse does not appear to be true. Finally, existing research on key characteristics of households engaging in land rental markets suggests it is extremely rare for a household to rent land in and out, indicating that tenants and landlords are two distinct groups of households.

Gendered characteristics of individuals and villages also impact tenure security and rental markets (Lunduka et al., 2009). Lunduka et al. (2009) use cross-section data to examine how the inheritance system in Malawi provides differing tenure security to individuals in a household depending on where they reside and whether or not the person brought land into their marriage. The study finds that households in patrilineal areas, where men have full land rights, are more likely to rent out land, and rent out larger areas of land, than households in matrilineal areas. This result is likely because in matrilineal areas men work on the family land of their spouses and so have less tenure security and are not the primary decision maker about inherited land, which likely reduces their incentive to participate in the land rental market. Consequently, Lunduka et al. (2009) stresses the importance of matrilineal versus patrilineal contexts and shows that spouses who do not relocate after marriage are more likely to engage in rental markets. Using results from a land certification system in Ethiopia, Holden, Deininger, and Ghebru (2009) find that certification increases female household head participation in the land rental market as landlords, while Chamberlin and Ricker-Gilbert (2016) find in Malawi and Tanzania that female headed households are more often landlords than tenants; these results indicate that women may need more labor than they have available and that there are gendered effects of increased tenure security.

Studies of credit and rental markets that includes direct measures of perceived tenure security have not been published to date. Most studies rely on certificate distribution and assume it improves perceptions of tenure security. Dower and Potamites (2005) use instrumental variables to proxy for tenure security. Lunduka et al. (2009) proxy for tenure security by utilizing matrilineal versus patrilineal family structure and spouse movement, as described above.³ While retaining indicators of marriage movement practices and inheritance practices, this paper also includes direct perception indicators of tenure security and credit market outcomes.

³In Malawi, as in Zambia, land may be inherited through either matrilineal or patrilineal systems, depending on the household tribe. Often in matrilineal systems, the husband will move to his wife's village and farm her family land (matrilocal), and in patrilineal systems, the wife will move to her husband's village and farm his family land (patrilocal). Note that even in matrilineal systems in Zambia, land often is allocated to men, not women--for example, to a nephew of the deceased.

As described above, overall, the empirical evidence supporting the notion that improved tenure security may increase access to credit and enhance participation in land rental markets is mixed although it is often unclear whether credit was constrained by land versus other environmental factors (Higgins et al., 2017). A recent systematic review conducted by IFAD of rigorous empirical research on the effects of titling found that of the six qualifying studies that attempt to measure this outcome, four found no effect of the titling intervention on credit access and two found a positive effect. Similarly, the same systematic review also found mixed evidence on the effect of titling on rental market participation, as two studies found a positive effect and one found no effect (Higgins et al., 2017).

Our study represents an important contribution to the literature through the use of panel data, including a randomized control trial that alleviates endogeneity concerns in the relationship between tenure security and credit or rental market participation; the inclusion of a more direct and robust set of tenure security indicators than have previously been available; and the ability to consider the relative effects of household and locational factors. It speaks directly to the work of Chamberlin and Ricker-Gilbert (2016) and Lunduka et al. (2009) and advances our understanding of the function and role of rental markets in lower population density countries such as in Zambia.

Contextual Background: distinguishing features of Zambian credit and land tenure

The extent to which tenure security influences livelihoods in relation to engagement in credit and land rental markets depends on country-specific political and contextual factors shaping characteristics of land and credit markets and systems of land tenure. In terms of access to credit in Zambia, the World Bank Group's 2016 assessment of Zambia's financial inclusion found that 40% of Zambians have a formal account of any type in a bank, microfinance institution, or e-money agent. These numbers are lower for women and for those in rural areas. Only 36% of rural Zambians and 37% of women are financially included, and only 26% of the population have taken formal loans (International Bank for Reconstruction and Development/The World Bank Group, 2017b). Despite the low prevalence of formal banking, 82% of adults have debts, primarily from informal instruments. The rural poor comprise those who most often have informal debt (The World Bank Group, 2017b).

Without access to formal loans – and often without collateral, proof of income, or the financial literacy necessary to secure a formal loan if banking was available (Buckley, R.M. and J. Kalarickal, 2004) – households take loans from friends, neighbors, and loan sharks to smooth consumption. Agribusinesses are an important source of agricultural loans, and smallholder cotton, tobacco, and sugarcane production benefit from outgrower support in which inputs are provided on credit (The World Bank Group, 2009). However, poor credit recovery is a threat to the success of these programs. In 2009, Dunavent cotton, a major company with 200,000 outgrowers, reports credit recovery rates under 70% and have questioned their investment in Zambia. Major tobacco companies have expressed similar concerns, and in some cases, ceased operations (The World Bank Group, 2009).

Some institutions have credited loan products targeted to the rural poor. The microfinance

institute FINCA as an example offers three loan products to its customer base, which is primarily comprised of low-income households in urban, peri-urban, and rural areas, including Chipata district. Its “Village Bank” product allows households to form groups between 3-10 people to borrow between K1,500-K15,000 (\$150-\$1,500) for a business. This product does not require collateral nor any formal business documentation – it only requires the business to have been in operation for six months. The group guarantees the loan, and FINCA will travel to the village to meet with the group and provide guidance and financial training. For other, larger business loans, FINCA collateral options include livestock, vehicles, business assets, and moveable property – but not customary land (FINCA, n.d.).

Access to credit is interrelated with land tenure laws that govern rental market activities. A key feature of Zambian land tenure is the coexistence of statutory and customary laws that govern village and forest land. Private ownership of land was abolished after independence and all land was vested to the President through the Lands Act of 1975 (Adams and Turner, 2006). In 1995, a new Lands Act introduced the privatization of land in Zambia in hopes of attracting investors, and the Act divides land in Zambia into state land and customary land. State land comprises between 6-10% of land (Spichiger and Kabala, 2014), and can be leased on 14 year or 99 year leases to private citizens, residents, or investors (GRZ, 1995). State land is located primarily in Lusaka province, where the capital is located, in the industrial Copperbelt province, adjacent to the railway, and various state forests and game management areas.

