EXPLAINING FACTORS DRIVING THE DEMAND FOR LAND USE RIGHTS, RISK OF EXPROPRIATION AND LAND CONFLICTS IN AFRICA: INSIGHTS FROM RURAL AND URBAN MOZAMBIQUE

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ABSTRACT

A cross-sectional data from 3,992 and 5,216 parcels in rural and urban areas respectively are used to estimate the determinants of demand for land use rights, risk of expropriation and land related conflicts. The study concluded that: the demand for land use rights or land registrations is context specific. While in the urban areas the demand for land use rights increases with the length of possession, the number of perceived rights, and formal modes of land acquisition, in the rural context, the number of perceived rights decreases both the demand for land use rights and the value landholders are willing to pay for them; the risk of expropriation increase with good amenities of the parcels and it is gender driven, and the risk of future land related conflicts decreases with length of possession, limited number of use and transfer rights and other than market-based modes of land acquisition. The perceived land use and transfer rights not only highlight the advantage of transferability of rights but also the importance of family ties and relationships on land tenure, suggesting that a significant part of tenure insecurity over land can be resolved through internal family decisions.

Keywords: land rights, DUAT, risk, expropriation, conflict, baseline, Mozambique, baseline, urban, rural

Introduction

There are perceptions that secure property rights lead to increased investments, land values, and reduce land conflicts. These assumptions have motivated a considerable number of countries to promote land legislation aiming to increase land tenure security.

Research attempting to understand the linkages between land tenure and investment in land has not been conclusive. However, the majority of researchers tend to report a positive causality between the land tenure and land investments on (Abulai et al., 2011; Deininger and Jin, 2006; Deininger and Ali, 2008; Amsalu and de Graaff, 2007). A study by Gebremedhin and Winton

(2003), in Tigray, found that land tenure variables had different effects for the two types of investments (adoption of stone terraces and soil bunds) even though they are closely related. Research in Uganda by Deininger et al. (2006) found that a greater number of transfer rights were associated with increased tree planting, while in Niger, (Gavian and Fafchamps, 1996), found that more manure was allocated to owned rather than borrowed plots.The recent work in Ethiopia by Makonnen (2009) and Deininger and Jin (2006) found that land insecurity influences the decisions to grow trees but not the number of trees to be grown.

These conclusions may reveal important differences in the methodological approaches which may lead to different conclusions including methodological, data quality, and measurement of land tenure. For instance, MacKinnon's case, measures land insecurity or tenure by the risk of expropriation while for example Abdulai et al. (2011) measures land tenure as the current tenure status of the parcels. Unfortunately, no good measure is readily available, which motivated this paper because none of these studies have provided the justification for the choice of tenure security measures used.

The purpose of this paper is twofold: a) to propose measures of land tenure security under limited land use rights or customary land use rights; b) to provide empirical evidence to test the proposed measures on the demand for formal registration demand and risk of expropriation. This paper aims to answer the following research question: (i) how the proposed tenure measure affects the demand for property rights, the risk of expropriation and land related conflicts? These research questions have important policy implications as they allow us to understand the motivations for landowners to buy a land title (use rights) in order to provide guidance on the creating incentives on the role of infrastructure for increasing demand for land administration services.

2 Conceptual Framework

2.1 Tenure Security: Concept and Measurement

Before developing the empirical models for this study, we want to provide the definition and the measures of tenure security. Theoretically, secure and transferable land rights have long been identified as investment and productivity enhancing as they facilitate access to credit, relocation of production factors to maximize allocative efficiency in resource use (Deininger *et al.* 2006). These relationships were formalized in three distinct channels: free of expropriation or security, collaterability, and gains from trade (Besley, 1995; Deininger *et al.*, 2008; Abdulai *et al.*, 2011).

Unfortunately, operationalizing these relationships faces several empirical challenges as follows.

First, as stated by Arnot *et al*. (2011), measurements and attribution are serious problems in the quantitative estimation of the effect of tenure security and investment because tenure security is multidimensional in which many dimensions are not directly observed by the outsiders (Deininger and Ali, 2008). Second, although many studies have used the title as ameasure of tenure security, it is now recognized that title does not necessarily provide higher tenure security, suggesting that a combination of objective and subjective measures of the threat of expropriation as aproxy for tenure security have been used, and therefore, the results should be interpreted accordingly. Third, a variety of measures and definition used given its complexity. Some studies defined tenure security in terms of the substance of rights rather than the assurance of rights and others have used thelegal title and renewability of rights, and transferability of rights (sell or transfer land) (Arnot *et al*., 2011). This diversity of definitions had led researchers to adopt agreat variety of measures, including (see Annex1): degree of transferability; legal title; type of tenure or method of acquisition; range of use rights; duration of possession; previous litigation; and obligation to share financial returns with the government. One reason for this great variation is probably because the information to measure tenure security is not available (Arnot *et al*. 2011).

According to Arnot *et al*. (2011), the ideal measure of tenure security is related to the provision of assurance which can explicitly be measured by land title and duration of tenure. However, these measures have their own problems. Land title has been challenged as ameasure of tenure security due to the fact that the legal title does not always guarantee secure rights. The challenge to the legal title has been identified in Thailand and Uganda where illegal squatters have more secure tenure since they face low lifetime eviction probabilities. Legal titles to be a good measure of tenure security depend on many other factors including government stability, legal enforcement, etc. As aconsequence, the empirical results should be interpreted with caution, given the measure used for tenure security. As per my knowledge only paper by Jacoby *et al*. (2002) and Besley (1995) used a measure of the assurance of landholder's rights (used the risk of expropriation).

