

Evaluating the Impact of Land Tenure and Titling on Access to Credit in Uganda

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Abstract

Increasing smallholder farmers' access to credit is a paramount concern in Africa in general and in Uganda in particular, as a means to help modernize agriculture. We use matching impact evaluation methods to assess four pair-wise comparisons: i) households who have freehold land with vs. without a title, ii) households who have customary land with vs. without a customary certificate, iii) households with a title or certificate having freehold vs. customary tenure, and iv) households without a title or certificate having freehold vs. customary tenure. Each comparison is then evaluated for the impact on access to any form of credit, formal credit and informal credit. Two matching methods were used and the results compared to test the robustness of the conclusions.

The only statistically significant finding is a positive impact on access to credit of households with freehold without title over customary holders without a certificate. The results imply that tenure rights, rather than title to those rights, affect credit access for rural households in Uganda. The fact that access to informal credit is increased by freehold tenure status, even without a title, suggests that informal lenders use the tenure status as a screening device, rather than as recoverable collateral.

Introduction

Theory has given rise to the idea that transforming the “dead capital” of the poor into usable capital will provide an engine for economic growth in developing nations (De Soto 2000). The basis of the theory is that communal land institutions are inefficient, but titling land will increase security of ownership, consequently owners will then optimize their use of the land. The response has been an explosion of land titling reforms throughout Latin America, Asia, and Africa.

The effects of tenure and titling are hypothesized to be multiple and extensive for developing countries, including increased access to credit. Freehold tenure allows the owner to use the land as seen fit, for sale, lease or mortgage, while customary tenure is subject to the traditions and customs of the community. Theory suggests that land titling provides greater land security, meaning ownership is protected and unchallenged. This enables the owner to use the land as collateral, since borrowers can prove free and clear ownership and lenders are easily able to recuperate the land in the case of default. These advantages of freehold tenure and formal title are hypothesized to lead to numerous advantages that contribute to increased economic development, including increased access to and use of formal credit secured by land mortgages (De Soto 2000). This paper tests whether this hypothesis is supported by evidence from rural Uganda.

The concern about land tenure and titling may seem an over-studied subject. Many studies have examined the impacts of land titling and tenure on credit access, land investment, agricultural productivity and other issues in Africa and other developing regions (e.g., Feder, et al. 1988; Barrows and Roth 1990; Place and Hazell 1993; Roth, et al. 1994; Besley 1995; Gavian and

Fafchamps 1996; Platteau 1996; Hayes, et al. 1997; Sjaastad and Bromley 1997; Pender and Kerr 1999; Otsuka and Place 2001; Deininger 2003). Nevertheless, evidence on the impacts of tenure and title on credit access is not entirely clear, and in most cases a bit dated. Studies on this issue in Uganda, which has undergone major changes in land tenure policies in the past decade, are quite limited.

Utilizing household survey data from Uganda, this paper seeks to determine if land title and/or tenure rights status affect access to credit among rural households. To address this issue, we use matching impact evaluation matching methods, distinguishing the impacts of tenure rights *per se* from the impacts of holding a certificate or title as proof of those rights. This is the only study of land tenure and title impacts in developing countries, that we are aware of, that has used this approach.

Research Question

Does tenure status or title impact rural households' access to credit, formal and informal, in Uganda? Comparison will occur within and between freehold and customary households. The focus on customary and freehold tenure is out of a need to understand the full impact of the Land Act of 1998. Currently, the vast majority of land in the country, and 69% of the parcels in this dataset, are of customary tenure. In the hope of modernization, the Land Act was designed to facilitate the transition of the Uganda from customary to freehold land ownership (Baland, et al. 2007; Coldham 2000). The proposed benefits included more efficient land markets and land use, with greater access to credit and investment (Platteau 1996). The Land Act provided a path to freehold tenure with title, as well as providing customary land owners an intermediate option to obtain a certificate of customary ownership.

The question of impact will be applied to four comparisons of tenure and title status (see Table 1). The comparisons made will be between i) households who have freehold land with vs. without a title (A-C in Table 1), ii) households who have customary land with vs. without a customary certificate (B-D), iii) households with a title or certificate having freehold vs. customary tenure (A-B), and iv) households without a title or certificate having freehold vs. customary tenure (C-D). These multiple comparisons are needed to understand whether the rights conferred upon a specific tenure status—such as freehold tenure with unrestricted rights vs. customary tenure subject to the communal norms and traditions – leads to greater access to credit; or whether the proof of tenure status provided by a title or certificate increases access to credit.

