

# Tenure Insecurity and the Continuum of Documentation in a Matrilineal Customary System\*

Laura Meinzen-Dick<sup>1</sup> and Helder Zavale<sup>2</sup>

<sup>1</sup>Assistant Professor, Villanova University

<sup>2</sup>Faculty of Agronomy and Forestry Engineering, Eduardo Mondlane University

Contact: laura.meinzen.dick@gmail.com

October 7, 2024

JEL codes: O13, O17, P48, Q15

## Abstract

In this paper, we document patterns of land tenure insecurity in a matrilineal region of Mozambique. Using data from a survey of nearly two thousand agricultural households in two districts of Mozambique, we explore the gendered sources and covariates of tenure insecurity that stems either from private land disputes or collective expropriation (by government or large-scale land investors). We find that overall, nearly half of respondents report experiencing collective land tenure insecurity, as compared with only 11.5% reporting individual tenure insecurity. We further distinguish gendered patterns, finding that male heads of household feel the least secure about their rights, a surprising finding compared with the majority of evidence from (patrilineal) Africa. Secondly, we make use of the fact that in several of the villages surveyed, the government carried out a variety of land rights documentation interventions. This continuum of documentation efforts allows us to see how well different interventions match the existing forms of tenure insecurity, and what is needed to address fears about losing land. Individuals in villages that received formal land certificates appear no more secure than those who merely had their rights demarcated in a less formal (and much less costly) process. Finally, we probe the heterogeneity in responses to documentation programs by gender and marital status. This paper fills a crucial gap, by empirically documenting gendered patterns of customary tenure and insecurity in a matrilineal system (15% of societies in Sub-Saharan Africa practice matrilineal kinship, according to the *Ethnographic Atlas*), as well as by contributing to a literature that aims to fit land rights documentation interventions to the needs of the community and most effectively enhance tenure security.

---

\*Many thanks to Hosaena Ghebru, who contributed substantially to the survey design, framing, and data collection for this project. Thanks also to participants at the World Bank Land Conference, the Villanova Department of Economics Brown Bag Series, the International Conference of Agricultural Economists, the Northeast Agricultural and Resource Economics Association conference, Ruth Meinzen-Dick, Daniel Putman, Caitlin Kieran, and Sam Bird for their thoughtful comments and suggestions which have improved this paper.

# 1 Introduction

Tenure security is key to unlocking agricultural investment, productivity, and welfare (Place, 2009). This has led many governments in the global South, particularly in Sub-Saharan Africa, to attempt to document land rights, thereby solidifying them, making them more secure for individuals and visible to outsiders who may be looking to invest in agricultural land (Ali et al., 2016). This documentation should alleviate fears that farmers will lose their land, either from private disputes or external expropriation (from the government or private investors), and thereby encourage farmers to invest in their land. Customary tenure systems, although not written, may be relatively secure and able to resolve disputes within communities (Brasselle et al., 2002). At the same time, they generally have complex, socially-embedded rights to land, with rights to the same piece of land being held to varying degrees by overlapping members of larger communities and individuals within the household (Barry and Danso, 2014). Together, this means that full titling may not be an appropriate, cost-effective way to unlock agricultural investment, although making land rights legible to outsiders (including the government and private investors) remains an important function of the state. However, legibility may be possible with other forms of documentation than full titling, and the fit of documentation to the particular sources and forms of insecurity faced by smallholders is key.

Under customary tenure systems, the social position of individuals plays a large role in determining their rights to land and how secure those rights are. This extends to individuals within the household, where gender is a particularly salient factor in perceptions of tenure security (Dillon and Voena, 2015). In much of the world, women feel less secure about their rights to land than men do. This is often posited to stem from women’s higher chance of losing the land they farm in cases of divorce or spousal death, particularly when a couple’s land is accessed through the husband’s kinship network. However, in a matrilineal kinship system, land is archetypically accessed through a woman’s family, so women do not face the same threats. In this paper, we explore how this changes the gendered burden and sources of tenure insecurity in two districts of Mozambique with predominantly matrilineal kinship groups.

Our data to explore questions of tenure insecurity comes from a very rich survey of nearly 2,000 households in two districts in Mozambique, which asks men and women within households about their land: its characteristics, documents, and investments, as well as their fears of losing the land within the next five years due either to private plot disputes (which we categorize as ‘individual insecurity’) or expropriation by government or private investors (‘collective insecurity’). We find that concerns about collective expropriation are much more salient, with 43% of respondents worried about losing their land due to expropriation (as compared with only 11.5% reporting individual insecurity). Women, however, are statistically significantly less concerned about expropriation than men are, which is the exact opposite of findings from other (patrilineal) customary systems. This finding is unusual, but in our data it holds for both female spouses and heads of household; other correlates of insecurity are generally consistent with other studies in Africa. We find no evidence consistent with this result being driven by lower awareness of threats to tenure security by women. This surprising result, of women being less insecure than men, is important to document, given the relative sparsity

of quantitative work on tenure security focusing on matrilineal customary systems, despite 15% of societies in Sub-Saharan Africa practicing matrilineal kinship.<sup>1</sup>

Within the study districts, the Government of Mozambique (GoM) also carried out land rights documentation interventions in several villages. These interventions can be considered along a continuum. At one end, communities as a whole were delimited, which mapped out the limits of the village and created a community-level Certificate of Delimitation which legally confirms the community as the land management entity responsible for the land within, including dispute resolution and the ability to intercede when government or external investors want to use local land. Moving further along the continuum, individual parcels were demarcated in some villages, marking plot boundaries. Finally, in one community, legal land certificates (*direto de uso e aproveitamento da terra*, or DUATs) were issued (although this is not full titling, which would be the full endpoint of the continuum). We do not have information on how communities were matched to the interventions they received, so we can only analyse these projects correlationally, but we explore how well each intervention matches existing forms of tenure insecurity and how well they address fears about losing land.

Collective threats, including government expropriation for public use or large-scale investors, make the legibility of land rights to outsiders particularly important. Formal certification, as in community delimitation and household certification, makes existing customary rights clear to those outside the community, and provides some assurance of compensation if expropriation does occur. Consistent with this, plus the fact that collective insecurity is a worry to nearly half of our sample, we find that the relatively inexpensive community delimitation is correlated with a significant reduction in insecurity. Notably, this reduction holds for both collective and individual threats; this latter may be due to documentation improving men's relative tenure security within the community. Although descriptive, this suggests that community-level delimitation may be a relatively cost-effective way to address the kinds of insecurity that smallholders in Mozambique face. This first step on the documentation continuum makes customary rights legible to outsiders, while preserving the flexibility of customary tenure systems within the community. Nevertheless, the process of documenting even community-level rights can influence customary institutions, and could be used by men to solidify their individual rights at the expense of the broader matrilineal group and the women within it.

The rest of this paper is organized as follows. First, we review the literature on land rights and tenure security, to provide a conceptual framework for understanding our empirical results. We then describe the context in which our data was collected: both the legal framework on land in Mozambique and documentation efforts, as well as a largely qualitative summary of matrilineal kinship systems and their customary land rights. Turning to our survey, we describe the data and our empirical strategy for a descriptive analysis of land rights in a matrilineal system and the continuum of documentation efforts in some communities. Our analysis begins with exploring matrilineal land rights, looking at predictors of insecurity for men and women. We also explore whether gendered awareness of threats could be driving the observed difference in insecurity between women and men. We then document correlations with communities that have received community-level delimitation,

---

<sup>1</sup>According to Robinson and Gottlieb (2021), 14% of Afrobarometer respondents across the continent belong to a kinship or ethnic group that traditionally practices matrilineal descent.

household plot demarcation, and issuance of land certificates, before concluding.

## 2 Land Rights and Tenure Security

Land tenure security refers to the degree of confidence that individuals or group of individuals who have different dimensions of land rights will not be arbitrarily deprived of those land rights (Doss and Meinzen-Dick, 2020). Land tenure security could improve households' agricultural productivity and welfare through at least three channels: an assurance effect by which more secure users invest in their land (as they believe themselves more likely to reap future rewards of investment), a collateral effect by which credit constraints can be eased if mortgage rights are held and credit markets and demand exist (Galiani and Scharfrodsky, 2010; Lawin and Tamini, 2019), and a realizability effect by which those who hold transfer rights can realize gains of investment sooner by selling or renting out the land, or can transfer to more productive users. With these three theoretical channels, many policymakers in Sub Saharan Africa assumed that informal customary tenure systems did not provide sufficient security for the necessary investment that would unlock agricultural productivity; the solution (based on Western experiences) was titling, which should provide clearly defined and enforceable property rights (Peters, 2010).

However, the empirical evidence of these three channels is more mixed (Fenske, 2011). To the first mechanism, despite some work showing that tenure security is associated with land-related investments (such as input usage, soil conservation structures, tree planting, etc), higher agricultural productivity and incomes (Ali et al., 2012; Bros et al., 2019; Deininger and Ali, 2008; Deininger et al., 2011; Deininger and Jin, 2006; Goldstein and Udry, 2008; Ngango and Hong, 2021; Noufe, 2023), other papers find weak or nonexistent relationships between tenure security and land-related investments (Brasselle et al., 2002; Jacoby and Minten, 2007; Place and Otsuka, 2002). These contradictory findings could be driven by differences in how land tenure security is measured (such as at the individual or collective level), or other location specific considerations (Arnot et al., 2011; Ghebru and Lambrecht, 2017). For land to serve as collateral, formal certificates are often required by financial institutions; most work shows modest to nonexistent credit effects of titling programs and tenure security (Carter and Olinto, 2003; Galiani and Scharfrodsky, 2010; Place and Migot-Adholla, 1998). Finally, some empirical work on the transfer mechanism shows that formal certificates do lower transaction costs and the risk associated with losing rented-out land, resulting in increased land rental market participation, productivity, and efficiency (Abdulai et al., 2011; Bellemare, 2012; Chamberlin and Ricker-Gilbert, 2016; Deininger et al., 2022), but this also requires complementary markets and has distributional consequences (Jacoby and Minten, 2006).

Despite these three possible channels by which land tenure security could impact welfare, in the current study, we focus primarily on the first, by which greater assurance of future benefits leads to higher land-related investment. In Mozambique, land cannot be sold or mortgaged: all land belongs to the government, which grants user rights to individuals, communities or companies. Therefore, land rental and sales markets are underdeveloped. Secondly, foreclosure on land is prohibited by law; consequently, farmers do not in general use land as collateral to access formal credit. Even in this context, formal certification could improve land tenure security by ensuring compensation if the

government begins land redistribution initiatives in the area, including granting land to large-scale investors.<sup>2</sup>

Doss and Meinzen-Dick (2020) lay out four dimensions of tenure security: completeness of the bundle of rights, duration, robustness (the ability of the institutional framework, including statutory and customary systems, to enforce land rights), and individual or shared rights (whether rights are held by individual people or collectively by a group, such as a lineage). This final dimension is particularly important in our case, as household members generally cannot transfer land rights without permission from the community chief when land rights are held collectively by a community. Therefore, following Ghebru (2015), we use two measures of perceived tenure insecurity: individual tenure risk and collective tenure risk. Land tenure insecurity arising from individual tenure risk refers to landholders' fear of losing user rights as a result of inheritance disputes, divorce, or border encroachment. Insecurity due to collective tenure risk, on the other hand, refers to fear of land expropriation by the government for public use or large-scale investors. This is particularly salient in Mozambique, where the Land Matrix reports 85 large-scale land acquisitions as of early 2023, and the government has encouraged private investment in 'empty' or 'underused' land (Tanner et al., 2009).

Much of the early work on the importance of tenure security neglected to address the fact that different individuals within the household often have different rights to land, and therefore different perceived tenure security. However, more recent theoretical and empirical work has addressed this (Bros et al., 2019; Deininger et al., 2011, 2019; Doss and Meinzen-Dick, 2020; Feyertag et al., 2021; Ghebru and Lambrecht, 2017; de la O Campos et al., 2023). In many contexts, women feel less secure about their rights to land (Deininger et al., 2019); in particular, women report feeling threatened by internal sources of insecurity, such as cases of divorce or spousal death (Feyertag et al., 2021).<sup>3</sup> Importantly, formal property rights documentation may not include women's names on documents, in fact weakening their rights, and formal documentation may not be effective in protecting women's rights from internal threats that rarely reach formal institutions. This paper makes an important contribution to the gendered lens on tenure security: although the statutory system in Mozambique is gender neutral, the two districts under study predominantly follow a matrilineal system. This means that although decision-making often remains with men (fathers, husbands, uncles or sons), women's land rights are relatively more protected than in a patrilineal area where women would often be forced off the land in case of divorce or widowhood (Adam et al., 2020). Our work is closely related to that of Deininger et al. (2022), Mwale and Ricker-Gilbert (2024), and Berge et al. (2014) who compare matrilineal to patrilineal areas of neighboring Malawi. Deininger et al. (2022) find few significant differences in the relationships between rightsholders and agricultural investment, although the particular rights held by men and women shape different investments.

The unique land rights and tenure security situation of female-headed households has been even less addressed, as these women are differently situated in their social and tenure contexts to female spouses or male heads of households (Deere et al., 2012). This may be due to an assumption that

---

<sup>2</sup>Spichiger and Kabala (2014) argue that in Zambia, titling initiatives actually made it easier for outsiders to acquire private titles to customary land, thereby depriving land users of their traditional access rights.

<sup>3</sup>Feyertag et al. (2021) finds that men, by contrast, generally express more worry about external sources of insecurity, such as government expropriation, as does Ghebru (2019).

female-headed households are less agriculturally productive, or simply a reflection of their social and political marginalization. Some work in Ethiopia finds that female-headed households have smaller owned landholdings than male-headed counterparts, but because they are generally smaller households, they operate even less land and are more likely to rent out land (Dokken, 2015; Bezahib et al., 2016). In Uganda, female-headed households are more likely to be affected by land conflicts, and legal changes appear not to have reduced these conflicts (Deininger and Castagnini, 2004).

### 3 Context

In order to understand our primarily descriptive results about the gendered nature of tenure insecurity in Northern and Central Mozambique, it is important to have a sense of the context. First, we describe the legal environment of land rights and documentation efforts in Mozambique, and then lay out important features of matrilineal descent systems and their implications for gendered land rights and tenure security.