All these challenges make it difficult to establish clearly its effect in a systematic way. Drawing insights from Arnot *et al*. (2011) to capture the assurance and duration of tenure components of tenure security, we define tenure insecurity through perception variables believed to be highly correlated with actual rights and perceived risks and it is measured at the plot level. The tenure insecurity as the perceived risk is measured by households' responses indicating: (a) their likelihood of losing parcels due to land disputes; (b) their concerns of being in land conflicts in the future; (c) their willingness-to-pay for legal documents (DUATs). As actual rights, the tenure insecurity is measured by: (d) the length of possession of parcel (10 or more years is considered

good faith occupation under the 1997 Mozambique's Land Law which confers some level of security under customary system); (e) modes of acquisition (ideally, the formal and market-led modes of acquisition would offer more tenure security than other forms of acquisition); (f) the number of perceived rights to use and transfer land should offer more security to landholders; and (g) the lack of documentation as an indication of high tenure insecurity.

To better understand how these various measures of tenure security affect the demand for land use rights, risk of expropriation and future land-related conflicts, we established bivariate relationships between the actual rights and perceived risks (see Table 1 and Table 2). Results in Table 1 highlights five key findings: First, the length of possession of land/parcel decreases the perceived risks of expropriation, increases the likelihood of searching for DUAT, and associated with higher hypothetical land values. However, the longer the parcel is owned, the lower probability of investing. This this may suggest that or the parcels have already been invested in or they are no longer attractive to make any investment in them.

Second, the number of perceived use and transfer rights is associated with lower perceived risk of expropriation, a higher willingness to formalize land ownership. Surprisingly, lower number of use and transfer rights is associated with higher rental values; this could be an indicator of inefficient land markets (speculative price).

Table 1 Here.

Third, the formal and market-led modes of land acquisition seem to be associated with less perceived risk of expropriation; are associated with higher demand for DUAT and a higher likelihood of investments; and higher land values relative to other modes of acquisition. Fourth, the lack of documentation, chosen as a proxy for tenure insecurity, is positively associated with higher perceived risk of future land conflicts, lower likelihood to search for DUAT (Note that for land registration to be initiated, the landholder should present some type of documentation); Fifth, there are some similarities between urban and rural areas. The major differences are as follows: length of possession not necessarily associated with perceived risk of expropriation. The lack of documentation in rural areas is associated with tenure insecurity and high demand for DUAT contrary to lower demand for DUAT in urban areas. Note that willingness to pay to do land titles is not necessarily correlated with tenure insecurity resulting from experiences of disputes or conflicts in past (Hagos, 2012), it can be correlated with availability of more information on land rights (Land Law awareness), access to land formalization services, financial capacity, and community conformity or peer pressure. However, given the increased land

pressure by national and foreign investors, especially in rural areas, WTP for DUATs can indicate some sort of tenure insecurity. But, our data show a weak correlation between WTP for DUAT and land disputes in the past, therefore, interpretation of empirical results should be made with caution.

To establish the relationship between tenure security and likelihood to demand DUAT, risk of expropriation, and potential land related future conflicts is positive as depicted in Figure 1.

However, for the stated relationships to be effective, some conditions must hold, including theexistence of legal and judicial institutions to enforce rights, the existence of functioning markets, and socio-economic context.

Essentially, the general model depicted in figure 1, highlights the theory of change in a form of long-term investment decisions of farm households based on the expectation that they will be able to enjoy the benefits in the long-run when they feel that they are not anticipatinglosing their rights over the land they possess, assuming that public services, markets, and institutions are functional which may create incentives to search for land use right certification services.

3 Data and Estimation Strategy

3.1 Description of data

The data used for this paper are from two baseline surveys conducted by the Michigan State University in collaboration with the Ministry of Agriculture for the impact evaluation of the land tenure project under the five-year Compact signed between Millennium Challenge Corporation (MCC) and the Government of Mozambique.

The baseline surveys were conducted in selected urban and rural areas in Nampula and Cabo Delgado provinces, Northern Mozambique. The baseline urban survey was implemented from October-December 2010 in urban areas of Nampula and Monapo covering a total of 1,690 households who own a total of 3,992 parcel and September/October 2011 and April-May 2012 in rural areas Malema, Nampula where 1,417 households were surveyed who owned 5,216 parcels (Maredia *et al*., 2012 ; Jin *et al*., 2013).

The data were collected by interviewing the head of the households using a structured questionnaire. In households that were male-headed with a spouse present, the spouse was the respondent for the livestock and food consumption modules and to minimize coverage error, if the head of the household was not present at the time of the first visit, enumerators tried to make

an appointment and returned again to interview the appropriate person within the time that the survey team was in the area. The survey questionnaire included more than 25 sections covering a variety of land, agricultural related topics, and investment decisions.

In rural areas, the majority of the 4,224 parcels are agricultural parcels (2,931), and the rest are distributed between residence (1,121) and others (172) while in the urban areas, the majority of parcels are used for residence (1,950) or agriculture purposes (1,898), very few parcels were reported to be used for commerce (22) and some reported as vacant parcels or their use was not reported (117).

3.2 Estimation Strategy

To test the proposed measures of tenure security in a limited land titling context is based on the following principles. Generally, the probability of expropriation is more closely related to assurance, the recommended measure of tenure security by Arnot *et al*. (2011), but few studies have used this concept and so, such empirical results should be interpreted with caution, given the measure used for tenure security used. To our knowledge, only paper by Jacoby *et al*. (2002) and Besley (1995) used a measure of the assurance of landholder's rights (used the risk of expropriation). Our study addresses this issue by considering two measures of perceived risk.

Aside from the measurement issue above, reversal causality is another empirical challenge to be addressed. Under the reversal causality: people search for the land title to guarantee tenure security. This aspect can be attenuated if the parcels have been attributed long ago and not selected by the household being investigated. But, if the unobserved characteristics of the household being investigated are correlated with the tenure security, it results in another empirical complication. A failure to control for unobservable characteristics and if they are correlated with the risk of expropriation, then it will result in biased estimates upwards on the impact of tenure security even if we control for household characteristics. Given that the households own more than one parcel, we address this issue by allowing household fixed-effects to control for unobserved household characteristics. We also estimated the heterogeneity effects, using the interaction between observed characteristics and tenure security measures.

The empirical problems found in the literature support the hypothesis that endogeneity of tenure security on investment is a serious problem. As econometric literature indicates the presence of endogeneity leads to biased and inconsistent estimates. When endogeneity is considered, the impact of tenure security on can be more robust. Few studies have taken this step further allowing the endogeneity of tenure security on the willingness to pay to land use rights or risk of land expropriation.