The remaining non-state land is customary land, which is held by chiefs and headman on behalf of communities. These customary leaders are responsible for land administration, including the allocation of land and resolution of land related conflicts (Brown 2005: 98). There is no private ownership of customary land, and the Zambian laws regarding the management of State land do not apply to customary land. Instead, in deference to traditional and cultural practices, customary law governs customary areas; this is not a unified body of law, but a mixture of laws and traditions that varies greatly among Zambia’s seventy-three tribes (Spichiger and Kabala, 2014).

Under customary law, which applies to all households involved in the CFP and TGCC impact evaluations from which we draw this data, chiefs act as trustees of the land and grant occupancy and use rights as they see fit. Chiefs and headmen allocate land to households but also have the right to take it away (Alden Wily 2003, 2). Chiefs also have the power to reallocate land away from villages and informally lease it to investors, often without any input or payment to the households who will be displaced; however, the chief’s ability to more formally convert customary land to state land (so as to then formally lease the land based on the chief’s private title) is disputed (Metcalf 2006: 8). Since households do not own their land, it is difficult to use their land for collateral when accessing credit. Household’s ability to lease land in or out is also limited, since it often requires permission from the headman or the chief, depending on the rules in a particular village, and in some villages the practice is banned altogether. These household leases of customary land are different than the formal 14- or 99-year leases of state land and are not bound by the lease conditions expounded in the 1995 Lands Act. Customary land leases are bound only to the informal and varying restrictions determined by customary leadership, often deals where investors provide goods in exchange for use of land.

Forestland, also prevalent in the study sites, is similarly governed through dual customary and state channels. The majority of forested land in Zambia is customary land, managed by the chiefs and headmen. The rights to all wildlife, trees, and forest produce, including those on customary lands, lie with the President (GRZ 2015a, 2015b, 2016). Other forests in Zambia are located on state land in state reserves classified as National Forests or Local Forests, and are governed by the Forestry Department of the Ministry of Lands, Natural Resources and Environmental Protection (GRZ 2015a, 2015b, 2016).

Data for the Impact Evaluations

Data for this paper comes from two Zambian household surveys, each associated with a separate USAID funded impact evaluation. The first is the baseline household data associated with the Community Forestry Project (CFP) impact evaluation. Data from 4343 households was collected from March 2015 to May 2015, in the Nyimba, Mambwe and Lundazi districts of Zambia's Eastern Province. The CFP evaluation focused on understanding climate change mitigation and the drivers of degradation and deforestation in the study area. It investigated whether CFP built the capacity of communities and local institutions to manage their forests sustainably and to reduce emissions.

The second set of data is from the baseline and endline household data collection of the Tenure and Global Climate Change (TGCC) randomized control trial. This survey contains a panel dataset of 3525 households, with baseline data collected from June 2014 through August 2014 and endline data collected from June 2017 through August 2017 in the Chipata district of Zambia's Eastern Province. The project supports USAID development objectives of improved resource governance, reduced rural poverty through improved agricultural productivity of smallholders, improved natural resource management, and improved resilience of vulnerable households. It was comprised of two interventions:

Land Tenure: A chieftain- and village-level land tenure intervention. The chiefdom-level activities aimed to increase transparency of land allocation, administration, and decision processes and to strengthen smallholder rights to land and trees through dialogues, administrative support, mapping and documenting customary rules. The village-level activities consisted of establishing Village Land Committees (VLCs), conducting participatory mapping, dispute resolution and facilitating the issuance of customary land certificates. The Chipata District Land Alliance (CDLA), a community-based organization, implemented this intervention.

Agroforestry: Through the agroforestry intervention, an extension agent provides support related to planting and establishment of Musangu (*Faidherbia albida*) trees and/or *Gliricidia* on cropland. Activities consisted of establishing Farmer Groups in treatment villages, establishing nurseries and distributing seedlings, and providing training and agricultural extension support services about agroforestry to farmer groups. The NGO Community Markets for Conservation (COMACO) implemented this intervention.

The primary objective of the TGCC impact evaluation was to determine whether and how village and household tenure interventions strengthen smallholder tenure security and resource rights and, in turn, lead to increasing farmer investment in sustainable agroforestry and adoption of CSA practices.

The two interventions share some broad similarities. The TGCC districts and three CFP districts fall in the same ecological zone, and resemble each other geographically. Households employ the same farming methods to grow the region's primary crops of maize, cotton, tobacco, and vegetables on similar sized fields. All villages are small, lead by a headman, and households have similar ages, level of education, and religion. The tribal makeup of each district varies slightly – The patrilineal Ngoni tribe makes up 61% of the TGCC sample, while the matriarchal Nsenga tribe is more common in the CFP sample. However, a single tribe does not dominate any district, and members of the major tribes of Eastern province can be found throughout all districts. Similarly, households in all districts speak Chinyanja or a closely related dialect of Chinyanja.

Characteristics differ by intervention. The CFP intervention was more remote. Villages in the CFP sample, particularly those in Southern Lundazi, are more isolated, and some cannot be reached except by canoe in the rainy season. Land is more abundant than in the TGCC sample. Additionally, CFP villages are located near national forests, game management areas, and national parks, and are more likely to have off-farm sources of income related to either the tourism or game management while the TGCC intervention worked in villages within 45 kilometers of Chipata City, a major periurban area. The CFP villages include more Chewa men relocating from more land-constrained chiefdoms in Katete to forested areas near the Luangwa valley, according to the implementer. While 67% of TGCC household heads were born where they currently live, only 45% of CFP were. The most common reason for moving in the CFP dataset was for better land (33% of those that moved). There are more matrilineal practices in the TGCC intervention area. For more information on background characteristics of each intervention, as well as balance tables and other supporting information for the TGCC RCT, please see the CFP Baseline Report (USAID, 2016) and the TGCC Endline Report (USAID, 2018).