Land Tenure in Uganda

The 1998 Land Act defined the rights of the four current classifications of tenure, freehold, leasehold, *mailo*, and customary. In this study, we focus only on freehold and customary, because leasehold is very uncommon and the expected impacts of *mailo* tenure on credit access are less clear. Freehold tenure allows the owner to use the land as seen fit, whether to sell, lease, or mortgage the land. To avoid confusion, title for the land must be obtained (Land Act, Sec 4.2). Regarding customary tenure, the Land Act recognizes the customary power and rights that still exist in Uganda, but includes provisions for converting customary tenure to freehold. Customary rights are contingent on local customs. If allowed under customary rules, the owner may sell, lease, or mortgage the land, but these occurrences are limited (Baland et al. 2007; Mwebaza 1999). They may obtain a certificate of customary ownership, which can be converted into freehold title upon surveying of the land (Sec 5 and 10).

Survey Data

The survey was conducted by the Uganda Bureau of Statistics in 2005/06 at both the household and parcel level. The last Ugandan household survey was conducted in 2002/03 and included questions about labor and the informal sector. In contrast, this survey included an agricultural module in addition to the standard socio-economic household questionnaire.

The household sample was selected through a two stage nationally representative sample, including 783 enumeration areas in the first stage and a total sample of 7,426 households. The agricultural survey included 13,990 parcels, of which 9,144 were under ownership rights, while 4,846 parcels were under usage rights.

From the 7,426 households, 5,877 were agricultural households, and from that 4,672 have ownership rights over a parcel of land. Since the survey distinguished between ownership and usage the decision was made to focus on those with ownership as that is the purpose of the law, to develop a pathway to land ownership. From that sample 4,113 were classified as rural, with some trimming of outliers from the data the ultimate subset for this paper was 3,890.¹ Once the sample was refined, it was necessary to make a decision on which households to use. There was the need to match up parcel level data with the household level credit data, difficulty arose with households owning multiple parcels of land. The solution was to use all of the households and classify them by their land characteristics.

The first classification of households was by tenure status, freehold, leasehold, *mailo*, or customary. When households were encountered that held parcels in different tenures one tenure

¹ Trimming included outliers of age, ownership years, and size of land, i.e. age greater than 99 years and land size of 400 acres.

status was selected.² For those with freehold and another tenure status, freehold became the classification. The idea is that if a household has one parcel of freehold that is most likely the parcel that would be used in the case of loan security, thus the household was classified as a freehold household. As for *mailo* and leasehold, since they do not confer complete ownership rights and the ability to mortgage, they were discarded from the analysis. This left households that are wholly customary, as these are the intended target of the Land Act. Overcoming this need for classification could only have occurred by the use of single parcel households; unfortunately, the sample became limited and the number with title was very small, so this course was not pursued.³

Method of Analysis

Do land tenure and title affect access to credit? To answer this question a proper counterfactual is required; a comparison between households that are alike in all aspects, but differ in their possession of title or tenure status. Ideally, the data would be randomized and in longitudinal form, from which comparison could occur over time for those who began without title, with some obtaining title later, to investigate how this impacted their credit access (reflexive or double difference analysis). However, this survey is not panel data.⁴ With these circumstances, ordinary least squares (OLS) or instrumental variables (IV) could be used, but matching was instead selected because of its ability to reduce sensitivity to parametric assumptions and its use

² The overlapping of tenure only occurred with 30 households: 1 freehold and *mailo*; 22 freehold and customary; 1 leasehold and *mailo*; and 6 leasehold and customary.

³ When restricted to single parcel households, the sample was cut in half to a mere 1,900 households, of which only 6% processed title (the majority of which were *mailo*). The analysis was conducted using these households, but the sample size appeared to hinder the significance of the results (no statistically significant differences were found across tenure types or access to title/certificate). Results available from the author upon request.

⁴ Though questions are asked over two different crop seasons, this is not relevant to credit question. Regarding credit access, the question was asked if the household has access to credit now and in 2001. This answer is not assumed to constitute panel data as the respondent may suffer from recall inconsistencies and the fact that the Land Act of 1998 was already in place (ideal panel data would have baseline information prior to the passage of the Act).

of common support (reducing the impact of outliers), thus minimizing bias in the results.⁵ There exists a variety of methods for matching, such as nearest neighbor, n nearest neighbors, and kernel matching, which all use propensity score matching (PSM). This paper will use kernel PSM. In addition, the Abadie and Imbens method of matching, which matches on a distance metric based on the values of the covariates (e.g., an inner product of the difference in covariate values divided by the standard deviation of the covariates) instead of propensity score, will also be utilized (Abadie et al, 2004). Each method has its advantages and disadvantages which will be discussed.