Given that measurements and attribution are serious problems in quantitative estimation of the effect of tenure security and risk of expropriation and demand for property rights, because tenure security is multidimensional in which many dimensions are not directly observed by the outsiders (Deininger andAli, 2008). To address these issues, we use alternative measures of threat of expropriation as proxy for tenure security, instead of the formal land title for three reasons: (i) limited number of observations with land title and (ii) the recognition that title does not necessarily provide higher tenure security; and (iii) limited land titles.

3.2.1Tenure Security Models

To explore the drivers of tenure insecurity, three plot-level binary and one continuous dependent variables were used, including: (i) potential land conflict/dispute; (ii) potential expropriation/loss of land; (iii) willingness to pay for DUAT; and (iv) value willing to pay for DUAT. The first three dichotomous dependent variables were set to one if a household either fears to losing land, perceive future land conflict or willing to pay for DUAT in a specific parcel and zero otherwise and modeled separately. Acknowledging the potential non-normality of the error terms with standard ordinary least squares (OLS) estimation; the maximum likelihood binary response model (Probit) was used as suggested by Woodridge (2010).

To model the determinants of fear-to-losing-land or concerns about future land conflict, it was assumed that there is a latent variable that reasons why farm households are concerned about future conflicts or fear to losing land or willingness to pay for DUAT indexed as utility index (latent variable), $Y_{hi}*$. For each region k, this latent variable is assumed to be function of exogenous variables X_{hi} expressed as:

$$Y_{hi}^{*} = \beta^{'} X_{hi} + \varepsilon_{hi} \qquad\qquad\qquad (1)$$

where $Y_{hi}*$ is latent variable that indicates the perceived tenure insecurity of household h in parcel i; $X_{hi}$is a vector of exogenous variables including the household demographic characteristics, parcel characteristics, and others believed to influence the household's perceived tenure insecurity; β' is a vector of parameters to be estimated; and ε_{hi} is error term that captures all unobserved factors that affect perceived tenure insecurity and is assumed to be normally distributed with mean zero and variance equal to one.

Instead of observing the latent variable $Y_{hi}*,$ we only observe the indicator variable Y_{hi} which is a binary variable following the sign of the latent variable $Y_{hi}*$, such that if the perceived tenure

insecurity is positive, the farm household is indexed as tenure insecure, $Y_{hi}=1$. As such, in each region, for the plot i possessed by farm household h, the observed binary response can be expressed as:

$$Y_{hi} = 1 \text{ if } Y_{hi}^* \mid \beta X_{hi}, \varepsilon_{hi} > 0 \tag{2}$$

$$Y_{hi} = 0 \text{ if } Y_{hi}^* \mid \beta X_{hi}, \varepsilon_{hi} \leq 0 \tag{3}$$

Finally, the determinants of tenure insecurity were estimated using the following expression:

$$Y_{hi} = \alpha_0 + \alpha_1 X_{hi} + \alpha_2 T_{hi} + \alpha_3 Q_{hi} + \alpha_4 V + \upsilon_{hi} \tag{4}$$

where: Y_{hi} is a measure of Perceived risk (future conflict and fear of losing land) on parcel i belonging to household h; X_{hi} is a vector of interactions of household characteristics and tenure; P_{hi} is a vector of parcel characteristics; T_{hi}: vector of tenure security measures (objective rights); Q_{hi} is a vector of pre-existing stock of investments; V is a vector of locational dummies; and υ_{hi} is error term assumed to be normally distributed.

3.2.2 Model for the Willingness to Pay for Property Rights

Given the sequential nature of household's decision-making, Heckman selection model was deemed appropriate as it estimates the value the household is willing to pay for formal land registration services given that the household has made the decision to pay in the first step because the value of WTP is observed only if the household have decided to pay for the services. To avoid limitations of the two-step estimation methods, the Heckman method is used which has the advantage of correcting standard errors for 2-step estimation (Wooldridge, 2010). Then, the empirical model is written as:

$$WTP_1 = V(wtp) = \beta_1 X_{hi1} + v_{hi1} \text{ ("regression equation")} \tag{5}$$

$$WTP_2 = p(wtp) = 1[\alpha_1 X_{hi} + v_{hi2} > 0] \text{ ("selection equation")} \tag{6}$$

Where X is a vector of covariates described below, WTP_1(a value that the household is willing to pay) is the response that is partially observed and Y_2 is selection indicator (probability of paying), and β and ξ are the corresponding vector of parameters to be estimated. The error terms v_1 and v_2 capture the unobservable factors affecting the marginal value and probability of WTP. The WTP_2

is equal to 1 if the household is willing to pay and 0 otherwise. Using this estimation method, it is possible to test for selection bias using the coefficient on the inverse mills ratio. Failing to reject the null, suggests that there is no selection bias, the decision of paying is not correlated with the value households are willing to pay for formal land registration, therefore, a regular Tobit with left truncation will suffice.

In the empirical model described above, the dependent variables are both discrete and continuous variables willingness to pay for formal land registration. While the discrete WTP only states whether the households are or not willing to pay, the continuous variable is the amount that the households are willing to pay once the investment decision has been made. And so, the value is restricted to those who are willing to pay. Given the heterogeneity of farm size among the households, the value was weighted by the area in order to give a unit WTP value.

The general empirical model is specified as:

$$WTP_{hi} = \beta_0 + \beta_1 X_{hi} + \beta_2 T_{hi} + \beta_3 Q_{hi} + \beta_4 V + \varepsilon_{hi} \tag{7}$$

where WTP_{hik} is willingness to pay for land registration of parcel i belonging to household h in region k (urban and rural);X_{hi} is a vector of interactions of household characteristics and tenure; P_{hi} is a vector of parcel characteristics; T_{hi}: vector of tenure security measures (objective rights); Q_{hi} is a vector of pre-existing stock of investments; V is a community/village dummy to capture unobserved level infrastructures, local amenities such as security, access to public services such as electricity, water, sanitation, schools, and ε_{hi} is an error term assumed to independent and identically distributed.