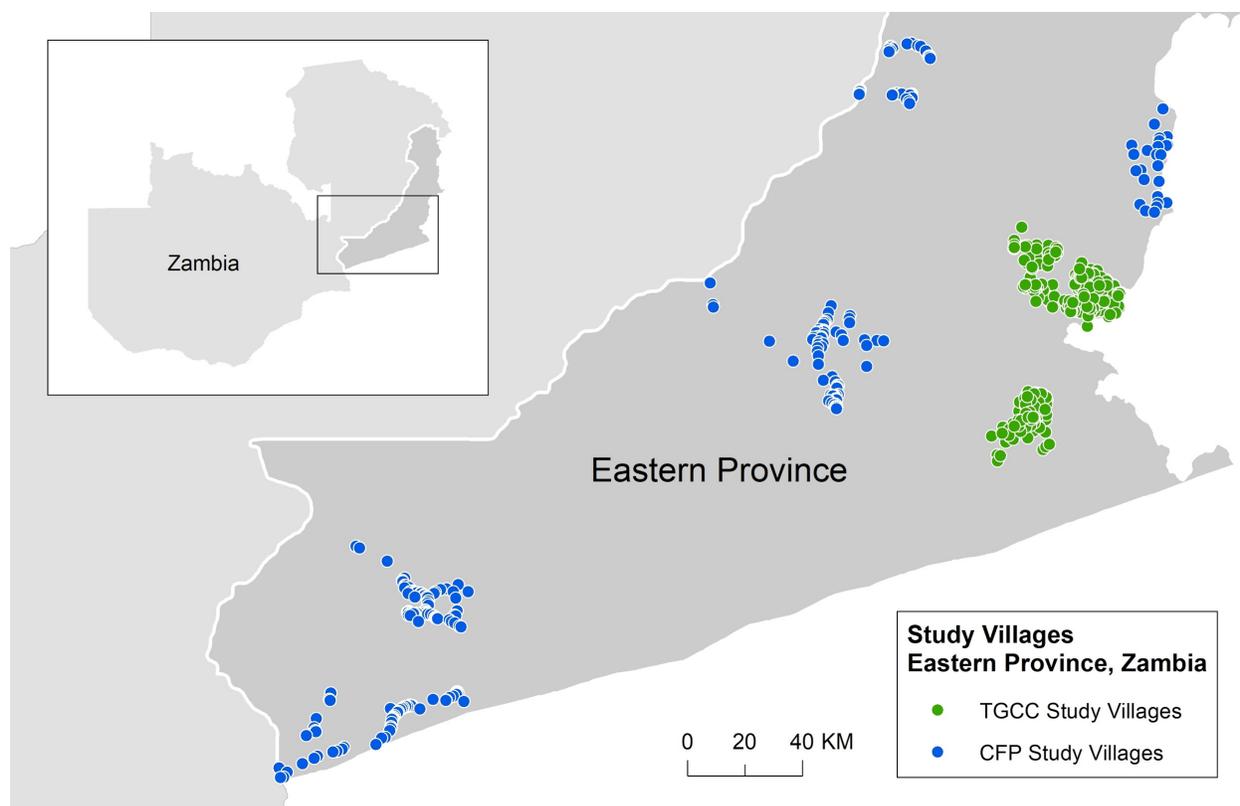


Figure 1— Map of TGCC and CFP Sites

Altogether the two impact evaluations yield a total sample size of 7716 households for the cross sectional analysis that combines the baseline CFP and TGCC household datasets.

Formal land renting is defined as land rental activity where money or anything in-kind is exchanged. Informal land renting covers cases where a household is only borrowing land (in or out), without expectation of any kind of payment. While this is certainly not the same as land rental, some research indicates that land borrowing can act as a form of informal insurance against negative shocks (Bene, Devereux, and Sabates-Wheeler, 2012).

Methods

Empirical Models

We run two types of models: the first correlates descriptive characteristics with the main outcomes of interest. The second reports the results of the randomized control trial by including each of the three treatment variables, controlling for the outcome at baseline. Both models include chiefdom fixed effects and cluster the standard errors at the village level. For our models, we use logit models to capture our binary outcomes and to offer relatively easy interpretation of the coefficients as odds ratios. As a robustness check, we also run ordered logit models. Results are similar to the model results below and are available upon request.

Independent Variables

The three main outcomes are: whether or not the household head reported taking out a loan, renting or borrowing land in on any field and renting or borrowing land out on any field. The borrowing and renting categories are combined due to the rare nature of renting alone and because both capture the idea of working on someone's land or letting someone else work on one's land. It would be possible to use the number of fields or hectares rented in or rented out instead of binary outcomes, but we are unsure of the veracity of specific numerical estimates so we prefer the binary outcome.

Dependent Variables

Apart from the treatment conditions and chiefdom-level fixed effects, for the descriptive models we utilize the dependent variables listed below. This paper is the only paper on rental and credit market outcomes in sub-Saharan Africa to our knowledge that uses a direct measure of the perception of tenure security, rather than certification or other proxies. The rest of these variables for the most part follow those used elsewhere in the literature, especially Chamberlin and Ricker-Gilbert (2016). We follow findings of Lunduka et al. (2009) that matrilineal and patrilineal context is important to consider, possibly more so than matrilineal and patrilineal tribes, for rental market outcomes. (Substantially similar results that also include matrilineal and patrilineal variables available upon request). We also posited that the existence of conflict/disputes might be reduce the likelihood of renting/borrowing out. The TGCC intervention considers it a possibility that conflicts increase in the short-term as old disputes are reopened and negotiated during the boundary demarcation process.⁴ The final list of included variables are:

- An asset index comprised of livestock owned (cattle, chicken, goats, pigs) as well as durable assets (phone, radio, TV, car, bike, stove, pump, solar panel, pickaxe, ox-drawn plough, ripper, knapsack sprayer, ox cart, wheelbarrow)
- Land area owned in logged hectares
- Distance to the nearest bank in logged hectares
- Perception of tenure security index (index of the threat of perceived expropriation in the present and future from chiefs, headmen, elites, neighboring villages, other households, and family members)
- Binary variable for a dispute existing on any field owned by the household
- Proportion of the household head unrelated to the headperson. (This variable serves as a rough approximation for potentially not being local to town - aka being a stranger - or being less likely to receive favors due to being unrelated to the headperson. Villages are sometimes founded by the headperson and their family members.)
- Matrilineal move - spouse moves to the wife's home village
- Patrilineal move - spouse moves to the husband's home village
- Age of Household Head
- Highest Level of Education of Household Head

⁴ Rarely studied explicitly, Fitzer and Marden (2017) use data from the Brazilian Amazon to violence as an outcome of weak tenure security. Alston, Libecap, and Mueller (2000) analyze conflict and land reform there as well. Fenske (2014) considers conflict due to commercialization in Benin.