This paper uses the method of PSM developed by Rosenbaum and Rubin (1983). Kernel matching was used. The advantage of kernel over other PSM, such as the nearest neighbor or n nearest neighbors, is the reduction in variance in the matching estimate achieved by the introduction of data from all the control households in the matching process. In addition, common support was used on all the analysis groups to decrease the bias by dropping outliers that are incomparable.⁶ However, kernel matching may also increase bias if the sample size is small by giving consideration to scores that are far from the treated score that is being matched (Heckman and Smith 1999). Fortunately, this data set from Uganda has a substantial number of counterfactual “control” observations that will minimize the concerns about sample size.

Another problem with two stage matching is the increased variance in the results. The second stage of matching uses predicted values from the first stage without considering that those predicted values have their own standard errors, influencing the standard error of the outcome and increasing its variation. This paper attempts to overcome this with bootstrapping. The

⁵ Matching only deals with selection on observables, while IV estimation can address problems of selection on unobservables.

⁶ The only incidence of dropped observations due to a lack of common support was for comparison of freehold with title and customary with title, 4 observations were dropped.

equation is bootstrapped using 50 replications, resulting in 50 estimated treatment effects on the households. The result is a distribution (and standard error) of the sample that approximates that of the population (Efron and Tibshirani 1993; Caliendo and Kopeinig 2005). However, a paper by Abadie and Imbens (2006) showed that using bootstrapping on nearest neighbor PSM produces incorrect standard errors. To overcome this problem, the Abadie and Imbens method of matching, which does produce correct standard errors, is also conducted.

Abadie and Imbens method of matching was developed to overcome some of the problems present in PSM; including biases that remain even for large sample sizes and suffering from inefficiency losses (Abadie and Imbens, 2002). As noted above, the Abadie and Imbens matching method does not use propensity scores to match. As an alternative to using predicted probability, Abadie and Imbens matches using the differences in the values of the covariates, weighted by a matrix, to create a distance metric of nearness. The advantage of this method is that the correct standard errors are calculated and it allows for a bias correction. Since the matching occurs on covariates and is combined with the bias adjustment, bias is decreased (Abadie et al, 2004). This method, however, is not without its weaknesses; Abadie and Imbens nearest neighbor method is more arbitrary than PSM since it uses an arbitrary distance metric based on the covariates to match that does not give greater weight to covariates that have greater impact on the participation decision, as does the PSM distance metric (Pender and Ndjeunga 2008). Since only covariates that jointly affect participation and outcomes can bias the estimated impacts if left out of the analysis (i.e. those that affect outcomes but not participation do not bias impact estimates since the error term should then be uncorrelated with participation), it is intuitive that giving greater weight to such covariates, as PSM implicitly does, yields a more defensible distance metric.

The covariates used in the analysis include characteristics of the land and household (see Table 2). The focus is mainly on characteristics of the parcel that may impact tenure and titling. The first set of variables is concerned with the quality of the soil; the survey asked owners to describe the quality of their soil as good, fair or poor, however, soil measurements were not taken to verify these statements. The next set addresses the topography of the parcel; the types were hilly, gentle slope, steep slope, flat or valley. These land characteristics become important because people may be willing to obtain or desire tenure and greater security if they have better quality land. To control for these parcel characteristics with households that have multiple parcels, proportions were introduced, i.e. the proportion of all the land owned that is of good soil, similar to the method used in Nkonya et al. (2004). Instead of assuming that all parcels are of the same soil type or of the same topography, proportions allow a truer representation of all the land owned.

Other variables related to land include the size of the land. As land size increases there may exist a greater need to increase security of the land through title in order to fend off squatters or boundary disputes (Roth, et al.1994). Another aspect that may impact tenure and title is the labor endowment of the household, expressed through the number of males and females above the age of 18, who presumably can and do work the land. A greater number of adults could decrease the propensity to title land since there are a greater number of people watching over and caring for the land. On the other hand, to discourage infighting and family feuds there may be an incentive to secure tenure and titling of the land. With regards to the household, control variables of the household head are included, sex, age, and school attendance.

The final set of covariates is the agroecological zones (AEZs) as fixed effects. These fixed effects attempt to control for unobservable differences in the land and climate of Uganda in

different locations that may influence tenure and title, and access to credit. The AEZs were classified based on seasonal rainfall pattern, length of growing period, and annual rainfall and temperature potential to create seven zones in Uganda (Ruecker et al, 2003). The seven categories are named for their rainy seasons (unimodal (or “uni” for one season) and bimodal (or “bi”) for two rainy season) and for their agricultural potential (including high, medium, low, and very low) (Map 1). Using the Uganda data from Ruecker et al. (2003), each district was classified by what zone they fell into. Some districts fell into two zones resulting in the creation of five more, mixed zones (bi_low_med, bi_med_high, bi_low_high, uni_low_medm, bi_uni_med). The resulting 12 zones allow classification of each district by its agricultural characteristics, that may not have been observed in the survey and contain distinctly different characteristics.