Since there may exist household unobservable characteristics that could be correlated with tenure status and risk of appropriation and demand for property rights, to deal with this concern, we allowed for household fixed effects (FE)and household heterogeneity effects (HE) in equation 8 to control for unobserved characteristics so that the effect of T_{hi} is separated between household and plot characteristics. Essentially, for the FE estimation, all household and village characteristics were dropped out from the equation 8.

Concerns of selection bias due to the possibility that farm households that decided to demand property rights are systematically different from those that did not by using a Heckman selection method. This concern was also addressed by FE since the FE variables eliminate the scope of sample selection bias (Deininger and Ali, 2008; Jacoby and Minten, 2007) by ensuring that the effects of the variables of interest are not due to unobserved household characteristics that are

correlated with them. As stated by (Deininger andAli, 2008), if these aspects are not controlled for, the resulting estimates of the effect of tenure security will be biased upwards even if we control for household characteristics. With FE, we tested the null hypotheses that the model is correctly specified following the application by Mekon (2009).

Another advantage of implementing the FE is due to the limited number of variables from the available data that could raise concerns that measured tenure might also be proxy of omitted variables such as investment abilities or knowledge, which could lead to a spurious link between tenure security and investment (Besley, 1995). Therefore, allowing a household fixed-effect result that that any effect of land tenure controlling for heterogeneity between farmers is likely to be important in explaining their investment behaviour (include a vector of farmers characteristics available from the data as well as the village data) as it may induce variation in investment decisions across parcels. Thus, the FE allows that any effect of tenure security is identified from the variation of investment decisions across plots owned by a given farmer.

Rather than limiting the analysis on the propensity to demand property rights only, this paper estimated the intensity of such investment using Heckman for such investment models. For all binary response models, we computed and reported the marginal effects for simple interpretation.

3.3 Variables explaining the demand for DUAT, risk of land loss and conflict

The household characteristic variables considered in our models include household head's education attainment (measured as the highest grade completed in years), their literacy level; and gender of the head of the household. Table 2present the hypothesized effects in each model.

Table 2 Here.

It is expected that parcels that experienced past land conflicts are expected to be more land insecure,therefore, more likely to be in conflict in future or lose land, and expected to demand DUAT.

The three tenure security proxies also considered such asdocumentation and property rights possessed over the parcels (parcels without documentation), and property rights parcels held over parcels (use rights without approval or unlimited use rights). We hypothesized that parcels without documentation are more tenure insecure and will have a positive effect on the demand for DUAT and negative effect on the risks of expropriation.

Under the customary land system in Mozambique[1], the time of possession of parcel is seen as an indication of security over it, reducing the risk of expropriation. However, it creates incentive/disincentive to demand formal property rights registration.

Differences across plots in terms of amenities also affect the suitability of parcels for searching for DUAT and risk of expropriation. Therefore, information on parcel characteristics such asplot size; modes of land acquisition; rights over the parcels; the number of buildings; the number of trees; land uses; length of possession of parcels (number of years); and past experience of land conflict on the parcels.

4 Results and Discussion

4.1 Descriptive Evidence

Summary statistics of key household characteristics are reported in Table 3. Results show no significant statistical differences in the key household characteristics between those with and without fear to losing land in both rural and urban areas. In general, the demographic characteristics of the households do not vary with perceived tenure insecurity in the study.

Table 3 Here.

Table 3summarize the key parcel characteristics by tenure insecurity in urban and rural areas; respectively. Summary results in Table 4show that, on overall, there are limited investments on land parcels. Not more than 11 percent of surveyed parcels received any kind of investment and those that did are mostly those in which the households fear to lose rights over them. Suggesting that tenure insecurity on investment is endogenous, in the sense that farmers tend to invest on parcels that they fear insecure in order to establish some sense of ownership. The average value of parcels in which the household have afearoflosing rights on them is significantly higher compared to those with high tenure security.

The modes of land acquisition vary with tenure security status. As indicated in Table 4, although land purchases are the most common modes of land acquisition in urban areas, land occupation is most common in less secure parcels. Perhaps this could be a direct result of the existing Land Law in which recognizes occupied parcels as legitimate acquisitions. In our sample, about 16 percent of the parcels less secure in the sample were acquired through occupation by farm households compared to only 4 percent of parcels less insecure. Although the purchasing land is by far the most common modes of land acquisition in the urban areas, its frequency does not vary with the chosen measure of tenure insecurity, but it does vary in the rural areas. The majority of

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[1] Under good faith occupation, a household gains rights over a parcel that has occupied for ten or more years.

purchased parcels in rural areas are those in which observed high tenure insecurity, suggesting that landholders that fear to lose land, opt for selling their parcels to avoid major losses in the event of a possible dispute.

Although in both areas, land purchases are common, the possession of formal titles is limited in the study area. A large number of parcels have no documentation to show the ownership mostly in rural areas where the customary system is more prevalent. The lack of documentation is profound in more insecure parcels. Only 1.2 percent of the parcels in the study area had formal titles and about 13 percent have any documentation as a proof of ownership. Despite this limited land documentation, households' willingness-to-pay for documents to validate land ownership is high. About 89 percent of the parcels were reported as parcels where households had shown interest and willingness-to-pay for land rights documentation. The perceived high interest in formalizing the land rights is documented in the previous studies (Hagos, 2012; Maredia *et al*., 2012; Jin *et al*., 2013), and it can be a justification for the farm households' decision to engage in the long-termland-related investment.

The land-related investment in the form of construction and rehabilitation of buildings and in facilities and services was undertaken in only 6 percent and 0.4 percent in rural areas; respectively. These investments were slightly higher in urban areas, reaching 10 percent and 4 percent of the plots; respectively. The low percentage of these investments in rural areas as compared to urban areas can be an indication of a higher perceived tenure insecurity in the rural areas; higher land values in urban areas; higher access to credit in urban areas compared to rural areas. Much less investment is made in rural areas where the customary land system is the most modes of land acquisition (inheritance, occupancy, and gifts) and land inheritance and purchase are the main sources of land acquisition for less secure parcels.