Descriptive Findings

The following section presents the key features of the rental and credit market context through an examination of primary data from the CFP and TGCC study areas in Eastern Province.

Credit Market Descriptive Findings

Previous studies on the relationship between tenure security and credit uptake specific to Zambia are scant. Nevertheless, our primary data align with previous descriptive findings and provide additional contextual information. Our data indicate it is uncommon for households to obtain credit in the CFP study area, where only 2% (92, out of 4342 respondents) of households reported taking out a formal loan in the past year. Obtaining credit was more commonly reported in the TGCC study area, where approximately 4% (171, out of 3525 respondents) of households reported taking out a formal loan in the past year. Only 1% or less in either study area reported providing documentation of land rights to secure a formal loan (Table 1). Reported documentations at baseline is likely from people who asked their chief for documentation for a specific purpose, such as a headman or headwoman who wants to establish a new village.

Table 1—Household Credit Activity in Zambia

	CFP		TGCC Baseline		TGCC Endline	
	%	#	%	#	%	#
Percentage of sample that...						
...applied for a loan (formal or informal)	-	-	-	-	5	184
...took out a formal loan in the past year	2	92	4	171	2	67
...took out an informal loan in the past year	-	-	-	-	2	57
...provided documentation of rights to secure loan	0	13	1	31	1	34
Total HH sample size	4342		3525		3403	

The profile of people taking a loan seems similar in TGCC and CFP. The percentage of formal loans is slightly lower than the 4.7-5.1% found in Eastern province by the WBG Financial Capability Survey 2016. The rates of informal loans are far lower than the 54.3-61.7% reported by the same survey (The World Bank Group, 2017b). These differences may be due to sampling strategy, as it is unclear what proportion of these loans comes from urban sources. It is also likely they are capturing different definitions of loans; the Rural Agricultural Livelihoods Survey (RALS) 2015 survey finds a 35% rate of informal loans in Eastern province from outgrower schemes. This survey does not include outgrower schemes, and is closer to the 6% rate found by the RALS 2015 for informal savings and loans societies (IAPRI, 2015). In both study areas in Zambia, obtaining credit was more commonly reported among wealthy households than among poor households (Table 2). Across the TGCC and CFP study areas, households who took out a loan score significantly higher on the asset index, where a one unit increase in the asset index increases the odds of having taken a loan by a factor of 1.2 ($p < 0.05$). These findings align with the study of Deininger et al. (2000) that found that asset and livestock ownership is correlated

with access to credit.⁵ Age reduced the odds of having taken out a loan in the TGCC study area by 0.9 ($p < 0.1$). Results are similar in the CFP area but not statistically significant. Possibly those who are elderly are less familiar with formal credit.⁶ Taking out a loan is associated with increased odds of a conflict on the land, by a factor of 1.78 ($p < 0.01$). Again, results are similar for CFP but not significant. It is not clear what drives this result, but it might be that higher-value property is most likely to be under dispute since more parties will be interested in the property. That the more land-constrained TGCC is seeing this problem might indicate that higher-valued properties are more likely to have disputes and more likely to be associated with wealthier people who are more able to take out a loan.

⁵ Deininger and Olinto (2000) find a relationship between cattle ownership and access to credit, which is in line with these results as cattle ownership is an important component of this asset index. They explain that draught animals may serve as collateral in credit transactions; cattle also increases the ability to cultivate land and helps smooth climate vulnerability across seasons.

⁶ In alternative specifications, female-headed households were disadvantaged with respect to credit access. These results were not robust to changes in variables included.

Table 2—Household Characteristics in Zambia

	CFP	TGCC Baseline	Both
	HH Took Loan ⁷		
Household wealth			
Asset index - higher is wealthier	1.303*	1.161*	1.197**
	(0.197)	(0.0999)	(0.090)
Household settlement and land			
Land area owned (logged hectares)	1.252	1.040	1.101
	(0.331)	(0.238)	(0.191)
Distance to nearest bank (logged hectares)	1.418	0.962	1.045
	(0.349)	(0.123)	(0.121)
Perception of tenure security index - higher is more secure	1.043	1.021	1.031
	(0.0796)	(0.0727)	(0.055)
Dispute on any field (yes or no)	1.759	1.783***	1.763***
	(0.726)	(0.353)	(0.311)
Household relationships			
Proportion of HH head unrelated to headperson	1.588	0.977	1.157
	(0.504)	(0.280)	(0.246)
Matrilocal move - spouse moves to wife's home village	1.163	1.913	1.579
	(0.595)	(0.808)	(0.517)
Patrilocal move - spouse moves to husband's home village	0.558	1.219	0.916
	(0.281)	(0.333)	(0.231)
Household demographics			
Mean head age	0.995	0.990*	0.991*
	(0.00821)	(0.00525)	(0.004)
Highest level of HH education	1.048	1.023	1.032
	(0.0390)	(0.0273)	(0.022)

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

Rental market descriptive findings

Our primary data indicate that rates of renting/borrowing in as well as renting/borrowing out are low. Five percent of CFP and 7% of TGCC households reported renting in one or more fields. Rates for borrowing in were similar although slightly lower at 4% for CFP and 4-7% of TGCC (depending on endline versus baseline figures). An even lower percentage reported renting out land, at 1-3% depending on the survey, with 2-5% rates of borrowing out. Across both study areas, a higher percentage of households that report renting in land compared to the percentage of households that reporting renting out land indicates that households are

⁷ Note that the CFP and TGCC baseline datasets ask about formal loans and not informal loans, while the TGCC endline asks about both. There is some possibility that this definitional difference would bias the amount of loans in TGCC upward. However loan rates are similar and there is no statistically significant increase in loans over time so this is unlikely. It is more likely that at baseline respondents did not make sharp distinctions between formal and informal loans when responding.

more likely to participate in land rental markets as tenants than as landlords. It also suggests that households rent out land to more than one tenant. These results are consistent or slightly higher than other empirical studies from Zambia and elsewhere within the region, which often have rates of renting in/out in the 1-3% range (e.g., RALS 2015, the studies in Holden et al. 2009; and Jin and Jayne, 2013).