#### 3.1 Mozambique

Mozambique is a relatively land-abundant country in Southern Africa, with only approximately 13.1% of arable land cultivated with annual crops as of the 2014-2015 season. However, it faces rapid population growth of 2.9%, leading to a doubling in population density between 1990 and 2018. Rural areas in particular face strongly increasing land pressures, with the agricultural landholdings per capita in rural areas dropping from 4.9 hectares in 1990 to only 2.8 hectares by 2016. According to Holden and Otsuka (2014), Ricker-Gilbert et al. (2014), and Willy et al. (2019), rapid population growth puts pressure on available arable land, and could result in increased land disputes, potentially worsening tenure security among landholders. Ghebru and Lambrecht (2017) found that urban areas, areas with a more vibrant economy and communities with more active land markets were more land tenure insecure; Ghebru (2019) finds this applies across a larger area. Legally, all land in Mozambique belongs to the government, so cannot be sold or mortgaged. In practice, there are some informal land markets, especially in urban areas,<sup>4</sup> but banks are very reluctant to use land as collateral as they are unable to foreclose in case of default. According to the nationally representative Integrated Agricultural Survey (IAI) in 2014-2015, only 8.6% of plots were purchased: customary means of accessing land predominate, and we will explore the particular customary norms that predominate in the study districts in more detail below.

The legal framework for land rights in Mozambique has been regarded as innovative and progressive (Ghebru, 2015; Tanner et al., 2015), particularly due to the participatory approach and recognition of community land use rights and customary norms and practices of the 1997 Mozambique Land Law. This law, in addition to the National Land Policy of 1995 and the Land Law Regulation in 1998, was drafted and came into effect soon after the signing of a peace agreement to end a 16-year civil war in 1992. These laws recognize equal land rights for men and women, but

---

<sup>4</sup>Technically, infrastructure on the land can be sold ‘separately’ from the rights to the land itself; this infrastructure and work-around are both more likely in urban areas.

women continue to face discrimination in practice, particularly under customary tenure arrangements which prevail in rural areas.

The 1995 and 1997 documents, as well as the 2004 Constitution, assert that all land belongs to the Government of Mozambique (GoM) and cannot be sold or otherwise alienated or mortgaged in any way, but do allow for the granting of land use-right certificates (Portuguese acronym DUAT) to individuals, communities, and companies. These DUATs can be awarded based on: (i) occupation by individual persons or local communities based on customary norms and practices; (ii) occupation by individual persons if land used in good faith for at least 10 years without objection; or (iii) granting of land use rights by the GoM upon legal request from individual persons, local communities, or entities.<sup>5</sup> Occupation via good faith and customary norms and practices are the primary modes of land acquisition in Mozambique. According to the law, DUATs can be transferred among holders, either via inheritance or sale of existing infrastructure on the land, but the land itself cannot be sold.<sup>6</sup>

Two types of land use-right certificates can be awarded under the law: provisional and definitive DUAT, with roughly half of awarded certificates to smallholders being of each type.<sup>7</sup> Provisional DUAT is valid for up to 5 years for Mozambiquan nationals (but only 2 years for foreigners), and requires a land use plan. Definitive DUAT is valid up to 50 years (with the possibility of renewal for another 50 years) if granted by the government for economic activities, but has a perpetual use period if obtained by good-faith occupancy or customary norms and practices.<sup>8</sup> Provisional DUATs can be upgraded to definitive if the land use plan is executed, although this is rarely observed. Considerable proportions of plots with DUATs are idled,<sup>9</sup> which could reflect landholders' limited capacity to fully utilize their plots, or speculative behavior.

Despite the legal possibility of land use-right certificates, as of 2015, these remained relatively rare. According to IAI 2015 data, nearly all (97.8%) plots did not have DUATs. Customary norms and practices of land acquisition predominate, with 26.8% of plots inherited, 24% allocated by parents, 21.8% occupied, and only 8.6% purchased and 8.7% allocated by local authorities. However, there have been various initiatives aimed at increasing land tenure security through land demarcation, delimitation, and issuance of DUATs to individuals and local communities since 1999, often in partnership with donors and non-governmental organizations. These efforts include the *Iniciativa para Terras Comunitárias* (iTC), *Centro Terra Viva* (CTV), ORAM, *Forum Terra*, and

---

<sup>5</sup>Local community refers to a group of households and individuals living a locality or a smaller administrative division who want to safeguard their common interests through the protection of the land area for agriculture, habitation, place of cultural importance, water source or other purpose.

<sup>6</sup>A DUAT holder can legally sell a dwelling built on a plot and transfer the DUAT to the person who purchased the dwelling. However, the plot itself cannot legally be sold and then have its DUAT transferred to the buyer. Data from IAI 2014 show that 38.2% of plots owned by DUAT owners were purchased or rented in, as compared with 9.5% of plots owned by non-DUAT owners. As argued above, this is substantially more common in urban and peri-urban areas than in the rural areas surveyed here.

<sup>7</sup>Approvals for DUATs can be completed by provincial governors for up to one thousand hectares, by the Minister charged with land tenure issues for between one and ten thousand hectares, and more than ten thousand hectares must be approved by the Council of Ministers.

<sup>8</sup>The 1997 Mozambique Land Law make a distinction between urban and rural land; however, our discussion focuses on issues related to rural land because they are the most relevant for the objectives of this study.

<sup>9</sup>According to Monteiro et al., the share of plots (plot area) fully used according to the land use plan when DUATs were awarded in the total number of plots (total plot area) supervised by National Directorate of Land and Territorial Development (DNDT) officials ranged from 35.9% (19.3%) to 56.4% (57.1%) during the period 2009-2012.

KULIMA, among others (Monteiro et al.; Ghebru, 2015). Nationally, 1,200 DUATs were issued between 2005 and 2011, but efforts scaled up to a cumulative 3,000 DUATs by 2012, and 21,000 by 2014. More recently, the National Fund for Sustainable Development (FNDS) of the Ministry of Agriculture and Rural Development, in coordination with the Ministry of Land and Environment (MTA) through the National Directorate of Land and Territorial Development (DNDT) began a program called *Terra Segura*, which aimed to issue five million DUATs to individual smallholders and complete four million community land delimitations between 2015 & 2019.<sup>10</sup> Between 2015 and 2017, 250 thousand DUATs were issued; *Terra Segura* appears more active in Southern Mozambique, where 64.2% of DUATs were issued, as compared with 23.8% in the Northern region and only 12.8% in Central Mozambique. Community delimitation was slower to start, with only 183 communities delimited between 2000 and 2010, although 754 additional communities were added between 2011 and 2016, representing a cumulative 17 million hectares delimited. The community delimitation, plot demarcation, and certification discussed below in our study areas were part of the *Terra Segura* efforts. Even in villages where *Terra Segura* was active, plot demarcation and issuance of DUATs was not universal; by the same token, even those in villages not reached by this and similar programs could demarcate their boundaries and apply for a DUAT as individuals.

### 3.2 Matrilineal Land Rights

As mentioned above, the study districts present a fascinating context in which to study the gendered incidence of land rights and tenure security, given the predominantly matrilineal and matrilineal kinship systems in Northern and parts of Central Mozambique (Adam et al., 2020; Gawaya, 2008).<sup>11</sup> In a matrilineal system, descent and membership in a kinship group is traced through the mother, and inheritance passes through the maternal line (Peters, 2010). This often means children inherit assets from their mother's brother, and (maternal) uncles play an important role in the family (Lowe, 2020; La Ferrara, 2007).<sup>12</sup> Importantly, most of Northern and Central Mozambique are not only matrilineal, but also matrilineal, where upon marriage, husbands will move to their wife's family dwellings or residence area, and women are considered to be the "rightful owners of the village" (Peters, 2010).<sup>13</sup> In many matrilineal groups, the bond between husband and wife will be weaker than the sibling bond between brother and sister, who belong to the same matrilineage; the fundamental family unit is a group of sisters who live together in a cluster of compounds, with an elder brother as their representative-cum-guardian. Spouses will retain split allegiances, where each spouse maintains their identity with their own kinship group (Lowe, 2020), and many adults have several spouses over their lifetime (Peters, 2010).

Women's proximity to their own family members (through matrilineal residence), and their asset

---

<sup>10</sup>The process of receiving a DUAT is still slow, however: one author has personally been waiting more than 10 years for issuance of a DUAT, even after processing required paperwork.

<sup>11</sup>Northern and parts of Central Mozambique are seeing an increasing number of patrilineal families, due to migration and rapidly growing urbanization; however, nearly 90% of our respondents were born in the village they currently reside in, so matrilineal systems dominate still.

<sup>12</sup>For example, the heir to a male leader will typically be his sister's son, rather than his own son (Peters, 2010).

<sup>13</sup>The matrilineal system endured despite Swahili-influenced Muslim culture, Bonate (2006) argues, due to a continued reliance on matrilineal descent from lords of the land as a source of legitimacy for local chiefs (who were strengthened by Portuguese colonial institutions).



ownership (through matrilineal inheritance), may enable them to better implement their preferences when bargaining within their household as they have better fallback options (Lowe, 2020). Even within the marriage, matrilineal descent rules imply that women have greater access to material resources and social capital (as they live near their own family) (Gottlieb and Robinson, 2016). In particular, the children of a union ‘belong’ to the wife’s kin group, so if a husband mistreats his wife, it is relatively easier for her to return to her natal kin group (or force her husband to leave, as the case may be), giving men less authority over their wives than in patrilineal systems.<sup>14</sup> Perhaps as a result, Lowe (2020) shows that matrilineal individuals are less cooperative with their spouses than those in non-matrilineal kinship systems, and there is a smaller gender gap in various measures of women’s participation and engagement in politics relative to men. In experimental settings, women from matrilineal groups are observed to be more competitive than women from patrilineal groups or men from their own communities, and in some cases more than patrilineal men (Gneezy et al., 2009). Gottlieb and Robinson (2016) also show that gender gaps in political engagement, political participation, and civic participation are much smaller in matrilineal groups compared to patrilineal ones, and argue that this is due to the “long-term expectation of resource entitlements conferred by matrilineal inheritance rather than a one-time positive economic shock that empowers women.” This is despite the fact that most matrilineal groups are patriarchal, where men dominate political authority and retain higher status and power (Lowe, 2020; Peters, 2010).

As underscored by Gottlieb and Robinson (2016), access to land through the matrilineal line is a particularly key part of matrilineal kinship systems. Few (married) men live on or cultivate land that belongs to their own matrilineage, although between marriages, men will return to their natal village to be loaned a field by their sisters or mothers (Peters, 2010). However, in these cases men are not necessarily considered ‘owners’ of the plots from their own matrilineage, but rather ‘borrowers’ of it. Peters (2010) documents that even when men purchase land, they intend their daughters (rather than sons) to inherit, and for it to become matrilineal property. La Ferrara and Milazzo (2017) show that in a matrilineal group in Ghana, families often invest in the education of their sons to substitute for land inheritance. Land inherited matrilineally is more consequential for a woman’s empowerment within the household and political participation than land obtained through other means, as shown by Gottlieb and Robinson (2016); Robinson and Gottlieb (2021). Traditionally, when a married woman dies, her spouse does not inherit rights to the land they may have jointly cultivated, because her spouse is not considered part of the lineage that retains rights to that land (Lowe, 2020).<sup>15</sup> This implies that “in matrilineal communities, women exert more influence than men over both the selection of local leaders (chiefs) and issues related to land ownership and use” (Robinson and Gottlieb, 2021). This is in tension with Islamic notions of inheritance and the division of property, but Bonate (2006) argues that matrilineal systems predominate in rural areas, within the solidarity of the matrilineal kinship group, where people rely on subsistence agriculture (so land is the primary asset).

The statutory legal system in Mozambique is gender neutral; however, it does recognize a role

---

<sup>14</sup>Although Alesina et al. (2016) find no differences in violence against women in matrilineal vs patrilineal societies

<sup>15</sup>This is in contrast to virilocal regions, where a couple lives on the husband’s kinship lands; in those areas, women often lose usufruct rights upon divorce or widowhood as the husband or his kin can appropriate the couple’s belongings (Bonate, 2006).

for the legitimacy of customary tenure systems, and so in matrilineal areas, women’s land rights are relatively more protected. This is likely true even for individuals who do not themselves engage in matrilineal practices; Robinson and Gottlieb (2021) document substantial spillovers of matrilineal community norms. However, decision-making authority remains with male relatives (only they are typically those within the matrilineage, so siblings rather than spouses). Households may need permission from a community chief or lineage elder to transfer rights, particularly when the rights are considered to be held collectively by the community. Even when descent is traced and assets are inherited through women, social relations are generally patriarchal, with male dominance. This means that when land is held jointly by spouses, social norms may mean that men practically exercise their joint rights individually. Documentation efforts, particularly if carried out by a bureaucrat entrenched in patriarchal and patrilineal systems, could record men’s names as ‘landowners’ (either husbands or brothers): Peters (2010) warns that “it will dispossess women in matrilineal-matrilocal areas who currently have highly secure, indeed privileged, rights in comparison with men’s.” This quite directly translates into a policy concern: during registration and documentation of land rights, whose name(s) are recorded? If men appear on formal land documents as permanent rightsholders, this could shift quite substantially the tenure security for men and women.

## 4 Data

For our primary analysis, we use data from the Land Tenure Survey (LTS) administered by the International Food Policy Research Institute (IFPRI) in collaboration with Eduardo Mondlane University. With a sample of 1,953 households, this survey covered the 2018/2019 agricultural season and surveyed respondents in two districts: Namarroi in Zambezia province (Central Mozambique), and Erati in Nampula province (Northern Mozambique). A total of nine communities were surveyed, including four in Namarroi (937 sampled households) and five in Erati (1,016 sampled households) (Table 1). Both regions are predominated by matrilineal tenure systems.