The average land parcel size varies across regions and tenure status, where rural parcels are larger than urban ones and the less tenure secure parcels in rural areas are significantly smaller compared to tenure insecure ones. For instance, in rural areas, the average farm size of those households who reported having afear of losing land is 0.24 hectare compared to an average parcel size 0.30 hectare in those with no fear of losing land.

Table 5 compares tenure insecurity variables by gender of the household head. Results in Table 5 show no statistical gender differences on the perceived risks in both regions with exception to fear to lose land which is significantly higher on female than male-headed households. Although not statistically significant, the willingness to pay for DUAT is relatively higher in female than male-headed households in urban areas. Results show that while 91.7 percent of the households

headed by females are willing-to-apply for DUAT, only 88 percent of male-headed households have reported having any interest in applying for documentations of improving land rights. In the contrast, in the rural areas, male-headed households tend to be relatively better off on perceived risks compared to those households headed by females.

Significant gender differences are observed with respect to actual rights in both regions. In urban areas, contrary to previous findings on perceived risks, male-headed households have a significantly higher proportion of parcels that have been acquired in 10 or more years, a large proportion of use and transfer rights, and a higher proportion of parcels acquired through formal authorities. A similar pattern is observed in rural areas. These results suggest that care must be exercised when assessing gender differences on the level of tenure insecurity in rural areas, where the perceived risks tend to show higher tenure insecurity among male than female-headed households while the opposite is observed using the actual rights. Results in urban areas are robust using the two groups of measures, indicating more tenure insecurity among female compared to male-headed households.

Table 4 Here

Table 5 Here.

4.2   Empirical Results
Before estimating the relationship between tenure insecurity and land-related investments, we start by exploring the determinants of household's perception of risks, using the three alternative measures discussed in section 3.2 (Table 6).

Results in Table 6 and Table 7 are consistent with our expectations. In urban areas, the demand for land use rights increases with the length of possession, a number of perceived use and transfer rights, on parcels acquired through formal authorities and purchase. The pre-existing investments were found to be negatively correlated with demand for land use rights, but the accessibility, tap water sources, and mobile network coverage are positively associated with demand for DUAT. Parcels used for agriculture are less likely to demand DUAT while those used for commerce are more likely to search for DUAT compared to those used for residential purposes.

Results in Table 6 show that large parcels size increases the probability of searching for formal registration of property rights (land abundant households), but the value that the households are willing to pay for them decreases with land size in both urban and rural areas. In urban areas, while for each additional square meter of land, the propensity of paying for DUAT increases by 1.9 percent, the actual value that the households are willing to pay for the services decreases by 5.7 percent (equivalent to 0.11 MZN/m2).

The pre-existing investments do not affect the risk perceptions over the parcels, while highly accessible parcels, those with tap water are less likely to experience the perceived risks. Heterogeneity effect is observed in the demand for DUAT and perceived risks. Results in Table 6 show that the risk of future conflict and land loss is more likely to occur among female- headed compared to their counterpart in both regions. This tenure security gender differential is consistent with earlier findings by Hagos (2012), parcels owned by female members of the households are perceived as more tenure insecure compared to those of male owners.

Results in Table 7 with relatively lower explanatory power between 0.06 and 0.08, show that length of possession, the number of use and transfer rights and purchased parcels are less likely to be in risk of future conflict and land loss. In fact, long periods of land possession seem to create a sense of ownership (tenure security), decreasing the level of household's perceived tenure insecurity, consistent with higher tenure insecurity is higher on younger household heads than older ones. The perceived land use and transfer rights not only highlight the advantage of transferability of rights but also the importance of family ties and relationships play an important on land tenure. Our results show that the number of full use and transfer rights is strongly correlated with tenure security, suggesting that a significant part of tenure insecurity over land can be resolved by internal family decisions.

The modes of land acquisition have a significant effect on the perceived risk (tenure insecurity). Our results in rural areas show that land acquired through other modes (traditional leaders acquire via occupancy, purchases, inheritance, and gifts) is riskier (less tenure secure) compared to those acquired via formal authorities and purchases. This clearly, indicates generalized tenure insecurity in the study area on both customary acquisition systems, calling for more efforts in land reform to protecting property rights.

Table 6 Here.

Table 7 Here.

Contrary to our expectations, we found significantly higher levels of tenure insecurity in rural than in urban areas, suggesting that perhaps rural areas are experiencing high land pressure associated with limited access to land formalization services, limited land legislation knowledge. This is a new finding and deserves further investigation since we were expecting that higher tenure insecurity would be in parcels located in urban orperi-urban areas where land values are high. If in fact, the rural areas are experiencing high land pressure; our findings of higher tenure insecurity are expressing potential high returns of land reform through higher demand for formal registration of land property rights. As the majority of parcels in rural areas are used for agricultural purposes, if high land pressure is observed, then households would be more willing to pay for DUAT on parcels used for agriculture than on other uses. The higher land economic

value in urban areas compared to rural areas reflects the development of housing industry and income gain potentials, revealing the second mechanism through which land reform is likely to have high impact.

5 Conclusions and Recommendations

This study aims to test the proposed measures of tenure security in the absence of land titles by establishing the relationship of the observed rights with demand for DUATs, the risk of expropriation, and risk of being in land-related conflict in the future. The key finding of our analysis is that our results corroborate with the argument about the linkages between perceived rights and land tenure security but it is context specific. In urban context, we found that the demand for land use rights increases with length of possession, number of perceived rights, and formal modes of land acquisition, butin rural context, the number of perceived rights decreases both the demand for land use rights and the value landholders are willing to pay for DUATs. This suggests that the demand for DUAT increases if the land is still being managed under the customary system. With a thin land market, lower land values, people accumulate land for objectives other than economic, such as prestige, proud, and political power. Our analysis leads to conclude that there is a significant demand for certificates of land ownership (i.e., household's willingness-to-pay for DUAT), suggesting that the government of Mozambique should intensify the formalization of land use rights (land certification) since such policy intervention is likely to have a multiplicity of benefits in the long-term. Therefore, land rights and tenure security should continue to be considered a priority within the national development agenda. As an example, the government of Mozambique has recently signed and implemented a five-year compact in which the land component provided about 180,000 land titles in the four Northern provinces.