Table 3—Land Rental in Zambia

	CFP		TGCC Baseline		TGCC Endline	
	%	#	%	#	%	#
Sample that ...						
Rents land IN	5	211	7	242	7	294
Rents land OUT	~1	22	3	96	2	81
Borrows land IN	4	171	7	230	4	153
Borrows land OUT	2	75	5	187	4	144
Engages in any land rental activity	5	226	9	333	10	366
Rents in and rents out simultaneously	0	7	0	5	0	9
Engages in any land borrowing activity	5	241	11	409	8	287
With paper documentation for at least one field (often provided by chiefs or headmen to founders of new villages)	2	106	1	44	28	9562
Total HH sample size	4342		3525		3403	

Similar to the existing research on key characteristics of households that engage in land rental markets (Chamberlin and Ricker-Gilbert, 2016) the CFP and TGCC data suggest that almost no households (<1%) both rent/borrow land in and rent/borrow land out, indicating that tenants and landlords are primarily two distinct groups of households with distinct characteristics.

The logit regressions in Table 4, 5 and 6 explore the relationship between baseline characteristics of households and the likelihood of renting/borrowing in or renting/borrowing out. In both CFP and TGCC datasets, larger land holdings are associated with more renting/borrowing out; an increase of one logged-hectare in land owned is associated with an increase in the odds of renting/borrowing out by a factor of 2.42 ($p<0.01$) in CFP and 2.14 ($p<0.01$) in TGCC. Inversely in the TGCC data, those with smaller land holdings are more likely to report renting/borrowing in; a logged hectare increase in land holdings is associated with reduced odds of renting/borrowing in by a factor of 0.48 ($p<0.01$). The trend is the same in the CFP data, but not statistically significant alone. The trends are significant in combination across the CFP and TGCC datasets, where an increase of one logged-hectare in land owned is associated with an increase in the odds of renting/borrowing out by a factor of 2.25 ($p<0.01$) and with a reduction in the odds of renting/borrowing in by a factor of 0.62 ($p<0.01$). That the relationship between land ownership and borrowing in is less strong in CFP districts accords with the overall lower levels of borrowing in/less land constrained nature of those districts. The overall relationship is intuitive--those with more land are more likely to need help with tasks like weeding and harvesting, while those with less land are more likely to need to work other land to fully utilize their time and increase their food intake.

Older household heads are also more likely to report renting/borrowing out; a one year increase in the age of the household head is associated with a 1.01 increase in the odds of renting/borrowing out ($p < 0.05$) in the TGCC data, an increase of 1.02 in the CFP data ($p < 0.01$) and an increase of 1.01 ($p < 0.01$) overall. Younger household heads are more likely to report renting/borrowing in; a one year increase in the age of the household head is associated with a reduction by 0.98 in the odds of a household renting/borrowing in ($p < 0.01$) using the TGCC data; the trend is similar in CFP and overall is 0.98 ($p < 0.01$). These results likely indicate that the more elderly may need help farming, which the young can provide. Younger respondents may also consider themselves to be borrowing in land if they work their parents' land. Older household heads on the other hand have had more time to inherit or acquire land.

Education rates trend mostly similarly across the two datasets. In the TGCC dataset, a one year increase in education increases the odds of borrowing/renting in by 1.04 ($p < 0.1$) and, while not statistically significant, decreases the odds of borrowing/renting out by 0.98. In the CFP dataset, a one year increase in education similarly, and significantly, decreases the odds of borrowing/renting out by 0.94 ($p < 0.1$). Note that the trend is the opposite for CFP where education is inversely related to renting/borrowing out. Since the TGCC areas are more established and closer to urban centers, it is likely that younger households are both more likely to be educated and to borrow/rent in. That trend is likely less strong in the more isolated and migrant-based CFP areas. It trends similarly to the TGCC dataset across both datasets but is not statistically significant.

In both samples, wealthier households are more likely to rent/borrow in as well as rent/borrow out. In the CFP data these trends are not statistically significant but in the TGCC data, a one unit increase in the asset index is associated with a 1.46 increase in the odds of renting/borrowing in ($p < 0.01$) and across both it's an increase of 1.27 ($p < 0.01$). It's associated with an 1.17 increase in the TGCC dataset ($p < 0.05$) and a 1.17 increase in the overall dataset ($p < 0.05$) in the odds of renting/borrowing out ($p < 0.05$). The renting/borrowing in relationship with wealth accords with the literature discussed in prior sections that explained that since households who rent/borrow in land need to be able to pay for both the rental fee and the inputs and labor necessary to farm additional plots, they often have more wealth. The renting/borrowing out relationship with wealth also accords with the oft-seen correlation between wealth and landownership.

The data also speak to inheritance patterns in rental behavior. Across both datasets and also in the CFP data, spouses that followed a matrilineal move at marriage increase the odds of borrowing/renting in (by 1.32 overall $p < 0.05$ and by 2.17 in CFP $p < 0.01$), and the odds of borrowing/renting out (by 1.57 overall $p < 0.1$). While the renting/borrowing in behavior accords with the literature on men using their in-laws' land upon a matrilineal marriage, the renting/borrowing out finding is more surprising. One explanation might be that the matrilineal Chewa tribe, where much of the matrilineal marriages occur, engages in higher renting/borrowing in behavior overall. Another might be that the geographic location of the Chewa tribe leads to more borrowing/renting behavior overall. The Chewas in the TGCC dataset tend to live in more land constrained areas such as Katete, and the higher land value might make it more advantageous to rent/borrow out land. Many Chewas in the CFP dataset

are migrants and it is unclear whether they are responding about land in their ancestral homeland or their current location.

It may also be that a spouse moving to another village, rather than inheritance *per se*, changes rental behavior. In the CFP data, a patrilocal move and not only a matrilineal one is associated with increased odds of borrowing/renting in land (by 1.88, $p < 0.01$) and results are similar although weaker overall (odds increase by 1.3, $p < 0.1$). It may be that people who move to a new village are more entrepreneurial, or less likely to have their own land and so must borrow/rent in. Some consistent evidence comes from the increased odds of borrowing/renting in overall (by 1.27, $p < 0.05$) and in CFP (by 1.5, $p < 0.01$) if one is unrelated to the village headperson. Relations with the headperson is a proxy (although not a perfect one) for being native to the village and so this descriptive finding can be interpreted as being more likely to borrow/rent land if one is a stranger to the village.