The two sampled districts were chosen to cover three land documentation treatments undertaken by the government of Mozambique and controls. Erati district with five communities covered (1,016 households interviewed) and Naura community in Namarroi district (80 HHs interviewed) represent pure control, where no government programs had carried out land rights documentation. Namaria in Namarroi district (326 households interviewed) had experienced community delimitation, but no household land certification had been undertaken; we will refer to this as treatment one (T1). Mutaliwa in Namarroi district (246 households interviewed) had both community delimitation and household plot demarcation, but no efforts to issue land certificates (DUATs); we will refer to this as treatment two (T2). Finally, Mussano in Namarroi district (285 households interviewed) had carried out community delimitation, household plot demarcation, and land certificates had been issued; we will refer to this as treatment three (T3). These three treatments were implemented by the Government of Mozambique and outside the control of the research team; however, we do not have information as to how treatment sites were selected, so our analysis of the impacts of each intervention arm will be correlational, and likely represents the joint impact of the treatment and the underlying factors that led the Government of Mozambique to respond with the intervention in

District	Community	Treatment	Sampled Households	Sample Share
Erati	Machicane	Control	204	10.4%
	Mpupene	Control	191	9.8%
	Mirote	Control	203	10.4%
	Murrima	Control	209	10.7%
	Nhotuane	Control	209	10.7%
<b>Total Erati</b>			<b>1,016</b>	<b>52%</b>
Namarroi	Naura	Control	80	4.1%
	Namaria	Treatment 1 (T1)	326	16.7%
	Mutaliwa	Treatment 2 (T2)	246	12.6%
	Mussano	Treatment 3 (T3)	285	14.6%
<b>Total Namarroi</b>			<b>937</b>	<b>48%</b>
<b>Total</b>			<b>1953</b>	<b>100%</b>

Table 1: Distribution of surveyed households by village. Treatment one refers to communities where only community delimitation were undertaken. Treatment two denotes communities where community delimitation and plot demarcation were undertaken. Treatment three refers to communities where community delimitation and plot demarcation were undertaken with land certificates issued. Source: Authors’ computation using data from LTS 2019

that community.

This survey, conducted in 2019, is unique and rich in at least four important dimensions. First, it has very detailed information on plot characteristics, potential and actual access to land, public and private land tenure insecurity, past insecurity experiences and future threats, land-related dispute experiences, land-related intra-household decision making practices, land related investment practices, different modes of land acquisition, land loss and depositions experiences, land and assets inheritance practices, off-farm economic opportunities, migration practices, and access to credit, among other aspects. Second, it collected gender-disaggregated data to capture the existing important intra-household variation in terms of key household members’ perceptions regarding land tenure security. Third, it captured information about two generations (i.e., information about heads/spouses of households and their siblings, information about children in the households, and information about currently non resident past household members). Finally, it collected information at three levels: household, household member, and plot. This will allow us to explore tenure security in an extremely nuanced way, which is impossible with coarser survey measures of tenure security. Importantly, we can look at individual land tenure risk as distinct from collective land tenure risk, and can make comparisons within households (comparing principal males to their female spouses on the same parcels<sup>16</sup>) as well as between households with different compositions (male vs. female-headed households).<sup>17</sup>

Our sample consisted of a total of 3,239 interviewed individuals: 1,504 men and 1,735 women, with the distribution of individuals laid out in table 2. Of the women, 1,186 live in dual adult

<sup>16</sup>Although it is possible women adults in male-headed households have a different relationship to the male head, such as siblings, it seems likely that most are their spouses; in future analysis we will look at the relationship of interviewees to the head of household in more detail.

<sup>17</sup>There is some confusion in the literature about the terminology. We refer to principal males (females) as the male (female) heads of household in which either both husband and wife of the same household exist (dual adult households) or spouse does not exist (either male or female adult only households).

Respondent Gender	HH Head Gender		Total
	Male	Female	
Male	1,399	105	1,504
Female	1,186	549	1,735
Total	2,585	654	3,239

Table 2: Distribution of respondents across genders and household types.  
Source: Authors’ computation using data from LTS 2019

households where men are considered the head of household (principal males); 105 live in dual adult households where women are considered the head of household, and 444 live in single adult households with only a woman adult, so the woman is considered the head of household. There are 215 men who live in single adult households with only a male adult (considered the head of household). It is somewhat striking that there are dual-adult households where the woman is considered the head of household, as this is rarely seen in household surveys from patrilineal Sub-Saharan Africa; however, in a matrilineal descent system, it is relatively common for siblings to live together, particularly for male siblings to return to their sisters’ homes in between marriages, which may be unstable. It may be that a few of these men are indeed the spouses and report the woman as the head of household, but it seems likely that most are siblings or other familial relations.

In table 3, we present descriptive statistics by gender and household type. We can see that men are, on average, older than their female spouses; female heads of household, however, are the oldest group by far, at 42 years on average. Men tend to have more education than any women, with female heads of household having the fewest years of education. Male-headed households seem to have greater access to credit, but the pattern is less clear for savings accounts. Interestingly, male-headed households own notably less land, although there are outliers in these figures, and the average distance of plots from the household are statistically similar across household composition. Finally, there does appear to be some dispersion in a wealth index constructed using Principal Components Analysis (PCA) on household assets: female-headed households with an adult male are wealthier than male-headed households, who in turn are wealthier than most female-headed households (without an adult male resident).

## 5 Empirical Strategy

Our analysis is simply descriptive, looking at gendered correlates of tenure insecurity (both collective and individual) and correlations with the village-level *Terra Segura* interventions: community land delimitation (T1), individual parcel demarcation (T2), and land certification (provision of DUAT) (T3). Our primary outcomes of interest are binary measures of perceived tenure risk. Perceived individual land tenure risk represents a dummy variable that takes the value of one if the respondent perceived that in the next five years, the respondent’s land ownership or user rights are likely to be lost because of private land disputes such as encroachment, inheritance, or divorce (among others); and takes the value of zero otherwise. Perceived collective land tenure risk represents a dummy variable that takes the value of one if the respondent perceived that in the next five years, the

Panel A: Individual Characteristics							
Variable	(1)	(2)	(3)	(4)	T-test		
	Male Head of Household Mean/(SE)	Male in Female- Headed HH Mean/(SE)	Female Spouse Mean/(SE)	Female Head of Household Mean/(SE)	(1)-(2)	(1)-(3)	(3)-(4)
Age	38.23 (0.313)	37.56 (1.134)	32.64 (0.320)	42.39 (0.629)	0.670	5.587***	-9.746***
Years of schooling	4.837 (0.082)	4.521 (0.341)	3.354 (0.081)	2.208 (0.118)	0.316	1.482***	1.146***
Owns ID	0.665 (0.013)	0.510 (0.049)	0.378 (0.014)	0.338 (0.020)	0.155***	0.286***	0.041
Number of observations	1399	105	1186	549			
Panel B: Household Characteristics							
Variable	(1)	(2)	(3)	(4)	T-test		
	Male-headed male-only HH Mean/(SE)	Male-headed HH with female spouse Mean/(SE)	Female-headed female-only HH Mean/(SE)	Female-headed HH with male partner Mean/(SE)	(1)-(2)	(2)-(3)	(3)-(4)
Access to credit	0.223 (0.028)	0.302 (0.013)	0.207 (0.019)	0.219 (0.041)	-0.079**	0.095***	-0.012
Savings account	0.094 (0.020)	0.199 (0.012)	0.078 (0.013)	0.200 (0.039)	-0.105***	0.121***	-0.122***
Plots' avg distance (walking time)	22.834 (1.436)	21.214 (0.821)	24.062 (2.590)	18.809 (1.686)	1.621	-2.849	5.254
Owned area (ha)	1.229 (0.098)	1.796 (0.045)	1.732 (0.083)	2.404 (0.156)	-0.568***	0.064	-0.673***
Cultivated area (rainy season)	0.741 (0.048)	6.080 (4.249)	0.975 (0.032)	1.588 (0.151)	-5.339	5.105	-0.613***
Wealth Index	-0.582 (0.091)	0.099 (0.045)	-1.072 (0.065)	0.465 (0.150)	-0.682***	1.171***	-1.537***
Number of observations	222	1186	440	105			

Table 3: Descriptive statistics for respondents by gender and household type. Panel A presents respondent-level characteristics: age and years of schooling are measured in years, while Owns ID is a dummy equal to one if the respondent has an ID card. Panel B presents household-level characteristics. HH access to credit is a dummy equal to one if the household has access to a source of credit; savings account is a dummy equal to one if any respondent in the household has a savings account. Plot's average distance is measured in minutes of walking time from the household; owned area and cultivated area are measured in hectares, with the latter being cultivated during the main rainy season. The wealth index is constructed using principal components analysis on household assets.

Source: Authors' computation using data from LTS 2019

respondent’s land ownership or use rights are likely to be lost because the government demands land for public use or allocation to private investors; and takes the value of zero otherwise. In our primary specifications, we use a linear probability model to allow for inclusion of fixed effects, although we also have estimated probits (available upon request). Particular controls are specified for each model, although our preferred default specification when looking at gender differences includes village (community) fixed effects to control for unobserved heterogeneity in land pressures between villages and improve precision, as well as p-values constructed via Wild Cluster Bootstrap at the village level (as there are only 9 clusters). We have data on respondent, household, and community characteristics, the last of which are computed as averages from individual interviews.

In exploring the correlates of tenure insecurity for men and women in a matrilineal context, we use data from all communities in our primary specifications, although in the appendix we present results from only control communities to ensure that *Terra Segura* programs are not driving our results. We retain respondents from all communities to maximize the precision of our estimates, and results are similar across sub-samples. Although we do not have much information about the operation of the various tenure interventions carried out by *Terra Segura*, the data we do have, on whether or not households have DUAT for any of their parcels, suggests the program was far from universal in coverage. Less than 10% of households in any community had DUAT in 2019, and the difference between control communities and the community which had received T3 (community delimitation, plot demarcation, and documentation) is statistically insignificant at the 10% level. Indeed, DUAT coverage is highest in the T2 community, at 8.1% (as compared with 2.7% across all control communities and 4.6% in T3). Therefore, it seems reasonable to conclude that the treatments play a relatively small role when compared with customary institutions which pervade all aspects of life.

In explorations of communities that have received the *Terra Segura* programs, we cannot confidently ascribe differences between communities that received one of the treatments vs. those who did not to causal impacts of the program, because we do not have enough information about how these communities were selected. It may be, for example, that the Government of Mozambique was responding to demand for documentation in these communities due to higher levels of collective insecurity, or that these communities had a higher belief in the efficacy of documentation, or simply were better connected to administrators or were easier to access. Indeed, we can see in table 4 that even on measures likely to be unrelated to tenure security or unaffected by the *Terra Segura* program in the short-term, control communities look significantly different than those who received treatments. Many of these differences could be a reflection of systematic differences between the two districts: Erati, which contains only control communities, seems to have a more educated and financially connected population, with less-active land markets.

As we do not have pre-treatment data, estimated differences between communities with different treatment statuses are the cumulative effect of these pre-existing factors as well as the impact of the treatment received. In the estimation of these differences, the dummy for community delimitation remains ‘on’ for T2 and T3 communities (as they also received community delimitation); similarly, the dummy for individual plot demarcation remains ‘on’ for T3 communities, as plot demarcation was prior to the issuance of DUATs. The coefficients on individual plot demarcation and certification

can then be read as the additional, marginal, effect of that treatment, in addition to the prior treatment(s).

However, to probe these correlational relationships further, we control for observable factors that may have influenced the likelihood of treatment. In particular, we look at a suite of geographic variables, including the travel time to the district capital (adapted from Muller-Crepon et al. (2021) and Muller-Crepon et al. (2021)<sup>18</sup>), and a measure of market access (from the same geospatial data). In addition, we include population density, and the Euclidean distance to the nearest Large Scale Land Acquisition (LSLA) reported in the Land Matrix (Andeew et al., 2012), a proxy for threats to collective land security. Due to the high degree of multicollinearity between these measures and the small number of villages in our data, we employ principal components analysis to create one variable that captures the underlying variation in these variables.<sup>19</sup> In addition, we control for individual or household-level characteristics that are unlikely to have been affected by treatment (as we do not observe households at baseline): the household size, the principal components analysis wealth index, the husband’s highest level of education, and a dummy equal to one if the respondent owns an ID card. Although these controls do not allow us to estimate the causal effect of the documentation efforts in these villages, they do allow us to estimate correlations conditional on observable characteristics of these villages and their inhabitants.

## 6 Matrilineal Land Rights and Tenure Insecurity

We begin with a correlational analysis of gendered tenure insecurity in the matrilineal districts in which the LTS 2019 was conducted. Broadly, we find that contrary to evidence from much of the rest of the continent, women actually report fewer concerns about losing their land, either due to individual disputes or collective expropriation.

Across all respondents, 43% report collective land tenure insecurity, while only 11.5% report individual insecurity.<sup>20</sup> The fear of the government expropriating land for either public use or private investors is quite salient for our respondents; the Land Matrix reports 85 large-scale land acquisitions in Mozambique, with several actually in Namarroi district and several others near Erati district. Tanner et al. (2009) argue that Mozambique’s land abundance has been framed as ‘unused’ land, which would be better utilized by large-scale private investors, despite historic patterns of shifting utilization within communities. Interestingly, and in contrast to most other work from Sub-Saharan Africa looking at tenure insecurity differences for men and women, men report higher levels

---

<sup>18</sup>This measure is constructed using historical road maps from Michelin, which Muller-Crepon et al. (2021) digitized and created a road atlas for all of Africa from 1966 to 2015, akin to a historical Google Maps. In Muller-Crepon (2021), he then estimates the shortest travel time via roads of different qualities to the district capital for each 5x5 km grid cell, and uses the inverse of travel time to the capital as a proxy of state reach in a local geography.

<sup>19</sup>We only use the first component in our regressions, as its eigenvalue is above 3 while the eigenvalues for all other components are below 1.

<sup>20</sup>PRINDEX, an initiative of Global Land Alliance and Overseas Development Institute, conducts nationally representative sample of adults 18 years or older to measure their perceptions and experiences with property rights and land tenure. PRINDEX findings in 2020 show that 24.0% of the adult population feels insecure in their land and property (Prindex, 2020). This is lower than our estimated rate of perceived collective tenure insecurity. However, this comparison should be interpreted with caution because PRINDEX estimate comes from a nationally representative survey (including urban areas), while ours come from two districts. In PRINDEX, 23% of rural residents feel insecure, with similar shares of men and women reporting insecurity.