Tables and Figures

Table 1: Tenure security measures rights and outcomes in urban and rural areas

Objective rights	Indicators	Perceived Risks		Willingness to pay for DUAT		Perceived Risks		Willingness to pay for DUAT	
		Future land conflict	Fear of losing land	Percent	Value per m2 (MZM)	Future land conflict	Fear of losing land	Percent	Value per m2 (MZM)
		Urban				Rural			
Parcel owner for 10 or more years (%)	No	16.3	4.7	85.7	2.11	10.0	3.2	89.7	0.98
	Yes	13.7	3.2	91.1	2.00	10.4	3.9	89.1	0.72
	Diff.	*	*	**					+
Total number of full rights held over the parcel	0 (Min.)	17.5	3.6	87.1	1.99	10.9	3.8	90.8	0.80
	6 (Max.)	4.4	1.2	95.9	5.44	9.4	3.8	93.7	0.53
	Diff. (max., min.)	**	+	**	**			+	

Modes of land acquisition (%)	1. Other modes of acquisition	13.4	4.0	85.2	1.65	10.1	3.3	89.4	0.82
	2. Ceded by formal authorities	21.6	7.1	94.1	3.13	14.5	9.0	67.0	0.94
	3. Purchased parcel	15.1	3.5	91.0	2.30	12.5	8.0	90.5	0.34
	Diff. 1,2	*		*	**			**	
	Diff.1,3			**	**		**		*
Parcels with NO any document (%)	No	12.8	3.2	91.6	2.66	7.3	0.4	75.3	0.04
	Yes	15.8	4.2	87.5	1.63	10.3	4.2	89.5	0.91
	Diff.	*		**	**		**	**	**
Total		14.7	3.8	89.0	2.04	10.3	3.7	89.3	0.79

Source: Authors' calculation based on the MCA/MINAG baseline survey data, 2010 and 2012

Table 2: Expected sign of the determinants of demand for property rights and risk of conflict

Variables	Expected effect/sign			
	Fear of losing parcel	Concerned about future conflict	Propensity to pay for DUAT	Value of WTP for DUAT
Perceived risk				
Actual rights				
Number of use and transfer rights	+/-	+/-	+/-	+/-
Parcels with no documentation (d)	+	+	+	+
Parcels owned for 10 or more years (d)	-	-	+/-	+/-
Ceded by formal authorities (d)	-	-	-	-
Purchased land (d)	-	-	-	-
Other modes of land acquisition (d)	+/-	+/-	+/-	+/-
Parcel characteristics				
Parcel area (m^2)	-	-	-	-
Number of buildings within parcels	-	-	-	-

Cashew trees (number)	-	-	-	-
Coconut trees (number)	-	-	-	-
Parcel used for agriculture (d)	+/-	+/-	-	-
Experienced land conflict (d)	+	+	+	+
Household characteristics				
Female-headed household (d)	+	+	+	+
Level of education of the head (years)	+/-	+/-	+/-	+/-

(+): positive effect; (-): negative effect; (+/-): undetermined effect; (d) Dummy variable

Source: Authors' calculation based on the MCA/MINAG baseline survey data, 2010 and 2012

Table 3: Sampled households' characteristics in urban and rural areas

Parcel characteristics	Households with No Fear of loss land	Households with fear of loss of land	All	Significance
	Mean	Mean	Mean	
Urban				
Age of the head (years)	41	39.1	40.9	
Percentage of heads that are literate (%)	74.9	77.7	75.1	
Level of education of the head (years)	6	6	6	
Household size (# members)	5.3	5	5.3	
Number of observations	1,531	159	1,690	
Rural				
Age of the head (years)	41.2	38.6	40.9	
Percentage of heads that are literate (%)	56.6	57.1	56.7	
Level of education of the head (years)	5.4	4.8	5.4	
Household size (# members)	5.2	5.1	5.2	
Number of observations	1,297	120	3,107	

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Source: Authors' calculation based on the MCA/MINAG baseline survey data, 2010 and 2012

Table 4: Parcel characteristics in urban areas

Parcel characteristics	Urban				Rural			
	Households with No Fear of loss land	Households with fear of loss of land	All	Signifi-cance	Households with No Fear of loss land	Households with fear of loss of land	All	Signifi-cance
Average parcel size (m²)	22,276.2	13,183.6	21,930.7		29,667.9	25,466.9	29,513.2	*
Parcels used for residence (%)	58.3	70.0	58.8	*	29.3	33.0	29.5	
Parcels used for agriculture (%)	38.2	27.4	37.8	*	67.6	65.3	67.5	
Hypothetical sales value of parcels per m2 (Mt)	405.57	266.85	400.30	*	39.71	38.21	39.66	
Hypothetical rental value of parcels per m2 (Mt)	10.99	32.44	11.81	***	17.85	8.90	17.52	
Average total investment per m2 (Mt)	1.50	2.68	1.55		0.10	0.44	0.11	***
Parcels purchased (%)	63.3	50.8	62.8		7.2	14.4	7.5	***
Parcels ceded by formal authorities (%)	2.3	3.1	2.4		0.8	0.3	0.6	
Average time of possession of parcels (years)	14.6	12.3	14.5	**	16.0	17.8	16.1	*
Parcel with no documentation (%)	60.2	66.4	60.5		85.7	98.6	86.2	***
Parcels with primary road as the main access (%)	8.0	5.1	7.9		9.6	14.6	9.8	
Parcels with tap water as main water source (%)	69.8	55.9	69.3		0.6	1.5	0.7	
Parcels with access to mobile network (%)	91.1	89.6	91.1		25.0	42.0	25.6	***
Parcels with investments in construction/rehabilitation (%)	10.6	19.7	10.9	*	5.9	6.9	6.0	
Parcels with investments in facilities/services (%)	5.7	13.8	6.0	*	0.4	0.3	0.4	
Number of observations	3,747	245	3,992		5,009	207	5,217	