A household that is borrowing/renting in land is also statistically significantly associated with increased odds of having a dispute on a field owned by the household (by a factor of 1.32 overall, $p < 0.1$ and 1.28 in TGCC ($p < 0.1$)). This finding suggests that disputes, perhaps inheritance complications, makes it more difficult to cultivate a farm one claims to own and instead drives farmers to cultivate land owned by others. Interestingly, in CFP alone a dispute increases the odds of borrowing/renting out by 2.25 ($p < 0.1$) although the trend is similar in TGCC. In CFP, a dispute might signal high value property worth renting out, but the reason this differs between CFP and TGCC is unclear. These results are less precise and so the inconsistent results may also be due to noise in the data.

The findings on distance to the nearest bank also differ between TGCC and CFP. In TGCC, being one logged hectare further away from a bank reduces the odds of borrowing/renting *in* by 0.87 ($p < 0.1$) while in CFP, it reduces the odds of borrowing/renting *out* by 0.67 ($p < 0.1$). However, neither result is significant across both datasets. Given that these results are not precise, they may also be due to noisy data.

The tenure security index is not significant at baseline. This result is unsurprising given that at baseline almost nobody held certificates and the interventions had not yet started. Tenure security was generally high, with ~80% expressing little fear of encroachment. Of the people who might take land, respondents most often expressed concerns about chiefs.

Many of these descriptive findings accord with those in the literature. Particularly, Chamberlin and Ricker-Gilbert (2016) also find that in Zambia and Malawi tenant households tended to have larger labor endowments and were more educated than landlord households. The authors also find, similar to the data provided here, that households with larger landholdings were more likely to rent out land and less likely to rent in land.

Table 4—Household Characteristics and Land Rental in Zambia: TGCC baseline

	TGCC Baseline	
	HH rents/ borrows in	HH rents/ borrows out
Household wealth		
Asset index - higher is wealthier	1.460*** (0.108)	1.170** (0.0876)
Household settlement and land		
Land area owned (logged hectares)	0.480*** (0.0756)	2.138*** (0.461)
Distance to nearest bank (logged hectares)	0.876* (0.0655)	1.125 (0.105)
Perception of tenure security index - higher is more secure	1.036 (0.0381)	1.011 (0.0491)
Dispute on any field (yes or no)	1.278* (0.188)	1.155 (0.206)
Household relationships		
Proportion of HH head unrelated to headperson	1.051 (0.177)	0.781 (0.150)
Matrilocal move - spouse moves to wife's home village	1.345 (0.391)	1.677 (0.570)
Patrilocal move - spouse moves to husband's home village	1.031 (0.222)	1.149 (0.259)
Household demographics		
Age of Household Head	0.972*** (0.00386)	1.011** (0.00467)
Highest Level of Education of Household Head	1.041* (0.0243)	0.979 (0.0229)

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

Table 5—Household Characteristics and Land Rental in Zambia: CFP Baseline

	CFP baseline	
	HH rents/ borrows in	HH rents/ borrows out
Household wealth		
Asset index - higher is wealthier	1.066 (0.0865)	1.186 (0.221)
Household settlement and land		
Land area owned (logged hectares)	0.795 (0.131)	2.416*** (0.577)
Distance to nearest bank (logged hectares)	1.003 (0.115)	0.668* (0.156)
Perception of tenure security index - higher is more secure	1.029 (0.0360)	0.977 (0.0771)
Dispute on any field (yes or no)	1.445 (0.344)	2.252* (0.994)
Household relationships		
Proportion of HH head unrelated to headperson	1.553*** (0.261)	0.913 (0.312)
Matrilocal move - spouse moves to wife's home village	2.166*** (0.563)	1.320 (0.617)
Patrilocal move - spouse moves to husband's home village	1.875*** (0.436)	1.092 (0.450)
Household demographics		
Age of Household Head	0.992 (0.00561)	1.025*** (0.00823)
Highest Level of Education of Household Head	0.982 (0.0200)	0.938* (0.0348)

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

Table 6—Household Characteristics and Land Rental in Zambia: CFP and TGCC baseline combined

	CFP and TGCC baseline combined	
	HH rents/ borrows in	HH rents/ borrows out
Household wealth		
Asset index - higher is wealthier	1.272*** (0.0646)	1.167** (0.0807)
Household settlement and land		
Land area owned (logged hectares)	0.619*** (0.0714)	2.253*** (0.376)
Distance to nearest bank (logged hectares)	0.904 (0.0557)	1.040 (0.0901)
Perception of tenure security index - higher is more secure	1.038 (0.0262)	0.998 (0.0414)
Dispute on any field (yes or no)	1.324** (0.161)	1.268 (0.214)
Household relationships		
Proportion of HH head unrelated to headperson	1.268** (0.151)	0.824 (0.138)
Matrilocal move - spouse moves to wife's home village	1.620*** (0.303)	1.570* (0.426)
Patrilocal move - spouse moves to husband's home village	1.300* (0.207)	1.147 (0.227)
Household demographics		
Age of Household Head	0.981*** (0.00358)	1.015*** (0.00402)
Highest Level of Education of Household Head	1.009 (0.0154)	0.969 (0.0194)

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

Results - TGCC Panel Models

Tables 7, 8, and 9 below describe the results from the TGCC Land Tenure and Agroforestry interventions. Unlike the descriptive associations above, these results are based on a rigorous randomized control trial and so it is likely that any relationships are causal and truly reflect the interventions' impact on outcomes.

As shown in Table 7, the TGCC treatments were not statistically significantly related to taking out a loan—although it might be hard to catch the effect of the treatment since this is relatively rare. According to Appendix Table 13 there is an upward trend in taking out loans in the Land Tenure intervention over time, even if numbers are small.

All of the TGCC treatments significantly increased borrowing/renting in land. Each treatment has similar effects. The odds of borrowing/renting in are 1.67 times more likely for those in the

Agroforestry treatment, compared to those in the control ($p < 0.05$). Similarly, the odds of borrowing/renting in are 1.67 times more likely for those in the Land Tenure treatment compared to in the control ($p < 0.05$). The effect of both interventions as compared to the control increases the odds of renting in by 1.52 times ($p < 0.1$). See Table 8 below.