Descriptive Results

Of the 3,890 rural households 75% are of customary tenure and 5% are of freehold tenure; the remainder are *mailo* (19%) and lease hold (1%). Interestingly, all of the tenures but customary are heavily concentrated in one of the regions of the country, the majority of freehold are in the western region (61%), the *mailo* are clustered in the central region (98% - not surprising considering the *mailo* status applies mainly to the Buganda kingdom, located in central Uganda), leasehold is mostly in the central as well (61%), while customary is spread throughout the country (39% in eastern, 31% in western, and 28% in the northern) (see Table 3). There also appear to be regional differences in access to credit that are statistically significant (see Table 4). Access to credit hovers around 50% for all four regions, but is highest in the northern region at 57%. Informal rates are nearly the same at around half the population; again the north is the highest with 55% access. As for formal credit, access rates are around one fifth for central,

eastern and western regions, however, in the north the rate jumps to 36%. One possibility for greater access in the north may be the concentration of government resources in the development and reconstruction of the North after the intense civil war with the Lord's Resistance Army (LRA). Looking to Table 4b, it is seen that the difference in access is driven by differences between individual regions. Significant differences in access to credit exist between the western region and the other three regions. For access to informal credit, the central and western regions are significantly different than the eastern and northern regions.

With regard to credit access, the comparison of access between freehold and customary tenure may appear counterintuitive. Of all freehold households, 57% have access to any form of credit, while 50% of customary households have access to any form of credit, a difference that is significant at the ten percent level. For formal credit, 21% of freehold households have access while 26% of customary households have access, a difference that is not significant. For informal credit, a significant difference does exist: 57% of freehold households have access while only 49% of customary households have access (see Table 5). It appears that when only considering tenure, and not title, freehold increases overall access, driven by greater access to informal credit, while customary households surprisingly have somewhat greater access to formal credit (though this difference is not statistically significant).

Turning to those with formal certificates, less than ten percent of freehold households have certificates of title (21 households), and only three percent of customary households have certificates (91 households). Combining freehold and customary households, those with titles or certificates experience nearly the same rates of access to credit as those without titles or certificates (Table 6). Of the freehold households with certificates, their access to any form of credit is nearly identical to customary households with certificates (52% for freehold households

with titles, 51% for customary households with certificates). Concerning formal credit the rate of access is slightly in favor of freehold with a title, as would be expected (29% for freehold with title and 26% for customary with a certificate). However, of households without a title or certificate, customary has greater access to formal credit (21% for freehold without a title to 26% for customary without a certificate). With regard to accessing informal credit, freehold households with titles of ownership do slightly better than customary households with certificate, 52% to 48%. None of the differences is significant, however, even at the ten percent level. With these results in mind, further econometric analysis is required. This will help to determine the effects of tenure and certificate on access to credit, as there may exist factors that are biasing the descriptive analysis (i.e. AEZs, land quality, or human capital endowments).

Results of Matching Estimators

First the probit was run on the sample with the previously specified variables (see Table 7). The balancing properties of each of the four samples were then tested to ensure there were no significant differences in the observable characteristics between the matched treatment and control groups (see Table 8). The purpose of the balancing test is to test whether there are statistically significant differences between the means of the matched treated and control groups. The results suggest that the propensity score performed well in matching. Although there were statistically significant differences in several covariates between the unmatched samples, the only significant differences (at 10% level) for the matched variables were for the age of household head in comparing customary owners with and without certificates, for the gender of the household head in comparing freehold households with a title to customary households with a customary certificate, and for the number of adult females in the household in comparing freehold and customary households with a title or certificate. In most cases, the difference

between the mean values of covariates was lower for the matched than unmatched samples, and not very large. Still, there may be bias resulting from imperfect matching using PSM. The Abadie and Imbens method corrects for such biases using auxiliary regressions.

Using the kernel PSM and Abadie and Imbens matching methods, the four comparisons of tenure and title/certificate were assessed, (1) customary with and without certificate, (2) freehold with and without title, (3) freehold with title and customary with certificate and (4) freehold without title and customary without certificate. Each of the four comparisons were then analyzed by the credit accessed, including (1) access to any credit, (2) access to informal credit, and (3) access to formal credit. The product is twenty-four impact estimates for the data.