* p<0.05, ** p<0.01, *** p<0.001
Source: Authors' calculation based on the MCA/MINAG baseline survey data, 2010 and 2012

Table 5: Tenure security indicators disaggregated by gender of the household head in urban areas

Tenure insecurity	Urban				Rural			
	Male-headed	Female-headed	All	Signifi cance	Male-headed	Female-headed	All	Signifi cance
Parcel with no documentation (%)	61.2	58.4	6.5		89.8	78.6	86.2	***
Percentage of parcels in which households fear to losing land	3.6	4.2	3.8	**	3.9	3.1	3.7	
Percentage of parcels in which households are concerned about land conflicts	14.1	16.2	14.7		9.7	11.6	10.3	
Percentage of parcels in which households are willing to pay for DUAT	88.0	91.7	89.0		89.8	88.1	89.3	
Total number of rights in a parcel (Max.6)	0.76	0.55	0.71	***	1.0	0.73	0.91	***
Parcels purchased (%)	63.0	62.3	62.8		8.3	5.6	7.5	***
Parcels ceded by formal authorities (%)	2.7	1.5	2.4	***	0.8	0.3	0.6	*
Parcels acquired in 10 or more years (%)	58.5	68.9	58.4	***	75.4	71.6	74.2	***
Number of observations (household level)	1,262	428	1,690		982	435	1,417	

Table 6: Determinants of demand for land use rights by region (marginal effects)

Variables	Urban HH-FE Probit	Urban HH-FE Heckman	Urban HE Probit	Urban HE Heckman	Rural HH-FE Probit	Rural HH-FE Heckman	Rural HE Probit	Rural HE Heckman
Parcel acquired in 10 or more years (1=Yes)	0.056**	-0.347**	0.056**	-0.345**	-0.005	0.197*	-0.007	0.195*
	(3.32)	(-3.86)	(3.31)	(-3.83)	(-0.36)	(2.42)	(-0.53)	(2.40)
Total number of rights in a parcel (Max.6)	0.017**	0.082**	0.018**	0.107**	-0.011**	-0.041+	-0.006+	-0.049*
	(2.85)	(3.81)	(2.80)	(4.69)	(-3.69)	(-1.88)	(-1.69)	(-2.00)
Ceded by formal authorities (1=Yes) (a)	0.075**	0.286	0.075**	0.273	-0.274	0.855+	-0.287	0.842
	(5.59)	(1.26)	(5.59)	(1.21)	(-1.50)	(1.68)	(-1.58)	(1.63)
Purchased infrastr./parcel (1=Yes) (a)	0.039+	0.183	0.038+	0.180	0.016	-0.292*	0.017	-0.291*
	(1.85)	(1.33)	(1.82)	(1.31)	(0.86)	(-2.35)	(0.93)	(-2.33)
Parcel with no any documentation (1=Yes)	-0.029	-0.156	-0.030	-0.159	0.141	-1.069**	0.157	-1.012**
	(-1.52)	(-1.33)	(-1.56)	(-1.36)	(1.16)	(-6.71)	(1.24)	(-5.55)
Parcel area in m2 (Log)	0.019**	-0.057*	0.019**	-0.052+	-0.001	-0.517**	-0.003	-0.510**
	(3.73)	(-2.05)	(3.70)	(-1.84)	(-0.13)	(-9.84)	(-0.43)	(-9.70)
Number of buildings in the parcel	-0.020**	0.310**	-0.020**	0.309**	0.003	0.073**	0.003	0.075**
	(-2.71)	(10.42)	(-2.70)	(10.42)	(0.78)	(3.96)	(0.81)	(4.06)
Number of Cashew trees in the parcel	-0.011**	0.000	-0.011**	0.000	-0.002**	-0.010**	-0.002**	-0.010**
	(-2.65)	(0.02)	(-2.65)	(0.02)	(-3.13)	(-2.73)	(-3.24)	(-2.83)
Number of coconut trees in the parcel	-0.013*	-0.051	-0.012*	-0.051	0.018**	0.016	0.017**	0.018
	(-2.41)	(-1.55)	(-2.40)	(-1.51)	(2.83)	(1.10)	(2.77)	(1.23)
Tap water is the most used water source (1=Yes)	-0.015	0.891**	-0.015	0.872**	-0.076	1.247**	-0.076	0.258**
	(-0.99)	(8.13)	(-0.97)	(8.21)	(-0.99)	(2.65)	(-0.98)	(2.67)
Parcel has access to mobile network (1=Yes)	0.174**	-0.191	0.174**	-0.177	0.048**	-1.015**	0.048**	-0.993**
	(3.99)	(-1.12)	(4.00)	(-1.03)	(3.42)	(-10.72)	(3.48)	(-10.40)
Parcel accessible by Primary and Secondary roads (1=Yes)	0.021	0.324**	0.021	0.321**	0.002	0.258**	-0.002	0.276**
	(1.21)	(2.88)	(1.25)	(2.93)	(0.16)	(2.58)	(-0.14)	(2.75)
Agricultural use (1=Yes) (b)	-0.059*	0.050	-0.059*	0.057	-0.001	-0.027	0.000	-0.022
	(-2.29)	(0.38)	(-2.31)	(0.43)	(-0.04)	(-0.30)	(0.01)	(-0.24)
Commercial use (1=Yes) (b)	0.086**	-0.258	0.086**	-0.247		-0.786**		-.762**
	(8.10)	(-0.91)	(8.14)	(-0.87)		(-3.84)		(-3.95)
Female-headed * total number of rights			0.048*	-0.664**			-0.016*	0.103*