Variable	(1)	(2)	(3)	(4)	Pairwise t-test		
	Control Mean/(SE)	Delimitation Mean/(SE)	Demarcation Mean/(SE)	Certification Mean/(SE)	(1)-(2)	(1)-(3)	(1)-(4)
Household Size	3.723 (0.048)	3.437 (0.081)	3.565 (0.100)	3.507 (0.085)	0.285***	0.158	0.216**
Association membership	0.492 (0.014)	0.386 (0.025)	0.300 (0.028)	0.338 (0.026)	0.106***	0.193***	0.154***
Husband absent in last 12 months	0.078 (0.008)	0.089 (0.016)	0.114 (0.020)	0.083 (0.016)	-0.011	-0.036*	-0.005
Wife absent in last 12 months	0.049 (0.007)	0.040 (0.011)	0.073 (0.017)	0.066 (0.015)	0.009	-0.024	-0.017
Has access to credit	0.270 (0.013)	0.183 (0.021)	0.179 (0.024)	0.240 (0.025)	0.087***	0.091***	0.030
Individual has savings account	0.170 (0.011)	0.093 (0.016)	0.110 (0.020)	0.077 (0.016)	0.078***	0.060**	0.093***
Owns ID	0.615 (0.015)	0.548 (0.028)	0.524 (0.032)	0.462 (0.029)	0.067**	0.091***	0.153***
Social Connectedness	0.750 (0.013)	0.737 (0.024)	0.691 (0.030)	0.722 (0.026)	0.013	0.059*	0.028
Political Connectedness	0.092 (0.009)	0.187 (0.022)	0.114 (0.020)	0.125 (0.020)	-0.095***	-0.022	-0.033*
HH has land inherited/gifted	0.139 (0.010)	0.055 (0.013)	0.073 (0.017)	0.066 (0.015)	0.084***	0.066***	0.073***
HH has land purchased	0.069 (0.008)	0.126 (0.018)	0.114 (0.020)	0.194 (0.023)	-0.057***	-0.045**	-0.125***
HH has land occupied/cleared	0.252 (0.013)	0.357 (0.027)	0.386 (0.031)	0.288 (0.027)	-0.105***	-0.134***	-0.036
HH has land borrowed	0.188 (0.012)	0.163 (0.021)	0.110 (0.020)	0.167 (0.022)	0.025	0.078***	0.022
Nonfarm activity	0.114 (0.010)	0.128 (0.019)	0.134 (0.022)	0.149 (0.021)	-0.015	-0.021	-0.036*
Wealth Index	-0.229 (0.051)	-0.076 (0.086)	-0.378 (0.091)	-0.094 (0.091)	-0.153	0.150	-0.134
N	1100	237	246	288			

Table 4: Descriptive statistics for respondents in villages that received different documentation treatments under *Terra Segura*. The value displayed for t-tests are the differences in the means across the groups. \*\*\*, \*\*, and \* indicate significance at the 1, 5, and 10 percent critical level, respectively. Association membership is a dummy equal to one if any member of the household is a member of an association. Husband or wife absent in last 12 months is a dummy equal to one if that spouse was reported as having migrated out of the household at all in the past 12 months. Has access to credit, savings account, and owns ID are each dummy variables. Social and Political connectedness are dummies equal to one if the household head actively participates in community issues or if the head or their relative ever held a position in community offices, respectively. The plot variables are dummies that take a value of one if any of the household's plots were acquired in the manner specified. Nonfarm activity is a dummy equal to one if any members of the household have significant nonfarm economic activity. The wealth index is constructed using principal components analysis on household assets.

Source: Authors' computation using data from LTS 2019



	(1)	(2)	(3)	(4)
	Collective Insecurity	Individual Insecurity	Collective Insecurity	Individual Insecurity
Female	-.0429185 (0.01)	-.0375107 (0.03)	-.035649 (0.00)	-.03902 (0.03)
Female household head			-.1192806 (0.10)	.0249355 (0.58)
Constant	.516591	.1517566	.5325794	.1484173
Observations	3224	3241	3223	3240
$R^2$	0.009	0.011	0.014	0.011
N	2054	2063	2053	2062
FE	Parcel	Parcel	Parcel	Parcel
Wild Cluster Bootstrap SE	Village	Village	Village	Village

p-values in parentheses constructed by Wild Cluster Bootstrap at the Village level

Table 5: Linear Probability Model estimated with the outcome of the individual’s perceived likelihood that the parcel in question will be lost due to collective expropriation or private plot disputes within the next five years, respectively, with parcel fixed effects; p-values in parentheses constructed by Wild Cluster Bootstrap at the village level. Each explanatory variable is a dummy, with female household head being the interaction of the respondent being female and living in a female-headed household.

Source: Authors’ estimation using data from LTS 2019.

of insecurity, both from collective and individual sources. In table 5, we can see that even on the exact same parcel, women are less likely to report that expropriation (by either the government in columns (1) and (3) or private disputes in columns (2) and (4)) is likely to occur in the next 5 years than their male partners are. By controlling for parcel fixed effects, we are identifying gender differences only using parcels held by households with both men and women, so that there is variation within the parcel in gender of respondent. These differences between men and women are statistically significant at the 1% level when thinking about the risk of collective expropriation; the difference is of a similar magnitude for individual insecurity, although only statistically significant at the 5% level. In columns (3) and (4), where we estimate effects separately for women in male-headed households (the first row) and women in female-headed household (the sum of the two coefficients), it appears that the most statistically significant differences are in collective insecurity between men and women in female-headed households; the lack of statistical significance for female-headed households is likely due to the small number of these households with a male adult (89) that are used in estimating the within-parcel effect here. Female household heads appear to perceive similar levels of individual insecurity to their female counterparts in male-headed households, perhaps because neither worry about losing land accessed through their own natal family in the event of divorce.

The LTS 2019 survey does not ask why individuals may be tenure insecure. However, in the Prindex data from Mozambique, 21% of those who report feeling insecure say the primary reason for their insecurity is that there may be disagreements with their family or relatives; 13% say that the owner or renter of the land may ask them to leave; 11% are primarily worried about government seizure; 9% about the death of a family member; 6% about a lack of money; 4% about seizure by

private companies; and only 2% about issues with customary authorities.

## 6.1 Predictors of Insecurity

Women report feeling less insecure than men do in these matrilineal regions of Mozambique. Given this unusual relationship, do other correlates of insecurity match what we would expect to see? Table 6 regresses individual perceptions of insecurity at the parcel level (either collective insecurity in columns (1) and (3) or individual insecurity in (2) and (4)) on a host of household-, individual-, and parcel-level correlates of insecurity. Each coefficient comes from a separate regression including only that variable and village fixed effects, to control for unobserved heterogeneity in insecurity between villages and restrict comparisons to households within a community. The majority of these have the expected sign (and often statistical significance), although we will note particularities below. Relationships are quite similar when we restrict our estimation to only control villages, as seen in table A2.<sup>21</sup>

Beginning with factors measured at the household level, we can see that as above, female-headed households report lower levels of individual and collective tenure insecurity. Wealthier households, as proxied either by a wealth index or the total area owned in hectares, are no more secure in their rights: these coefficients are not statistically significant. Households with greater social connection, measured through actively participating in community issues are weakly less insecure about collective threats to their tenure, but more concerned about individual threats: perhaps they are more involved because they worry about disputes arising, or are more aware of disputes among others in their community due to their participation. Also interestingly, households that have held positions in community offices or have close relatives who have feel more insecure about collective and individual threats. Households that have in the past received legal advice about land-related matters are not statistically more insecure.

Turning to individual-level factors, women (even those in male-headed households) feel less insecure than men, particularly about the likelihood of collective expropriation. The difference is larger here than within a couple asked about the same parcel, as estimated in table 5. The coefficient on female household head is negative and statistically significant for collective insecurity at the 5% level, but not for individual insecurity.

Other individual factors that seem to matter for tenure security are roughly as expected. More educated people are less worried about losing their land, either due to collective expropriation or private disputes, perhaps as they are confident in their ability to contest expropriation. Individuals with an identity card feel more concerned about collective expropriation, which is likely because they are more connected to the national context in Mozambique where there have been several high-profile cases of government and large-scale corporate expropriation. ID cards, on the other hand, seem to be unrelated to the likelihood of private disputes, which is consistent with these disputes being resolved through informal institutions. Individual participation in nonfarm labor activities is unrelated to tenure security.

---

<sup>21</sup>We use a series of simple linear regressions rather than multiple linear regression, as our goal is not to predict insecurity but rather to examine unconditional correlations.

Turing to features of the plot itself, having a formal document (DUAT) for the plot is associated with no changes for collective security, but it is statistically significantly related to a reduction in individual insecurity. Other legal documents (which are more common than DUATs), are positively correlated with collective insecurity (despite the fact that they can generally be used to defend claims in a court of law), but negatively and significantly correlated with the perceived likelihood of losing land due to private disputes. Unsurprisingly, plots that had faced disputes in the past are perceived as more likely to be lost to future disputes; this past history also holds for collective insecurity. Perhaps counterintuitively, plots that had boundaries clearly demarcated are statistically indistinguishable from those without in terms of both types of tenure security. Plots that had been surveyed, however, are less insecure to individual threats, and those that had been put up as collateral for a loan were seen as (statistically insignificantly) more likely to be lost.

Plots further from the household are less insecure, which is a puzzle: households may feel less able to defend claims further from their homestead, or expect government expropriation is more likely in ‘less occupied’ land further away from village centers. Interestingly, people feel roughly equally secure on land acquired from their family compared to land acquired in other means in regards to private disputes (which often arise within the family), but family land is more secure against collective expropriation. Relative to plots with poor or fair quality soil, good soil quality is associated with higher levels of insecurity from private disputes, but there is no relationship with collective expropriation. Classic theories of endogenous tenure security suggest that tree-planting and conservation structures help secure rights against others in the community; the positive correlation between trees on plots and the likelihood of private disputes may be due to individuals who feel less secure choosing to plant trees in response to their insecurity (in an attempt to shore up their social rights to the land). Similarly, fallowing has been suggested in West Africa as only possible on land securely held, with the potential to weaken rights to the land; however, we see no correlation between fallowing and the individual security of a given plot. Collective expropriation, by contrast, functions differently: trees are not recognized as a marker of property rights by the formal legal system, so they have no relationship with the likelihood of expropriation, but fallow plots may be seen by outsiders as ‘unused’ land available for expropriation. Unexpectedly, there is a negative correlation between ever having fallowed a plot and collective insecurity; however, relatively few plots are reported as ever being fallowed, and 80% of those that were are demarcated, which may mean they are more secure for other reasons.

### **6.1.1 Accessing Land**

Given that many correlates of insecurity are typical, we are inclined to believe that women’s greater security is a product of their social position in a matrilineal group. Therefore, it seems plausible that women feel relatively more secure on land that was accessed through (their own) family, rather than purchased, rented, or allocated by government officials. In table 7, we see that all respondents report fewer worries about collective expropriation and private disputes on land accessed through their families. Interestingly, however, women do not feel substantially more secure on family land than men do; the interactions of social position and family land parcels are not statistically significant.

	Collective Insecurity	Individual Insecurity
<b>Panel A: Household Characteristics</b>		
Female-headed household	-.0934479 (0.05)	-.0153789 (0.45)
Wealth Index	.0079589 (0.69)	.0076485 (0.22)
Total landholdings, ha	-.0127778 (0.65)	.011235 (0.12)
Social Connectedness	-.0549016 (0.17)	.1025833 (0.00)
Political Connectedness	.0882627 (0.01)	.1797085 (0.00)
Received Legal Advice	-.0711009 (0.14)	.0236382 (0.30)
<b>Panel B: Individual Characteristics</b>		
Female	-.0628532 (0.00)	-.0121846 (0.29)
Female household head	-.0803747 (0.03)	.0052058 (0.79)
Years of Schooling	-.0078432 (0.06)	-.0092176 (0.01)
Owns ID	.1305863 (0.00)	.0029547 (0.88)
Nonfarm activity	-.0176133 (0.72)	.0011513 (0.95)
<b>Panel C: Parcel Characteristics</b>		
Other document owned	.2513534 (0.00)	-.0980061 (0.00)
Had plot dispute	.222526 (0.03)	.1827377 (0.02)
Has DUAT	.0280416 (0.74)	-.0595663 (0.03)
Plot clearly demarcated	.016369 (0.76)	-.0363042 (0.13)
Plot surveyed	-.020018 (0.84)	-.0971219 (0.00)
Plot used as collateral	.279694 (0.15)	.1390217 (0.19)
Walking time to parcel	-.0008317 (0.16)	-.0003855 (0.08)
Acquired parcel from family	-.1415271 (0.00)	-.0184511 (0.52)
Plot has conservation structure	.0034605 (0.97)	.0714203 (0.07)
Plot has trees	.0145127 (0.64)	.0615286 (0.01)
Ever fallowed plot	-.2258812 (0.01)	.0451893 (0.14)
Good soil quality	.0552593 (0.12)	-.0845687 (0.00)
Observations	3223	3241
FE	Village	Village
Wild Cluster Bootstrap SE	20 Village	Village

Wild Village Cluster Bootstrapped p-values in parentheses

Table 6: Linear probability models estimated with the outcome of the individual's perceived likelihood that the parcel in question will be lost due to collective expropriation or private plot disputes, respectively. Each coefficient is from a separate bivariate regression, controlling for village fixed

	(1)	(2)	(3)	(4)
	Collective Insecurity	Individual Insecurity	Collective Insecurity	Individual Insecurity
Female Spouse	-.0522658 (0.00)	-.0240082 (0.11)	-.0472152 (0.11)	-.0243935 (0.56)
Male Spouse in Female-Headed HH	-.1738508 (0.07)	-.1387262 (0.02)	-.1486466 (0.24)	-.1473286 (0.10)
Female household head	-.1066972 (0.02)	-.0087829 (0.62)	-.1360228 (0.00)	-.0242391 (0.29)
Family land	-.1856665 (0.00)	-.0361767 (0.03)	-.1910661 (0.00)	-.042725 (0.09)
Female Spouse $\times$ Family land			-.0105108 (0.76)	.0011021 (0.98)
Male Spouse $\times$ Family land			-.0619289 (0.70)	.0206797 (0.67)
Female household head $\times$ Family land			.0624773 (0.41)	.0332167 (0.46)
Constant	.6204112	.1631018	.6228101	.1660255
Observations	3203	3219	3203	3219
$R^2$	0.042	0.007	0.043	0.008
FE	Village	Village	Village	Village
Wild Cluster Bootstrap SE	Village	Village	Village	Village

p-values in parentheses constructed by Wild Cluster Bootstrap at the village level

Table 7: Linear probability model estimated with the outcome of the individual's perceived likelihood that the parcel in question will be lost due to collective expropriation or private plot disputes, respectively, with village fixed effects and p-values constructed by Wild Cluster Bootstrap at the village level. Models (3) and (4) have respondent social position interacted with a dummy for if the parcel was assigned by relatives or inherited.