According to Table 9, the TGCC treatments were not statistically significantly related to renting or borrowing out. From the descriptive statistics in Appendix Table 13, borrowing out decreased in the control but decreased even more in the tenure treatment.

Unsurprisingly, each outcome at baseline is highly related to the outcome at endline. For example, renting/borrowing in at baseline increases the odds of renting/borrowing out at endline by a factor of four ($p < 0.01$).

Table 7—Household Treatment Status and Loans in Zambia: TGCC Endline

TGCC - HH Took Loan					
	Odds ratio	Standard error	P-value P>z	[95% conf. interval]	
Baseline outcome	2.463**	0.904	0.014	1.200	5.057
Agroforestry treatment	0.802	0.268	0.508	0.416	1.543
Land tenure treatment	1.118	0.378	0.742	0.576	2.170
Both treatments	0.890	0.301	0.731	0.459	1.726
Chiefdom fixed effects					
Mkanda	0.764	0.292	0.481	0.361	1.616
Mnukwa	0.910	0.296	0.773	0.481	1.722
Mshawa	0.433**	0.144	0.012	0.226	0.832
Saili	0.494*	0.195	0.074	0.228	1.071
Constant	0.050***	0.015	0	0.028	0.091

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

Table 8—Household Treatment Status and Land Rental IN in Zambia: TGCC Endline

TGCC - HH Rents/ Borrows in					
	Odds ratio	Standard error	P-value P>z	[95% conf. interval]	
Baseline outcome	3.995***	0.508	0	3.114	5.127
Agroforestry treatment	1.665**	0.405	0.036	1.033	2.683
Land tenure treatment	1.670**	0.391	0.028	1.056	2.641
Both treatments	1.524*	0.369	0.082	0.948	2.451
Chiefdom fixed effects					
Mkanda	0.335***	0.073	0	0.218	0.514

Mnukwa	0.314***	0.067	0	0.207	0.476
Mshawa	0.209***	0.044	0	0.138	0.315
Saili	1.002	0.260	0.994	0.603	1.665
Constant	0.157***	0.034	0	0.103	0.241

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

Table 9—Household Treatment Status and Land Rental OUT in Zambia: TGCC Endline

TGCC - HH Rents/ Borrows Out					
	Odds ratio	Standard error	P-value P>z	[95% conf. interval]	
Baseline outcome	3.484***	0.709	0	2.338	5.191
Agroforestry treatment	1.041	0.242	0.863	0.660	1.640
Land tenure treatment	0.944	0.217	0.802	0.602	1.481
Both treatments	0.880	0.208	0.587	0.554	1.397
Chiefdom fixed effects					
Mkanda	0.716	0.165	0.148	0.455	1.126
Mnukwa	0.882	0.210	0.597	0.553	1.406
Mshawa	0.516***	0.119	0.004	0.328	0.812
Saili	0.848	0.245	0.568	0.481	1.494
Constant	0.080***	0.016	0	0.053	0.119

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

Discussion of TGCC Intervention Results

The evidence is strong that interventions caused more renting/borrowing in. It is unexpected that all the interventions improved renting/borrowing in at similar rates. The expectation was that the Land Tenure intervention would make households feel more secure and that results would come from that intervention and not from the Agroforestry one. The expectation in the Land Tenure intervention was that increased tenure security would improve borrowing/renting out, since households would reduce fears that the fields borrowed out would be reallocated to those cultivating their fields. It is unexpected that borrowing/renting out did not increase while borrowing/renting in did. For more people to borrow/rent in, someone must be borrowing/renting out to them.

There are a number of plausible explanations for these findings. One possibility is that the Tenure Security and Agroforestry interventions both increased borrowing/renting in activities but through different mechanisms. The Tenure Security intervention did successfully reduce fears of land encroachment (see TGCC Endline Report, 2018). So it may be that the Tenure

Security intervention reduced fear of reallocation as originally posited, leading to increased rental market activity.

Changes to borrowing/renting in are likely more visible than borrowing/renting out because the sample size is larger. The lack of statistically significant changes to borrowing/renting out could be an artifact of the random sampling strategy of villages. Land-rich farmers renting out more fields might recruit from nearby villages, rather than within the same village. Also, since relatively few farmers own many fields, it is less likely to capture them through random sampling than farmers who own fewer fields and are more likely to borrow/rent in. Some tangential evidence to support this view is that farmers that borrow/rent out own a higher than average number of fields.

As for the Agroforestry intervention increasing rental market activity, there are a number of plausible causes. In general, Eastern Province is labor scarce. Farmers overwhelmingly plant maize on a normal basis. Since the intervention suggests planting the agroforestry trees/shrubs with groundnuts, participants may have needed additional labor support to plant groundnut fields. On the other hand, it's possible that participants who chose to utilize the Agroforestry intervention were a self-selected group more likely to opt into a variety of entrepreneurial activities including renting/borrowing, once they were prompted to think about more efficient ways to allocate their labor.

An alternative possibility is that a single driver increased rental activity across all the interventions. It could be that all interventions made participants more aware of the distinctions between ownership categories as the interventions defined them. Respondents may have redefined their relationship to their land as "borrowing in" when before they would not have done so. For example, a widow might consider the land she cultivates now borrowing in from her in-laws rather than her own land. The interventions did not define renting in or borrowing in for the respondents.

Finally, it is worth noting that although a registered pre-analysis plan did consider credit and rental variables as central outcomes of the intervention, there is the possibility that the results are statistical accidents. They may be significant due to chance.

Conclusion and Policy Recommendations

The CFP and TGCC interventions advance our knowledge of the relationship between tenure security and credit and rental markets both through descriptive and causal means: these interventions are some of the first to directly ask a battery of survey questions that measure perceptions of tenure security, and are also some of the first to systematically investigate the relationship between those perceptions and characteristics of households that take loans or engage in renting or borrowing in Zambia's Eastern Province. They provide the first experimental evidence assessing the benefits of customary land formalization and agroforestry interventions for increased credit and rental market activity. As such, this research generates new knowledge around the impacts of customary land documentation and contributes to enhanced policy and programming insights to meet Zambia's broader development objectives.