			(2.18)	(-3.31)			(-2.27)	(2.27)
Literate female-headed* total rights			-0.054*	0.585**			-0.004	-0.155*
			(-2.06)	(2.88)			(-0.42)	(-2.19)
Constant		-0.699*		-0.729*		4.595**		4.408**
		(-2.37)		(-2.45)		(8.11)		(7.66)
Observations	3,390	3,223	3,390	3,223	3,708	3,420	3,708	3,420
Pseudo R-square	0.107		0.108		0.032		0.038	
Percent correctly predicted	0.890		0.890		0.895		0.895	
rho		0.129		0.118		0.176		0.225
sigma		1.446		1.435		1.678		1.680
lambda		0.186		0.170		0.295		0.377
Wald test of indep. eqns. (rho = 0)(p-value)		0.060		0.099		0.016		0.002

Marginal effects; *t* statistics in parentheses; (1=Yes) for discrete change of dummy variable from 0 to 1

[+]$p< 0.10$, [*]$p< 0.05$, [**]$p< 0.01$

Source: Author's computation from the MCA/MINAG baseline survey data, 2010 and 2012

Table 7: Determinants of perceived risk of being in future land conflict and losing land in urban and rural areas, Probit models

	Urban				Rural			
	Concerned about future conflict		Fear of losing land		Concerned about future conflict		Fear of losing land	
Variable	HH-FE	HE	HH-FE	HE	HH-FE	HE	HH-FE	HE
Parcel acquired in 10 or more years (1=Yes)	-0.009	-0.008	-0.017[+]	-0.016[+]	-0.017[+]	-0.016[+]	0.007	0.008[+]
	(-0.50)	(-0.45)	(-1.78)	(-1.77)	(-1.78)	(-1.77)	(1.50)	(1.69)
Total number of rights in a parcel (Max.6)	-0.023**	-0.029**	-0.001	-0.005	-0.001	-0.005	-0.002	-0.004**
	(-3.37)	(-3.38)	(-0.45)	(-1.52)	(-0.45)	(-1.52)	(-1.42)	(-2.73)
Ceded by formal authorities (1=Yes) (a)	0.073	0.071	0.006	0.005	0.006	0.005	0.093	0.100
	(1.05)	(1.04)	(0.28)	(0.26)	(0.28)	(0.26)	(0.83)	(0.87)
Purchased infrastr./parcel (1=Yes) (a)	0.029	0.025	-0.024*	-0.028*	-0.024*	-0.028*	0.023[+]	0.021[+]
	(1.24)	(1.03)	(-2.12)	(-2.28)	(-2.12)	(-2.28)	(1.95)	(1.90)
Parcel with no any documentation (1=Yes)	0.028	0.025	-0.001	-0.004	-0.001	-0.004	0.028**	0.028**
	(1.33)	(1.15)	(-0.13)	(-0.36)	(-0.13)	(-0.36)	(4.86)	(5.32)
Parcel area in m2 (Log)	-0.001	-0.001	0.001	0.001	0.001	0.001	-0.001	-0.000
	(-0.09)	(-0.21)	(0.46)	(0.34)	(0.46)	(0.34)	(-0.23)	(-0.04)
Number of buildings in the parcel	0.005	0.005	0.003	0.003	0.003	0.003	-0.000	-0.000
	(0.69)	(0.69)	(1.21)	(1.21)	(1.21)	(1.21)	(-0.16)	(-0.05)
Number of Cashew trees in the parcel	-0.004	-0.004	-0.001	-0.001	-0.001	-0.001	0.000	0.000
	(-1.03)	(-1.03)	(-0.46)	(-0.43)	(-0.46)	(-0.43)	(0.37)	(0.52)

Number of coconut trees in the parcel	-0.023	-0.023	-0.012	-0.012	-0.012	-0.012	-0.001	-0.001
	(-0.91)	(-0.91)	(-1.34)	(-1.36)	(-1.34)	(-1.36)	(-0.99)	(-0.96)
Tap water is the most used water source (1=Yes)	-0.128**	-0.126**	-0.031**	-0.029**	-0.031**	-0.029**	0.032	0.034
	(-4.86)	(-4.86)	(-2.70)	(-2.66)	(-2.70)	(-2.66)	(0.85)	(0.89)
Parcel has access to mobile network (1=Yes)	0.044	0.044	-0.016	-0.016	-0.016	-0.016	0.000	0.000
	(1.64)	(1.64)	(-0.78)	(-0.78)	(-0.78)	(-0.78)	(0.03)	(0.07)
Parcel accessible by Primary and Secondary roads (1=Yes)	-0.055**	-0.053**	0.005	0.007	0.005	0.007	0.019*	0.019*
	(-3.15)	(-3.02)	(0.51)	(0.72)	(0.51)	(0.72)	(2.10)	(2.23)
Agricultural use (1=Yes) (b)	-0.043+	-0.045*	-0.026**	-0.027**	-0.026**	-0.027**	-0.002	-0.001
	(-1.91)	(-2.01)	(-3.08)	(-3.34)	(-3.08)	(-3.34)	(-0.29)	(-0.21)
Commercial use (1=Yes) (b)	0.030	0.019	-0.026*	-0.028**	-0.026*	-0.028**		
	(0.29)	(0.20)	(-2.50)	(-3.20)	(-2.50)	(-3.20)		
Female-headed * total number of rights		0.057+		0.029*		0.029*		0.009**
		(1.69)		(2.18)		(2.18)		(2.93)
Literate female-headed* total rights		-0.040		-0.021		-0.021		-0.006
		(-1.17)		(-1.57)		(-1.57)		(-1.62)
Observations	3,390	3,390	3,390	3,390	3,708	3,708	3,708	3,708
Pseudo R-square	0.077	0.078	0.058	0.055	0.023	0.030	0.076	0.086
Percent correctly predicted	0.146	0.147	0.043	0.043	0.102	0.102	0.035	0.035

Marginal effects; t statistics in parentheses; significance level: $^+p< 0.10$, $^*p< 0.05$, $^{**}p< 0.01$

(1=Yes) for discrete change of dummy variable from 0 to 1

(a)Reference is other modes of acquisition which are considered less secure (e.g. gifts, inheritance, occupation, etc.);

(b) Reference is residential use

Source: Author's computation from the MCA/MINAG baseline survey data, 2010 and 2012

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