Source: Authors' estimation using data from LTS 2019.

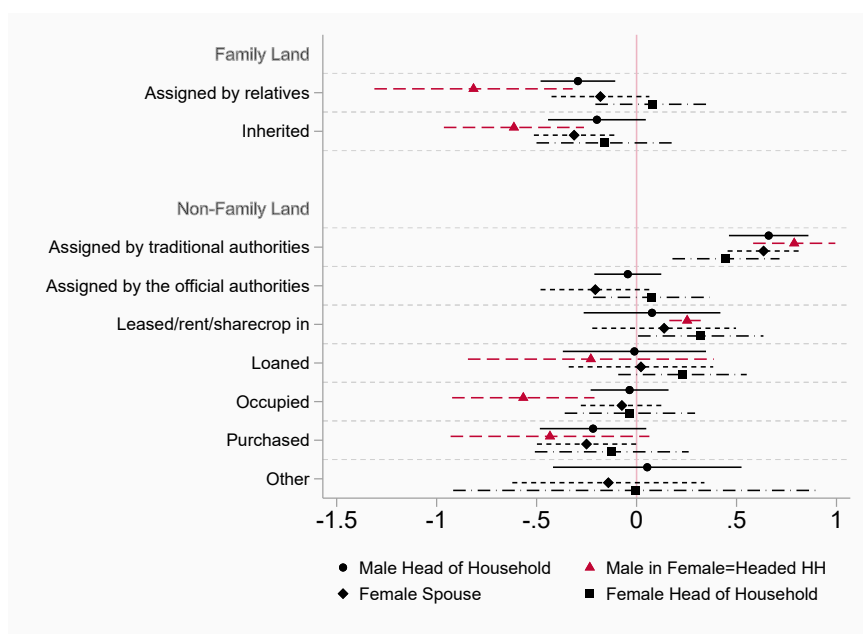


Figure 1: Coefficients from a linear probability model estimated with the outcome of the individual's perceived likelihood that the parcel in question will be lost due to collective expropriation regressed on dummies for different modes of acquisition, estimated separately for each of four respondent social position categories.

Source: Authors' estimation using data from LTS 2019.

The dummy variable used here, for land accessed through the family, contains both land assigned by relatives and land inherited. Therefore, in figure 1, we look separately at each of 9 ways in which parcels were accessed for each of our four respondent categories: male heads of household, their female spouses, female heads of household, and men in female-headed households. We begin to lose precision given the large number of splits, but we can see much greater collective insecurity for land assigned by traditional authorities. Nevertheless, contrary to our expectations, women's relative tenure security does not seem to be primarily experienced for land accessed through their own families in this matrilineal area.

### 6.1.2 Family Structure

Men and women's tenure security in customary systems often depends on their family circumstances, particularly private disputes that may emerge. To examine these patterns, we look at the number and gender of children of the household head, as well as the migration experiences of the primary couple in the past 12 months. In table 8, we find that controlling for the number of children or the number of male and female children separately have no correlation with collective insecurity. By contrast, having more children (both male and female) is associated with a higher risk of losing land due to private disputes (perhaps because these additional children could dispute their claims to land from their parents). Nevertheless, controlling for children in columns (2) and (4) does not change the gender difference in insecurity; in column (6) we additionally see that the relationship between

children and insecurity does not depend on the respondent's gender, as seen by the insignificant interaction terms.

In table 9, we control for the migration history of the primary couple in the household. In columns (1) and (2), we find that controlling separately for whether the husband or wife had been absent from the household in the last 12 months does not change the estimated gender differences in insecurity. We also find, consistent with table 8, that migration is uncorrelated with collective insecurity overall, but the wife's absence is correlated with higher individual insecurity. It seems plausible that if land has been accessed through the woman's family, her presence helps secure those rights within the community. In columns (3) and (4), where we differentiate the migration relationship by social position in the household, we interestingly see that women with their husband absent feel less worried about collective expropriation; female headed households with the wife absent have higher collective insecurity. In column (4), the positive coefficient on the husband being absent is almost precisely netted out by its interaction with the female respondent, which is true for the vast majority of households where the husband is absent.

### 6.1.3 Experiences losing land

The LTS 2019 survey also asks a number of questions about experiences losing land in the past; we explore how these shape current worries about losing land and the gender difference we document in table 10. In columns (1) and (2), we control for dummies equal to one if the household reported ever losing a parcel due to a private dispute and if the household reported having land confiscated by the government. These controls do not change the gender differences in tenure security, reassuringly. The first of these, experience with private disputes, has no relationship with collective insecurity but a strong positive correlation with individual insecurity that is statistically significant at the 5% level, as expected. Surprisingly, though, household experience with government confiscation of parcels is significantly negatively correlated with both collective and individual insecurity. This is counter to expectations, and the effect is particularly marked for female-headed households in columns (3) and (4). Only 8% of households report this experience, although they are distributed among the villages.

## 6.2 Gendered Awareness of Threats

Although it is unusual that men report higher levels of insecurity than women in this data, it may be that men have more information than women in a patriarchal society and therefore are more accurately reporting the risks to their land. The fact that the perceived likelihood of collective expropriation is particularly high for men could reflect men's greater awareness of government expropriation elsewhere. Even if women's land rights are relatively protected under a matrilineal customary system, they may be underestimating the risks they face due to a lack of information. Could women feel more secure than men do, simply because they are less aware of the threats they face?

We cannot entirely rule this out, as we have no objective measure of the probability that individuals or households will in fact lose their land in the future due to private disputes or collective expropriation. However, there is some suggestive evidence against the gender divergence being solely

	(1)	(2)	(3)	(4)	(5)	(6)
	Collective Insecurity	Individual Insecurity	Collective Insecurity	Individual Insecurity	Collective Insecurity	Individual Insecurity
Female	-.0444799 (0.00)	-.0116213 (0.37)	-.0433037 (0.00)	-.0127905 (0.31)	-.0106221 (0.80)	.0064466 (0.71)
Number of children	.0362484 (0.22)	.0469375 (0.03)				
Number of male children			-.0354757 (0.24)	.0365134 (0.03)	-.0447765 (0.22)	.0531285 (0.03)
Number of female children			.0460116 (0.29)	.0330504 (0.02)	.0377523 (0.41)	.0388742 (0.00)
Female × Num Male Children					-.0071259 (0.87)	-.0099587 (0.64)
Female × Num Female Children					-.0339691 (0.23)	-.0218942 (0.13)
Female-headed household	-.0674792 (0.15)	-.0012651 (0.95)	-.0764865 (0.13)	.0046202 (0.81)	-.174338 (0.02)	.0149587 (0.63)
Female-headed HH × Num Male Children					.0533856 (0.19)	-.0554803 (0.22)
Female-headed HH × Num Female Children					.1257226 (0.23)	.0271519 (0.38)
Constant	.5019753	.1018536	.5262147	.0942819	.5361142	.0804139
Observations	3223	3240	3223	3240	3223	3240
$R^2$	0.008	0.004	0.010	0.007	0.013	0.008
FE	Village	Village	Village	Village	Village	Village
Wild Cluster Bootstrap	Village	Village	Village	Village	Village	Village

p-values in parentheses constructed by Wild Cluster Bootstrap at the Village level

Table 8: Linear probability model estimated with the outcome of the individual's perceived likelihood that the parcel in question will be lost due to collective expropriation or private plot disputes, respectively, with village fixed effects and p-values constructed by Wild Cluster Bootstrap at the village level. Models (1) and (2) control for the number of children of the household head; models (3) and (4) distinguish between male and female children, and (5) and (6) interact the number of male and female children with dummies for the respondent being female and the household head being female.

Source: Authors' estimation using data from LTS 2019.



	(1)	(2)	(3)	(4)
	Collective Insecurity	Individual Insecurity	Collective Insecurity	Individual Insecurity
Female	-.0430328 (0.00)	-.0128875 (0.26)	-.0308213 (0.04)	-.0019874 (0.84)
Female-headed household	-.0773143 (0.09)	-.0147243 (0.44)	-.0888456 (0.08)	-.0114378 (0.42)
Husband absent from HH in last 12 months	-.0109405 (0.79)	.0494768 (0.22)	.0799588 (0.13)	.1310717 (0.01)
Wife absent from HH in last 12 months	.0467592 (0.34)	.1906528 (0.01)	-.0195739 (0.81)	.1824871 (0.12)
Female × Husband Absent			-.1471972 (0.01)	-.1277262 (0.01)
Female × Wife Absent			.0132362 (0.83)	.0139823 (0.87)
Female-headed Household × Husband Absent			-.0176786 (0.92)	-.0895376 (0.39)
Female-headed Household × Wife Absent			.1691413 (0.06)	-.0136597 (0.87)
Constant	.5304331	.1295177	.5257241	.123305
Observations	3223	3240	3223	3240
$R^2$	0.008	0.017	0.011	0.021
FE	Village	Village	Village	Village
Wild Cluster Bootstrap	Village	Village	Village	Village

p-values in parentheses constructed by Wild Cluster Bootstrap at the village level

Table 9: Linear probability model estimated with the outcome of the individual's perceived likelihood that the parcel in question will be lost due to collective expropriation or private plot disputes, respectively, with village fixed effects and p-values constructed by Wild Cluster Bootstrap at the village level. Models (1) and (2) control for the dummies indicating if either the husband or wife was absent from the household in the past 12 months; models (3) and (4) interact these migration experiences with dummies for the respondent being female and the household head being female. Source: Authors' estimation using data from LTS 2019.

	(1)	(2)	(3)	(4)
	Collective Insecurity	Individual Insecurity	Collective Insecurity	Individual Insecurity
Female	-.0433962 (0.00)	-.0126128 (0.32)	-.0396671 (0.01)	-.0041549 (0.71)
Female-headed household	-.0734008 (0.08)	-.0085499 (0.64)	-.0556665 (0.23)	-.0066222 (0.77)
HH lost land due to private dispute	-.0082691 (0.89)	.3484324 (0.06)	-.0424017 (0.48)	.3681227 (0.04)
HH had land confiscated by government	-.1865757 (0.01)	-.0481145 (0.02)	-.0870763 (0.07)	.012273 (0.75)
Female			-.0283599 (0.81)	-.1101701 (0.12)
× HH Lost land to private dispute				
Female-headed HH			.3052158 (0.12)	.261096 (0.37)
× HH lost land to private dispute				
Female			-.0834979 (0.17)	-.0716135 (0.15)
× HH had land confiscated by gov				
Female-headed HH			-.286981 (0.02)	-.114995 (0.04)
× HH had land confiscated by gov				
Constant	.5483825	.1323243	.5430387	.1274392
Observations	3223	3240	3223	3240
$R^2$	0.017	0.040	0.025	0.045
FE	Village	Village	Village	Village
Wild Cluster Bootstrap	Village	Village	Village	Village

p-values in parentheses constructed by Wild Cluster Bootstrap at the village level

Table 10: Linear probability model estimated with the outcome of the individual's perceived likelihood that the parcel in question will be lost due to collective expropriation or private plot disputes, respectively, with village fixed effects and p-values constructed by Wild Cluster Bootstrap at the village level. Models (1) and (2) control for the household's past experiences with land disputes: a dummy for if the household had lost land due to a private dispute, and a dummy for if the household had land confiscated by the government. Models (3) and (4) interact these experiences with dummies for the respondent being female and the household head being female.

Source: Authors' estimation using data from LTS 2019.

driven by women being less-informed. First, in table 5, although both men and women report higher levels of collective insecurity than private disputes, the magnitude of the difference in perceptions between men and women on the same parcel is remarkably similar for each source of insecurity, with women around 4 percentage points less likely to believe they will lose their plot in the next five years. If women are less informed than men, we would expect their information to be relatively better about disputes and conflicts within their community rather than cases of government expropriation, so there would be a greater divergence in collective insecurity.

Additionally, in a 2015 survey asking similar questions across seven provinces in Mozambique, including both patrilineal and matrilineal descent systems, Ghebru and Girmachew (2019) find that nationally, female spouses are more insecure than male heads of households. This divergence from our results is important: if women feel more secure because they lack information about threats to their land, this should apply equally if not more strongly in patrilineal areas where traditionally, land is not considered to ‘belong’ to women. They also find that although the largest threat to women’s tenure security is collective expropriation, within the same household, women perceive their tenure to be more at risk from individual disputes: perhaps accurately, as these disputes often emerge in cases of divorce or widowhood, when women in patrilineal areas archetypically lose their rights to land accessed through their husband.

Within the LTS 2019 data from primarily matrilineal areas, we can also explore whether women’s perceived tenure security results from their lack of engagement with the formal legal system. First, we can look at whether women with legal identification (a direct result of engagement with the state; also a proxy for awareness of issues outside of the local community) are more or less likely to feel secure than women without ID cards. In our sample, 50% of respondents have ID cards – but only 36% of women. In table 11, we can see in column (1) that individuals who have an ID card do indeed worry more about collective expropriation (but not individual disputes in column (2), which largely happen within the community). However, controlling for this reduces the gender difference in collective insecurity, which is no longer statistically significant for female spouses, and only significant at the 10% level for female heads of household (in comparison with male heads of household, the reference category). In column (3), when we interact ID card ownership with our respondent categories, men in female headed households with ID cards are significantly less insecure than male household heads, and there is no difference in collective insecurity between women with and without ID cards, which is not what we would expect to see if the differences were primarily driven by less-informed women feeling (naively) secure about collective threats to their land.