Descriptive findings supported the contention of Carter (1988) who argues that credit markets tend to persistently exclude asset-impooverished households regardless of their legal ability to use land as collateral (Carter and Olinto 2003). The TGCC intervention, despite increasing perceptions of tenure security and providing land certificates, did not change credit access. Meanwhile, owning more assets was significantly related to taking a loan.

Characteristics of respondents who engaged in rental markets was for the most part consistent with prior literature and were also consistent across location in Zambia: wealthier household heads were more likely to engage in rental market activities, and those with more land were more likely to borrow/rent out while those with less were more likely to borrow/rent in. Relatedly, older household heads (who are more likely to have more land) are more likely to borrow/rent out while younger ones are more likely to borrow/rent in. Rental market activity is more likely the closer one is to a bank, which might relate to the ease of cash transactions but given low use of formal banks more likely relates to increased land scarcity nearer to cities.

There were some new findings that deserve further exploration. Conflict over fields had a separate effect on credit and rental market activities, even after controlling for tenure security. It increased the odds of taking a loan as well as the odds of borrowing/renting in for the TGCC dataset, and borrowing/renting out for the CFP dataset. These differences are unexpected in the literature, and may be the result of a higher likelihood of disputes over high value land. Also unexpected was that in the CFP dataset, both matrilocality spousal moves as well as patrilocality ones increased the likelihood of borrowing/renting in, suggesting that having less decisionmaking power due to moving matters more than specific inheritance patterns.

The intervention's positive effect on rental market activity via both the Land Tenure and Agroforestry programs provides initial evidence that a policy of customary land formalization and programs that increase awareness of how to use land efficiently may support a viable pathway for achieving greater agricultural productivity through rental markets among smallholders, a necessary step towards smallholder-led agricultural transformation.

Future research would provide further understanding about the long-term impact and benefits of agroforestry and land tenure interventions and would promote a fuller understanding of the full policy potential and value for money of such programs, and inform other stakeholders' decisions to take the program to scale in Zambia and other African countries with similar customary land systems. A follow-up evaluation is crucial, as rental market activity is likely to ramp up after the Land Tenure certificates are fully distributed and households have more chance to verify their trustworthiness.

Appendix

Table 10—Household Characteristics: CFP Baseline

	Average	Min	Max	Standard deviation	Number of observations
Household wealth					
Asset index - higher is wealthier	-0.111	-1.137	23.210	1.055	4342
Household settlement and land					
Land area owned (logged hectares)	0.552	0	3.045	0.489	4342
Distance to nearest bank (logged hectares)	3.799	1.386	5.707	0.736	3503
Perception of tenure security index - higher is more secure	0.207	-0.991	7.205	1.688	4152
Dispute on any field (yes or no)	0.080	0	1	0.272	4147
Household relationships					
Proportion of HH head unrelated to headperson	0.264	0	1	0.441	4342
Matrilocal move - spouse moves to wife's home village	0.270	0	1	0.444	4193
Patrilocal move - spouse moves to husband's home village	0.579	0	1	0.494	4193
Household demographics					
Mean head age	41.223	18	99	16.079	3700
Highest level of HH education	8.127	1	15	3.765	3901

Table 11—Household Characteristics: TGCC baseline

	Average	Min	Max	Standard deviation	Number of observations
Household wealth					
Asset index - higher is wealthier	-0.011	-1.137	8.786	0.928	3516
Household settlement and land					
Land area owned (logged hectares)	0.869	0	3	0.470	3521
Distance to nearest bank (logged hectares)	3.194	0	6	0.904	2660
Perception of tenure security index - higher is more secure	0.187	-0.991	7.205	1.638	3482
Dispute on any field (yes or no)	0.229	0	1	0.421	3479
Household relationships					
Proportion of HH head unrelated to headperson	0.217	0	1	0.412	3516
Matrilocal move - spouse moves to wife's home village	0.093	0	1	0.291	3410
Patrilocal move - spouse moves to husband's home village	0.775	0	1	0.418	3410

Household demographics					
Mean head age	43.738	0	101	16.542	3521
Highest level of HH education	8.845	1	15	3.361	3483

Table 12—Household Characteristics: TGCC endline

	Average	Min	Max	Standard deviation	Number of observations
Household wealth					
Asset index - higher is wealthier	0.153	-1.137	9.056	0.981	3403
Household settlement and land					
Land area owned (logged hectares)	0.804	0	3.063	0.494	3403
Distance to nearest bank (logged hectares)	3.187	0	5.526	0.913	2622
Perception of tenure security index - higher is more secure	-0.451	-0.991	7.205	1.139	3347
Dispute on any field (yes or no)	0.155	0	1	0.362	3347
Household relationships					
Proportion of HH head unrelated to headperson	0.244	0	1	0.430	3403
Matrilocal move - spouse moves to wife's home village	0.110	0	1	0.313	3323
Patrilocal move - spouse moves to husband's home village	0.753	0	1	0.432	3323
Household demographics					
Mean head age	42.700	0	101	16.238	3403
Highest level of HH education	8.997	1	15	3.526	3379

Table 13—Rental Activity by Treatment Status: TGCC Baseline

Dataset	Variable	Control		Agroforestry		Tenure Security		Agroforestry + Tenure Security	
TGCC Baseline	Rent in	37	5.55%	51	7.15%	49	6.83%	47	6.10%
	Rent out	13	1.95%	18	2.52%	20	2.79%	18	2.34%
	Borrow in	51	7.65%	55	7.71%	32	4.46%	46	5.97%
	Borrow out	44	6.60%	34	4.77%	40	5.58%	36	4.68%
	Loan	54	8.10%	20	2.81%	16	2.23%	34	4.43%
TGCC	Rent in	43	6.26%	50	7.42%	59	8.35%	58	7.83%

Endline	Rent out	16	2.33%	11	1.63%	18	2.55%	14	1.89%
	Borrow in	19	2.77%	37	5.49%	38	5.37%	36	4.86%
	Borrow out	31	4.51%	36	5.34%	24	3.39%	28	3.78%
	Loan	23	3.35%	21	3.12%	30	4.25%	23	3.10%

Table 14—Table Demonstrating Balance Between Treatments and Control at Baseline

[To insert]

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