Finally, in thinking about whether women feel more secure simply due to their (lack of) awareness of threats, we can look at differences in beliefs about the efficacy of different methods of protecting against external threats. Because, as will be discussed later, these outcomes are particularly likely to have been affected by the various *Terra Segura* interventions, we restrict our sample to only control villages in columns (3) and (4). In the first and third columns of table 12, we regress a dummy for believing that having a legal document makes a plot more secure on our respondent categories; in columns (2) and (4) the outcome is whether an individual is interested in applying for a plot boundary certificate (another legal document which can testify to land rights against external collective and individual threats). We can see that female spouses are no more likely than

	(1)	(2)	(3)	(4)
	Collective Insecurity	Individual Insecurity	Collective Insecurity	Individual Insecurity
Female Spouse	-.0150158 (0.36)	-.0252747 (0.14)	-.0109035 (0.66)	-.0166512 (0.36)
Male Spouse in Female-Headed Household	-.1475102 (0.09)	-.1376725 (0.02)	-.0254372 (0.79)	-.15495 (0.02)
Female household head	-.0732663 (0.07)	-.0106784 (0.56)	-.0572866 (0.12)	.0060724 (0.75)
Owens ID	.1204139 (0.00)	-.0041299 (0.87)	.133143 (0.01)	.0065084 (0.78)
Female Spouse $\times$ Owens ID			.00016 (1.00)	-.0150743 (0.39)
Male Spouse $\times$ ID			-.2629725 (0.07)	.0429773 (0.67)
Female head $\times$ ID			-.0329063 (0.66)	-.0373292 (0.07)
Constant	.4557981	.1485332	.447263	.141442
Observations	3221	3238	3221	3238
$R^2$	0.022	0.005	0.024	0.005
FE	Village	Village	Village	Village
Wild Cluster Bootstrap SE	Village	Village	Village	Village

p-values in parentheses constructed by Wild Cluster Bootstrap at the village level

Table 11: Linear probability model estimated with the outcome of the individual's perceived likelihood that the parcel in question will be lost due to collective expropriation or private plot disputes, respectively, with village fixed effects and p-values constructed by Wild Cluster Bootstrap at the village level. Models (1) and (2) control for if the respondent has a government ID, while (3) and (4) interact this with the respondent's social position.  
Source: Authors' estimation using data from LTS 2019.

	(1)	(2)	(3)	(4)
	Having legal document makes plot more secure	Interest in applying for plot boundary certificate	Having legal document makes plot more secure	Interest in applying for plot boundary certificate
Female Spouse	-.0097798 (0.63)	.0030493 (0.70)	-.0072397 (0.71)	.0006087 (0.94)
Male Spouse in Female-Headed HH	-.2685184 (0.00)	-.1387088 (0.00)	-.2626623 (0.01)	-.0956706 (0.01)
Female household head	-.0799714 (0.00)	-.0609803 (0.01)	-.0779051 (0.01)	-.0569922 (0.05)
Constant	.8627765	.856511	.8686442	.8691871
Observations	2671	2666	1498	1493
$R^2$	0.017	0.007	0.018	0.005
FE	Village	Village	Village	Village
Wild Cluster Bootstrap sample	Village	Village	Village	Village
	All Villages	All Villages	Control Villages	Control Villages

Wild Village Cluster Bootstrapped p-values in parentheses

Table 12: Linear probability model estimated with the outcome of the individual’s belief that having a legal document makes a given plot more secure (in columns (1) and (3)) or their interest in applying for a plot boundary certificate for the plot in question (in column (2) and (4)), with village fixed effects and p-values constructed by Wild Cluster Bootstrap at the village level. Columns (1) and (2) use the full model, while (3) and (4) only use control villages. Source: Authors’ estimation using data from LTS 2019.

their male heads of household to feel that legal documents protect their rights against collective expropriation; neither are they any more or less interested in applying for a certificate for their own plots. However, female household heads and their male spouses are significantly less likely to believe in the importance of legal documents or express interest in a plot boundary certificate than male-headed households. The share of respondents answering ‘yes’ to each of these questions is relatively high, but it does not seem to indicate differential awareness of strategies to protect land rights among men and women, although perhaps between household types.

Therefore, it seems unlikely that the observed relative security of women’s land rights compared to men’s in this area is solely driven by women’s lack of information about (particularly external) threats. Instead, we would argue, it reflects women’s position within a matrilineal kinship system, as members of the broader kinship group that holds ultimate rights to the land. This is consistent with work by other scholars, such as Gottlieb (2016), who finds that land inherited matrilineally is key to women’s empowerment within the household.

## 7 Continuum of Documentation

We do not have sufficient information about the implementation of the *Terra Segura* program’s actual activities in treated communities, nor how communities were selected by the Government of Mozambique, in order to make strong claims about the impacts of these treatments. Nevertheless, it is worth considering how interventions along the continuum of documentation are correlated with perceptions of individual and collective tenure security.

The first step along the continuum of documentation is community-level delimitation of rights, which was carried out in all three treated communities in Namarroi district. This delimitation, according to Tanner et al. (2009), does not establish a new right to the land (which is recognized

under the constitution and Land Law of 1997), and does not entail full survey precision, but instead creates a ‘Certificate of Delimitation’ that maps out the limits of the community and gives community DUAT, confirming the community as a whole as the land management entity responsible for the resources within its borders, including dispute resolution. Importantly, it does not delineate individual parcels, land uses, or rights within the community. This certificate also establishes the community to be consulted when external interests (such as the government or private investors) seek to use local land. Community delimitation thus should help protect customary land rights against external threats, which as we saw previously, is a substantial concern for 49% of our sample.

Household plot demarcation, the next step along the continuum of documentation, is much more costly, involving placing markers around the (agreed-upon) boundaries of a plot (Tanner et al., 2009). This requires additional surveying, with greater precision, and the agreement of community members as to who has rights to a given plot, although it does not necessarily result in any formal documentation of rights. Household plot demarcation happened in T2 and T3 communities, although it appears not to have been systematic for all plots in the community: only 59% of plots in these communities have boundaries clearly demarcated. This demarcation seems likely to be more important in addressing private plot disputes rather than large-scale expropriation; only 12.5% of our sample were worried about the likelihood of losing their land due to private plots disputes. Even without government action, individuals can demarcate plot boundaries themselves: in control communities, 53.8% of parcels had their boundaries clearly marked.

Finally, only one of our communities, T3, received community delimitation, household plot demarcation, and had land certificates issued through the *Terra Segura* program. However, fewer than 5% of respondents or parcels in T3 actually had DUAT in 2019; a similar share report other legal plot ownership documents such as sales agreements, wills, or building permits. Full certification (issuance of a DUAT) is relatively expensive, even compared to plot demarcation, as it requires accurate surveying plus recording and legal document issuance. However, being able to call upon a DUAT in case of dispute, either individual plot disputes with neighbors, or government expropriation for public use or private investors, is a strong legal security.

In tables 13 and 14, we can see correlations with each of the three treatments. We present correlations unconditional on any controls or matching procedure in columns (1) and (3) of each table, given our lack of information on how treatment communities were chosen. In columns (2) and (4), we control for the first principal component of a suite of geospatial measures: population density, travel time to the district capital, market access, and the distance to the nearest large scale land acquisition recorded in the Land Matrix.<sup>22</sup> We also control for individual characteristics, including the household size, a wealth index, the husband’s highest level of education completed,<sup>23</sup> and a dummy equal to one if the respondent owns an ID card. These controls explore whether conditional on observables (including geographic features that interviews suggest may have determined treatment locations), the treatments have any relationship with our outcomes of interest.

---

<sup>22</sup>We use PCA due to the high degree of multicollinearity in these measures, which are measured at the village level.

<sup>23</sup>We use husband’s education rather than respondent’s education as we are trying to control for village-level features that may have determined treatment; despite the matrilineal nature of these communities, the patriarchal power system means that men are the primary points of contact for government officials who may be deciding where to document land rights Peters (2010).

In table 13, we present intermediate outcomes: whether the plot boundary is clearly demarcated (which should be positively affected in T2 and T3 where household demarcation occurred), and whether or not any household member has a DUAT for the plot (which should be affected in T3, where land certificates were issued). Interestingly, it appears that even community-level delimitation (all 3 communities) is positively correlated with plot boundary demarcation, as is *Terra Segura*-sponsored household plot demarcation in the community, although these results are not statistically significant when controls are added in column (2). The village which saw land certificates issued in addition to household plot demarcation, however, appears to have a lower share of plots with boundaries clearly marked than the other two treated villages; indeed, we cannot statistically distinguish the share in T3 from the share in control communities. A similar pattern can be observed in column (3), where all treated communities are more likely than control to have DUATs; it might be expected that only T3 would see more certification. Here again, households in T3 are less likely than those in T2 (which only had plot demarcation and no efforts at certification) to have DUATs, although they are more likely than those in control communities. When controls are added in column (4), community delimitation is associated with a lower likelihood of having a DUAT, but interestingly, the village where certificates was issued has an even lower share.

These patterns of intermediate outcomes are interesting for two reasons. First of all, it appears that even a more minimal intervention by the state in documenting land rights, namely community delimitation, is correlated with individuals taking steps to document their individual rights to particular parcels, even if those are costly. Secondly, it appears that *Terra Segura*'s efforts to issue land certificates was less successful in the T3 community. Whether this is due to issues in carrying out the certification, or idiosyncracies of this community, is unknown, but this is a key caveat in thinking about the correlates of certification.

In table 14, we turn to perceived insecurity in villages that received different interventions. Interestingly, community delimitation (which theoretically has a stronger role in protecting against external expropriation than disputes within the community) is negatively correlated with individual insecurity in column (1). Perhaps this is mediated by the individual security-enhancing actions people in delimited communities undertake on their own, such as boundary demarcation and applying for a DUAT; however, even when we control for these intermediate outcomes, the negative correlation with community delimitation and individual insecurity remains (results available upon request). However, the statistical significance is lost when controls for geographic and individual characteristics are added. Equally interesting, household plot demarcation has no additional correlation with individual insecurity above that of community delimitation in column (1), and in the certification village the correlation is attenuated slightly. This is despite the fact that T2 and T3 have interventions aimed more directly at individual insecurity than T1 is. However, legal certification of rights as provided in T3 may be less useful in disputes within communities. Results in column (2) with controls are weaker, with only a marginally significantly higher likelihood of individual insecurity in the T2 villages.

Columns (3) and (4), finally, look at perceived collective insecurity to government or private investor expropriation. Here, correlations with each step along the continuum of documentation are consistent with the theoretical justification: community delimitation, which provides a community-

VARIABLES	(1) Parcel Boundary Demarcated	(2) Demarcated	(3) DUAT for Plot	(4) DUAT for Plot
Community Delimitation	0.0504** (0.0247)	0.0231 (0.0379)	0.0318*** (0.0109)	-0.0980*** (0.0261)
Household Plot Demarcation	0.0838*** (0.0307)	0.0443 (0.0343)	0.0325* (0.0169)	-0.00825 (0.0209)
Land Certificates Issued	-0.172*** (0.0324)	-0.137*** (0.0327)	-0.0431** (0.0169)	-0.0364* (0.0192)
Constant	0.538*** (0.0122)	0.298*** (0.0383)	0.0278*** (0.00388)	0.102*** (0.0185)
Observations	3,093	2,603	3,249	2,746
R-squared	0.011	0.111	0.012	0.077
SE	HC3	HC3	HC3	HC3
Geographic Controls	No	Yes	No	Yes
Individual Controls	No	Yes	No	Yes
T2 vs control p-value	1.01e-07	0.151	4.35e-06	0.00262
T3 vs control p-value	0.153	0.120	0.0528	6.63e-06

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 13: Linear probability model estimated with the outcomes in columns (1) and (2), a dummy for the plot boundary being clearly demarcated; or in columns (3) and (4), a dummy for any household member having a DUAT certificate for the plot, with HC3 robust standard errors. The explanatory variables are dummies for if the village had the intervention named: community delimitation, household plot demarcation, and land certificates issued. Note that each of these represents the marginal ‘effect’ of the intervention listed, so T2 will have a value of 1 for community delimitation and household plot demarcation; T3 will have a value of 1 for all three dummies. Columns (2) and (4) control for the first principal component of geospatial measures, as well as household size, a PCA-constructed wealth index, the education level of the husband, and a dummy equal to one if the respondent owns an ID card.

Source: Authors’ estimation using data from LTS 2019.



VARIABLES	(1)	(2)	(3)	(4)
	Individual Insecurity		Collective Insecurity	
Community Delimitation	-0.0860*** (0.0149)	-0.0101 (0.0223)	-0.153*** (0.0244)	-0.0689* (0.0384)
Household Plot Demarcation	-0.0147 (0.0169)	0.0343* (0.0196)	0.0321 (0.0317)	0.0932** (0.0365)
Land Certificates Issued	0.0334* (0.0186)	0.00831 (0.0196)	-0.0969*** (0.0325)	-0.122*** (0.0348)
Constant	0.170*** (0.00887)	0.0452* (0.0263)	0.566*** (0.0117)	0.485*** (0.0382)
Observations	3,241	2,739	3,224	2,725
R-squared	0.016	0.064	0.029	0.059
SE	HC3	HC3	HC3	HC3
Geographic Controls	No	Yes	No	Yes
Individual Controls	No	Yes	No	Yes
T2 vs control p-value	0	0.403	4.27e-06	0.616
T3 vs control p-value	7.01e-05	0.249	0	0.0304

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 14: Linear probability model estimated with the outcomes: in columns (1) and (2) the individual’s perceived likelihood that the parcel in question will be lost due to private plot disputes or in columns (3) and (4) due to collective insecurity, with HC3 robust standard errors. The explanatory variables are dummies for if the village had the intervention named: community delimitation, household plot demarcation, and land certificates issued. Note that each of these represents the marginal ‘effect’ of the intervention listed, so T2 will have a value of 1 for community delimitation and household plot demarcation; T3 will have a value of 1 for all three dummies. Columns (2) and (4) control for the first principal component of geospatial measures, as well as household size, a PCA-constructed wealth index, the education level of the husband, and a dummy equal to one if the respondent owns an ID card.

Source: Authors’ estimation using data from LTS 2019.

level DUAT that documents the community’s right to be consulted when external interests seek to use land, is correlated with lower worries about external expropriation. Plot demarcation within the village, which does not provide any documentation that is legible to outsiders, is not correlated with any significant additional reduction in collective insecurity above that from community delimitation in column (3); when controls are added in column (4), demarcation of plots is associated with an attenuation of the delimitation relationship. However, the village which received DUATs through *Terra Segura* does, on average, have lower collective insecurity than that which would be predicted by only the community delimitation.

These results should not be read as causal impacts of the *Terra Segura* interventions, as we do not know how locations were selected for treatment and what determined how far along the continuum of documentation each community progressed. However, it seems plausible that communities facing the most insecurity demanded government action to protect their rights; the fact that after delimitation, demarcation and/or certification, these communities felt more secure about the likelihood of losing their land to either individual or collective threats is encouraging.

## 7.1 Gender and the Continuum of Documentation

Do these correlations with government documentation of land rights hold for all members of the population? In table 15, we interact each of the treatments (delimitation, demarcation and certification) with each of our respondent types (female spouse, male in female-headed household, and female head of household, with male heads of household as the reference category). In column (1), which looks at individual insecurity, we see that community delimitation is negatively correlated with insecurity overall, although this effect is almost precisely netted out for men and women in female-headed households. Plot demarcation, although insignificant overall in table 14, does appear to be slightly positively correlated with individual insecurity for men in female-headed households; this does not hold for their female household heads. A similar pattern emerges with the opposite signs for certification, where men in female-headed households feel more secure in a village that has experienced certification.

In column (2), our outcome is collective insecurity, with a similar specification. Here we find few significant differences in correlations between documentation interventions and collective insecurity for different types of respondents. The notable exception is female-headed households actually feel more insecure if their community has experienced community delimitation (particularly the men in these households), as compared with male household heads who feel a greater sense of security against collective threats. We caution against interpreting any of these regression results with too much confidence, as we are splitting the sample quite finely for, say, men in female-headed households in the T3 community and are likely to lose precision. However, results are broadly similar when we split along only respondent gender or household head gender, respectively.

Despite the fact that these interventions occurred in matrilineal areas, the traditional norms are still patriarchal, where men primarily make decisions about land even if the rights are held jointly or through the woman’s family. Therefore, the process of formally documenting rights could actually strengthen the land rights of men, making them more permanent than under the customary system.

VARIABLES	(1) Individual Insecurity	(2) Collective Insecurity
Female Spouse	-0.0336* (0.0198)	-0.0763*** (0.0258)
Male Spouse in Female-Headed Household	-0.193*** (0.0137)	-0.244*** (0.0720)
Female Household Head	-0.0355 (0.0264)	-0.161*** (0.0352)
Community Delimitation	-0.107*** (0.0233)	-0.219*** (0.0371)
Delimitation × Female Spouse	0.00656 (0.0323)	0.0666 (0.0553)
Delimitation × Male Spouse	0.107*** (0.0233)	0.439** (0.190)
Delimitation × Female Household Head	0.0792* (0.0452)	0.199*** (0.0672)
Household Plot Demarcation	-0.0176 (0.0258)	0.0580 (0.0482)
Demarcation × Female Spouse	0.0234 (0.0363)	-0.0113 (0.0716)
Demarcation × Male Spouse	0.684* (0.409)	0.00866 (0.446)
Demarcation × Female Household Head	-0.0507 (0.0487)	-0.101 (0.0871)
Certification	0.0305 (0.0278)	-0.0696 (0.0497)
Certification × Female Spouse	0.0105 (0.0419)	-0.0109 (0.0743)
Certification × Male Spouse	-0.697* (0.409)	-0.439 (0.421)
Certification × Female Household Head	0.0395 (0.0537)	-0.0653 (0.0892)
Constant	0.193*** (0.0137)	0.624*** (0.0168)
Observations	3,241	3,224
R-squared	0.026	0.041
SE	HC3	HC3

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 15: Linear probability model estimated with the outcome of the individual’s perceived likelihood that the parcel in question will be lost due to collective expropriation or private plot disputes, respectively, with HC3 robust standard errors. The explanatory variables are dummies for if the village had the intervention named: community delimitation, household plot demarcation, and land certificates issued, interacted with respondent categories. Note that each of these represents the marginal ‘effect’ of the intervention listed, so T2 will have a value of 1 for community delimitation and household plot demarcation; T3 will have a value of 1 for all three dummies. These treatment dummies are interacted with the respondent’s social position (gender, household head gender, and a dummy for being a female head of household).

Source: Authors’ estimation using data from LTS 2019.

This could also help explain the fact that community delimitation is associated with a reduction in individual insecurity. The delimitation process does not just make customary rights legible to outsiders, but may shore up men’s claims to land within the community.

## 8 Conclusion

There is a long tradition in economics of thinking about the importance of tenure security, particularly for agricultural investment, productivity, and welfare. Tenure insecurity, whether stemming from fears of private disputes or government (or private investor) expropriation, can prevent farmers from investing in their land and making the most productive use of it. However, customary tenure systems in much of Sub-Saharan Africa present additional layers of complexity, with overlapping rights being held by members of larger communities than the individual or nuclear household, as well as important intra-household dimensions of land rights. Documenting and enforcing rights to land is one of the most fundamental roles of the state, but absolute notions of ‘title’ are often a poor fit for flexible, changing, and relational customary rights.

Using data from a very detailed survey of land rights and tenure security from Mozambique, we document that in a matrilineal customary system, women feel less worried about losing their land than men do. This difference is particularly notable for concerns about collective expropriation, either by the government or private investors. We probe this unusual finding, and find that it holds both for female spouses and female heads of household, but other correlates of insecurity are largely as expected and do not seem to differ by or mediate the gender difference. This is itself a contribution: very little other quantitative work on tenure security has looked explicitly at matrilineal areas, despite 15% of societies in Sub-Saharan Africa practicing matrilineal kinship.

Secondly, we examine villages in which a variety of land rights documentation interventions were carried out, ranging from community delimitation, to individual parcel demarcation, to formal certification of rights. This continuum of documentation efforts allows us to see how well different interventions match the existing forms of tenure insecurity, and what is needed to address fears about losing land. We find that relatively inexpensive and flexible community-level delimitation is correlated with a significant reduction in insecurity stemming both from collective and individual threats.

Although this work is primarily descriptive, it does suggest several policy implications. First, community-level delimitation seems to be a relatively cost-effective way to protect the tenure security of communities against outside threats, and perhaps even individual disputes within the community. This form of documentation makes customary rights legible to outsiders, while preserving the flexibility of customary tenure systems for adapting to changing circumstances within the community. Secondly, even this light-touch documentation can shape customary institutions, and in particular the relative rights of men and women. If not carried out with a sensitivity to the unique relationships of a matrilineal kinship system, the process of documentation could be used by men to solidify their individual rights at the expense of women and their matrilineage.

## References

- A. Abdulai, V. Owusu, and R. Goetz. Land tenure differences and investment in land improvement measures: Theoretical and empirical analyses. *Journal of Development Economics*, 96(1):66–78, 2011. Publisher: Elsevier B.V.
- R. I. Adam, M. d. L. Quinhentos, P. Muindi, and J. Osanya. Gender relations along the maize value chain in Mozambique. *Outlook on Agriculture*, 49(2):133–144, 2020.
- A. Alesina, B. Brioschi, and E. La Ferrara. Violence against women: A cross-cultural analysis for Africa, 2016.
- A. Ali, A. Abdulai, and R. Goetz. Impacts of tenancy arrangements on investment and efficiency: evidence from Pakistan. *Agricultural Economics*, 43:85–97, 2012.
- D. A. Ali, K. Deininger, and M. Duponchel. Using Administrative Data to Assess the Impact and Sustainability of Rwanda’s Land Tenure Regularization, 2016. ISBN: 1813-9450.
- W. Andeew, M. Boche, T. Brey, M. Giger, J. Lay, P. Messerli, and K. Nolte. Transnational Land Deals for Agriculture in the Global South: Analytical Report based on the Land Matrix Database. Technical report, International Land Coalition, 2012.
- C. D. Arnot, M. K. Luckert, and P. C. Boxall. What is tenure security? Conceptual implications for empirical analysis. *Land Economics*, 87(2):297–311, 2011.
- M. Barry and E. K. Danso. Tenure security, land registration and customary tenure in a peri-urban Accra community. *Land Use Policy*, 39:358–365, 2014. Publisher: Elsevier Ltd.
- M. F. Bellemare. Insecure Land Rights and Share Tenancy: Evidence from Madagascar. *Land Economics*, 88(1):155–180, 2012. ISSN 0023-7639. doi: 10.1353/lde.2012.0006. ISBN: 0023-7639.
- E. Berge, D. Kambewa, A. Munthali, and H. Wiig. Lineage and land reforms in Malawi: Do matrilineal and patrilineal landholding systems represent a problem for land reforms in Malawi? *Land Use Policy*, 41:61–69, 2014. ISSN 02648377. doi: 10.1016/j.landusepol.2014.05.003. URL <http://dx.doi.org/10.1016/j.landusepol.2014.05.003>. Publisher: Elsevier Ltd ISBN: 0264-8377.
- M. Bezaib, S. Holden, and A. Mannberg. The Role of Land Certification in Reducing Gaps in Productivity between Male- and Female-Owned Farms in rural Ethiopia. *Journal of Development Studies*, 52(3):360–376, 2016. ISSN 17439140. doi: 10.1080/00220388.2015.1081175. URL <http://dx.doi.org/10.1080/00220388.2015.1081175>. Publisher: Routledge.
- L. J. Bonate. Matriliney, Islam and Gender in Northern Mozambique. *Journal of Religion in Africa*, 36(2), 2006.
- A. S. Brasselle, F. Gaspart, and J.-P. Platteau. Land tenure security and investment incentives: Puzzling evidence from Burkina Faso. *Journal of Development Economics*, 67(2):373–418, 2002.

- C. Bros, A. Desdoigts, and H. Kouadio. Land tenure insecurity as an investment incentive: The case of migrant cocoa farmers and settlers in Ivory Coast. *Journal of African Economies*, 28(2), 2019.
- M. R. Carter and P. Olinto. Getting institutions "right" for whom? Credit constraints and the impact of property rights on the quantity and composition of investment. *American Journal of Agricultural Economics*, 85(1):173–186, 2003.
- J. Chamberlin and J. Ricker-Gilbert. Participation in Rural Land Rental Markets in Sub-Saharan Africa: Who Benefits and by How Much? Evidence from Malawi and Zambia. *American Journal of Agricultural Economics*, 98(5), 2016.
- A. P. de la O Campos, F. Edouard, and M. R. Salvago. Effects of land titling on household tenure security and investments: Evidence from Nicaragua. *Land Use Policy*, 2023.
- C. D. Deere, G. E. Alvarado, and J. Twyman. Gender Inequality in Asset Ownership in Latin America: Female Owners vs. Household Heads. *Development and Change*, 43:505–530, 2012.
- K. Deininger and D. A. Ali. Do overlapping land rights reduce agricultural investment? Evidence from Uganda. *American Journal of Agricultural Economics*, 90(4):869–882, 2008.
- K. Deininger and R. Castagnini. Incidence and impact of land conflict in Uganda, 2004. Publication Title: World Bank Policy Research Working Paper.
- K. Deininger and S. Jin. Tenure security and land-related investment: Evidence from Ethiopia. *European Economic Review*, 50(5):1245–1277, 2006.
- K. Deininger, D. A. Ali, and T. Alemu. Impacts of Land Certification on Tenure Security, Investment, and Land Market Participation: Evidence from Ethiopia. *Land Economics*, 87(2):312–334, 2011. ISSN 00237639. doi: 10.3368/le.87.2.312. URL <http://le.uwpress.org/content/87/2/312.abstract>. ISBN: 09-11 Publisher: Environment for Development.
- K. Deininger, F. Xia, and S. Holden. Gendered Incidence and Impacts of Tenure Insecurity on Agricultural Performance in Malawi's Customary Tenure System. *Journal of Development Studies*, 55(4):597–619, 2019. ISSN 17439140. doi: 10.1080/00220388.2018.1425395. URL <https://doi.org/10.1080/00220388.2018.1425395>. Publisher: Routledge.
- K. Deininger, F. Xia, T. Kilic, and H. Moylan. Investment impacts of gendered land rights in customary tenure systems: Substantive and methodological insights from Malawi. *World Development*, 147, 2021.
- K. Deininger, F. Xia, T. Kilic, and H. Moylan. Investment Impacts of Gendered Land Rights in Customary Tenure Systems: Substantive and Methodological Insights from Malawi. 2022.
- B. Dillon and A. Voena. Inheritance customs and agricultural investment, 2015. ISSN: 03043878.
- T. Dokken. Allocation of Land Tenure Rights in Tigray: How Large is the Gender Bias. *Land Economics*, 91(1):106–125, 2015.

- C. Doss and R. Meinzen-Dick. Land tenure security for women: A conceptual framework. *Land Use Policy*, 99:105080, 2020. Publisher: Elsevier Ltd.
- J. Fenske. Land tenure and investment incentives: Evidence from West Africa. *Journal of Development Economics*, 95(2):137–156, 2011. Publisher: Elsevier B.V.
- J. Feyertag, M. Childress, I. Langdown, A. Locke, and D. Nizalov. How does gender affect the perceived security of land and property rights? Evidence from 33 countries. *Land Use Policy*, 104, 2021.
- S. Galiani and E. Schargrotsky. Property rights for the poor: Effects of land titling. *Journal of Public Economics*, 94(9-10):700–729, 2010. ISSN 0047-2727. doi: 10.1016/j.jpubeco.2010.06.002. URL <http://dx.doi.org/10.1016/j.jpubeco.2010.06.002>. Publisher: Centro de Estudios Distributivos, Laborales y Sociales.
- R. Gawayana. Investing in women farmers to eliminate food insecurity in southern Africa: policy-related research from Mozambique. *Gender and Development*, 16(1):147–159, 2008.
- H. Ghebru. Is there merit to the continuum tenure approach? A case of demand for land rights formulation in rural Mozambique. Milan, Italy, 2015.
- H. Ghebru. Women’s Land Rights in Africa. In A. Quisumbing, R. Meinzen-Dick, and J. Njuki, editors, *2019 Annual trends and outlook report: Gender equality in rural Africa: From commitments to outcomes*. International Food Policy Research Institute, Washington, D.C., 2019.
- H. Ghebru and F. Girmachew. Perceived Tenure (In)Security in the Era of Rural Transformation: Gender-Disaggregated Analysis from Mozambique, 2019.
- H. Ghebru and I. Lambrecht. Drivers of perceived land tenure (in)security: Empirical evidence from Ghana. *Land Use Policy*, 66:293–303, July 2017. ISSN 02648377. doi: 10.1016/j.landusepol.2017.04.042. URL <https://linkinghub.elsevier.com/retrieve/pii/S0264837716307013>.
- U. Gneezy, K. Leonard, and J. A. List. Gender Differences in Competition: Evidence from a Matrilineal and a Patriarchal Society. *Econometrica*, 77(5), 2009.
- M. Goldstein and C. Udry. The profits of power: Land rights and agricultural investment in Ghana. *Journal of Political Economy*, 116(6):981–1022, 2008.
- J. Gottlieb. Greater Expectations: A Field Experiment to Improve Accountability in Mali. *American Journal of Political Science*, 60(1):143–157, 2016. ISSN 15405907. doi: 10.1111/ajps.12186.
- J. Gottlieb and A. L. Robinson. The effects of matrilineality on gender differences in political behavior across Africa, 2016.
- S. T. Holden and K. Otsuka. The roles of land tenure reforms and land markets in the context of population growth and land use intensification in Africa. *Food Policy*, 48:88–97, 2014. ISSN 03069192. doi: 10.1016/j.foodpol.2014.03.005. URL <http://dx.doi.org/10.1016/j.foodpol.2014.03.005>. Publisher: Elsevier Ltd.

- H. G. Jacoby and B. Minten. Land titles, investment, and agricultural productivity in Madagascar: A poverty and social impact analysis, 2006.
- H. G. Jacoby and B. Minten. Is land titling in Sub-Saharan Africa cost-effective? Evidence from Madagascar. *World Bank Economic Review*, 21(3):461–485, 2007. ISSN 02586770. doi: 10.1093/wber/lhm011. ISBN: 0258-6770.
- E. La Ferrara. Descent rules and strategic transfers. Evidence from Matrilineal groups in Ghana, 2007.
- E. La Ferrara and A. Milazzo. Customary Norms, Inheritance, and Human Capital: Evidence from a Reform of the Matrilineal System in Ghana. *American Economic Journal: Applied Economics*, 9(4), 2017.
- K. G. Lawin and L. D. Tamini. Land Tenure Differences and Adoption of Agri-Environmental Practices: Evidence from Benin. *Journal of Development Studies*, 55(2):177–190, 2019. ISSN 17439140. doi: 10.1080/00220388.2018.1443210. URL <https://doi.org/10.1080/00220388.2018.1443210>. Publisher: Routledge.
- S. Lowes. Kinship Structure and Women. *Daedalus*, 149(1), 2020.
- J. Monteiro, A. Salomao, and J. Quan. Improving land administration in Mozambique: a participatory approach to improve monitoring and supervision of land use rights through community land delimitation. Washington, D.C.
- C. Muller-Crepon. State Reach and Development in Africa since the 1960s: New Data and Analysis. *Political Science Research and Methods*, 2021.
- C. Muller-Crepon, P. Hunziker, and L.-E. Cederman. Roads to Rule, Roads to Rebel: Relational State Capacity and Conflict in Africa. *Journal of Conflict Resolution*, 65:563–590, 2021.
- M. Mwale and J. Ricker-Gilbert. What’s hers isn’t mine: Gender-differentiated tenure security, agricultural investments, and productivity in sub-Saharan Africa, 2024.
- J. Ngango and S. Hong. Impacts of land tenure security on yield and technical efficiency of maize farmers in Rwanda. *Land Use Policy*, 2021.
- T. Noufe. Impact of land tenure security through customary law on agricultural productivity in Burkina Faso: Propensity score matching approaches. *Land Use Policy*, 2023.
- P. E. Peters. “Our daughters inherit our land, but our sons use their wives’ fields”: matrilineal-matrilocal land tenure and the New Land Policy in Malawi. *Journal of Eastern African Studies*, 4(1), 2010.
- F. Place. Land tenure and agricultural productivity in Africa: A comparative analysis of the economics literature and recent policy strategies and reforms. *World Development*, 37(8):1326–1336, 2009. Publisher: Elsevier Ltd.



- F. Place and S. Migot-Adholla. The economic effects of land registration on smallholder farms in Kenya: Evidence from Nyeri and Kakamega Districts. *Land Economics*, 1998.
- F. Place and K. Otsuka. Land tenure systems and their impacts on agricultural investments and productivity in Uganda. *Journal of Development Studies*, 38(6):105–128, 2002.
- Prindex. Prindex 2020 Data: Mozambique, 2020.
- J. Ricker-Gilbert, C. Jumbe, and J. Chamberlin. How does population density influence agricultural intensification and productivity? Evidence from Malawi. *Food Policy*, 48, 2014.
- A. L. Robinson and J. Gottlieb. How to close the gender gap in political participation: Lessons from matrilineal societies in Africa. *British Journal of Political Science*, 51:68–92, 2021.
- R. Spichiger and E. Kabala. Gender equality and land administration: the case of Zambia, 2014.
- C. Tanner, P. De Wit, and S. Norfolk. Participatory Land Delimitation: An Innovative Development Model Based Upon Securing Rights Acquired through Customary and Other Forms of Occupation, 2009.
- C. Tanner, T. Lopes, and A. Cristiano. The legal framework and investment: How to improve Mozambique land legislation. Support Program for Economic and Enterprise Development (SPEED). Technical report, United State Agency for International Development (USAID)., 2015.
- D. K. Willy, M. Muyanga, and T. Jayne. Can economic and enviornmental benefits associated with agricultural intensification be sustained at high population densities? A farm level empirical analysis. *Land Use Policy*, 81, 2019.

## A Matrilineal Land Rights in Control Communities Only

In the main results presented above, we use data from all communities to look at gender and tenure security in matrilineal communities in order to estimate the relationships more precisely. However, we do not have pre-intervention data from communities treated by *Terra Segura*, so to ensure that those programs are not driving our results, we also present here results using only respondents in control communities. Results are qualitatively similar regardless of the sub-sample used, despite lower precision in some estimates given the smaller sample sizes.

VARIABLES	(1)	(2)	(3)	(4)
	Collective Insecurity	Individual Insecurity	Collective Insecurity	Individual Insecurity
Female	-.0520833 (0.04)	-.0445104 (0.17)	-.0480769 (0.03)	-.0495208 (0.17)
Female household head			-.0560897 (0.48)	.0703541 (0.20)
Constant	.5928713	.1924568	.5987955	.1848673
Observations	1790	1795	1789	1794
$R^2$	0.017	0.013	0.018	0.016
N_g	1117	1120	1116	1119
fe	Parcel	Parcel	Parcel	Parcel
Wild Cluster Bootstrap	Village	Village	Village	Village
Sample	Control Villages	Control Villages	Control Villages	Control Villages

p-values in parentheses constructed by Wild Cluster Bootstrap at the village level

Table A1: Linear Probability Model estimated with the outcome of the individual’s perceived likelihood that the parcel in question will be lost due to collective expropriation or private plot disputes within the next five years, respectively, with parcel fixed effects and p-values constructed by wild cluster bootstrap at the village level. Each explanatory variable is a dummy, with female household head being the interaction of the respondent being female and living in a female-headed household. Source: Authors’ estimation using data from LTS 2019.

## B Investment Decisions

Following Deininger et al. (2021), in table A3, we explore the respondent’s role in managing the parcel. In columns (1) and (2), we control for three different roles: whether the respondent is the primary manager of the parcel’s output, whether the respondent is the primary source of labor for the parcel, and whether the respondent is the primary decision maker for business decisions about the parcel (such as renting out, renovating, or what crops to grow). We can see in column (1) that controlling for these roles does not eliminate the gender difference in collective insecurity; additionally, the primary decision maker on the parcel feels significantly more secure. The primary decision maker is, however, significantly more worried about individual threats, as seen in column (2).

	Collective Insecurity	Individual Insecurity
<b>Panel A: Household Characteristics</b>		
Female-headed household	-.1494477 (0.03)	-.0534539 (0.01)
Wealth Index	-.0270642 (0.13)	.0157747 (0.15)
Total landholdings, ha	-.0010905 (0.61)	-.000046 (0.78)
Social Connectedness	-.0265099 (0.38)	.1360569 (0.01)
Political Connectedness	.0939464 (0.01)	.2891566 (0.01)
Received Legal Advice	-.0148394 (0.79)	.0258876 (0.37)
<b>Panel B: Individual Characteristics</b>		
Female	-.0921238 (0.01)	-.0257603 (0.13)
Female household head	-.1287897 (0.03)	-.0208092 (0.43)
Years of Schooling	-.0058733 (0.17)	-.0147082 (0.03)
Owns ID	.121243 (0.01)	-.0046432 (0.91)
Nonfarm activity	-.0194521 (0.79)	.0056354 (0.86)
<b>Panel C: Parcel Characteristics</b>		
Other document owned	.2069019 (0.04)	-.1325321 (0.01)
Had plot dispute	.3434941 (0.01)	.2020196 (0.11)
Has DUAT	.1234999 (0.84)	-.0447224 (0.11)
Plot clearly demarcated	.0959489 (0.06)	-.0346657 (0.34)
Plot surveyed	.271915 (0.01)	-.1368741 (0.00)
Plot used as collateral	.109771 (0.45)	.2341657 (0.25)
Walking time to parcel	-.0009685 (0.39)	-.0003902 (0.41)
Acquired parcel from family	-.1584494 (0.02)	-.034651 (0.51)
Plot has conservation structure	.0800852 (0.42)	.1142083 (0.16)
Plot has trees	-.0053286 (0.86)	.066839 (0.07)
Ever fallowed plot	-.2945397 (0.02)	.0654316 (0.11)
Good Soil Quality	.0291822 (0.43)	-.1261999 (0.01)
Observations	1790	1795
FE	Village	Village
Wild Cluster Bootstrap SE	43Village	Village

p-values in parentheses constructed by wild cluster bootstrap at the village level

Table A2: Linear probability model estimated with the outcome of the individual's perceived likelihood that the parcel in question will be lost due to collective expropriation or private plot disputes, respectively. Each coefficient is from a separate bivariate regression, controlling for village fixed

In columns (3) and (4), we interact each of these roles with the respondent's gender and the gender of the household head, which shows interesting patterns. In column (3), women remain significantly less insecure about collective threats than men, but we additionally see that male output managers and decision makers are more secure, while men who are the primary labor source are less secure for that parcel. However, compared to a male output manager, a female output manager is actually more worried about collective threats; a similar direction can be seen for decision makers although the magnitude is more muted and statistically insignificant. In column (4), patterns are often opposite in sign: for instance, men who are the primary source of labor are less worried about losing their land, while the primary decision maker men are more insecure. These differences are attenuated or even switched for female respondents, and there is little relationship with the household head. Overall, there seems to be substantial gendered patterns of heterogeneity in the relationship between management decisions and insecurity, which are masked if the interactions are not considered.

	(1)	(2)	(3)	(4)
	Collective Insecurity	Individual Insecurity	Collective Insecurity	Individual Insecurity
Female	-.0682934 (0.00)	.0012141 (0.93)	-.1567765 (0.00)	-.0269354 (0.18)
Female-headed household	-.04642 (0.31)	-.0265237 (0.26)	-.0759885 (0.38)	-.1076841 (0.01)
Output Manager	-.023767 (0.35)	.0122038 (0.49)	-.1579991 (0.01)	-.0374222 (0.03)
Primary source of labor	.0145524 (0.56)	.0046798 (0.68)	.0910195 (0.03)	-.0346256 (0.07)
Business Decisionmaker	-.0636191 (0.01)	.0279179 (0.08)	-.100215 (0.00)	.069851 (0.02)
Female × Output Manager			.3292245 (0.00)	.085022 (0.04)
Female × Main Labor			-.1926907 (0.00)	.0596623 (0.09)
Female × Business Decisions			.0611956 (0.17)	-.1099476 (0.02)
Female-headed Household × Output Manager			-.2521728 (0.01)	.0291797 (0.35)
Female-headed Household × Main Labor			.200883 (0.01)	.0510434 (0.03)
Female-headed Household × Business Decisions			.0231615 (0.72)	.0542988 (0.21)
Constant	.5773512	.1128744	.6429862	.132851
Observations	3223	3240	3223	3240
$R^2$	0.012	0.003	0.039	0.015
FE	Village	Village	Village	Village
Wild Cluster Bootstrap	Village	Village	Village	Village

p-values in parentheses constructed by Wild Cluster Bootstrap at the village level

Table A3: Linear probability model estimated with the outcome of the individual's perceived likelihood that the parcel in question will be lost due to collective expropriation or private plot disputes, respectively, with village fixed effects and p-values constructed by Wild Cluster Bootstrap at the village level. Models (1) and (2) control for the respondent's role in managing the parcel: a dummy for if the respondent is the primary manager of the parcel's output, a dummy for if the respondent is the primary source of labor on the parcel, and a dummy for if the respondent is the main person making business decisions for the parcel. Models (3) and (4) interact these roles with dummies for the respondent being female and the household head being female.

Source: Authors' estimation using data from LTS 2019.