Table 9 reports the estimated average treatment on the treated (ATT) effects of titling and tenure on access to any form of credit.⁷ The results for comparison of customary households with certificate and without are statistically insignificant, but the direction is as expected. This suggests that, though the effect may be small, having a certificate may positively impact access to credit for customary tenure. Matching freehold households with and without a title resulted in no impact from the kernel PSM method and a negative impact from Abadie and Imbens method, though both estimates are statistically insignificant. The interpretation of these results would imply that title has no impact or even hinders access to credit for freehold households. However, caution must be given as this is the smallest group of the four, with only 21 freehold households having certificates of title. Regarding the matching between freehold with certificates and customary with certificates, the result was in the anticipated, positive direction, although not statistically significant at the ten percent level. The final matching for access to credit was

⁷ In comparison 1: customary with title is the treatment and customary without title is control. In comparison 2: freehold with title is the treatment and freehold without title is control. In comparison 3: freehold with title is the treatment and customary with title is control. In comparison 4: freehold without title is the treatment and customary without title is control.

conducted on freehold and customary without certificates, producing statistically significant results. The kernel showed an impact at the ten percent significance level that freehold had a 13% better chance of obtaining credit than customary households. Results from the Abadie and Imbens estimator were not as large, 9% impact, but statistically significant at the five percent level. This could imply that title or certificate of ownership is not of as great importance as what one's actual tenure status is.

Turning to the impact of tenure and certificate on access to informal credit, the results are similar to those of general access to credit. Table 10 provides the ATT results of the kernel and Abadie and Imbens matching for each of the four categories. For the first three comparisons, the results are almost identical to the previous ones, just as the descriptive statistic showed. A driving force of this may be that informal credit is the dominant credit source in most of Uganda, thus the results differ little between access to informal and access to any credit. One notable variation occurred for the comparison between freehold without certificate and customary without certificate, the statistical significance of the kernel PSM results increased from the ten to one percent level, while the impact remained at 13% greater access for freehold tenure.

Regarding access to formal credit, none of the ATTs was statistically significant for any of the comparisons (see Table 11). The lack of statistical significance of all the comparisons may be connected to the limited availability of formal credit, while informal remains the dominant form of credit. One explanation may be the limited supply of formal credit. For example, one question in the survey asked why rural households had not borrowed from a formal credit source, and the

top responses were inadequate security and a lack of local supply.⁸ These issues of credit supply are outside the focus of this paper, but warrant further investigation.

Conclusion

The only statistically significant differences in access to any form of credit and to informal credit were found between freehold and customary households without title. This impact was not present for formal credit, contrary to the original hypothesis that freehold would primarily impact access to formal credit. The reason for the limited impact of tenure and title on formal credit may be the limited supply of formal credit. With limited availability of formal credit, other factors inhibiting credit availability (such as access to markets) may be more binding than land tenure or title. A possible explanation for the significant impact of freehold tenure on informal credit access, despite the lack of informal lenders' ability to use land as formal recoverable collateral, is that tenure status is used as a screening device rather than as collateral by informal lenders. This hypothesis requires further research that is beyond the scope of this paper.

Overall the impacts of tenure and titling did not differ between general access and informal access, probably due to the pervasiveness of informal credit. Formal credit lacked significant results, due to the limited access to formal credit for all rural households. And as noted before, tenure status, not title, proved the difference in access to credit. The positive impact of freehold over customary tenure on credit access may provide the incentive for customary households to transition to freehold, which is one of the main purposes of the Land Act of 1998.

⁸ The top reason for not applying for credit with a formal institution was inadequate security (freehold 30% and customary 24%). The top reason of those without title for not applying for a loan with a formal institution was also inadequate security. Alternatively, those with title sighted lack of need or high interest rates as their top reasons for not applying for formal loans.

Tables and Maps

Table 1 Comparisons used in the Analysis

Title/Certificate	Rights Status		Impact of rights status
	Freehold	Customary	
Yes	A	B	A-B
No	C	D	C-D
Impact of title or certificate	A-C	B-D	

Table 2. Descriptive Statistics of Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Sex of the Head of the Household (=1 if male)	3890	0.7611825	0.4264158	0	1
School Attendance dummy for Head of Household (=1 if attended school)	3881	0.8003092	0.3998194	0	1
Age of the Head of the Household	3890	44.47404	15.52458	13	90
Number of Adult Males in the Household (18 years or older)	3890	1.177121	0.8438003	0	9
Number of Adult Females in the Household (18 years or older)	3890	1.278149	0.7604661	0	7
Materials of the Roof (=1 if purchased materials, i.e. tiles, cement or tin)	3890	0.5514139	0.4974135	0	1
Soil Type/Land Quality of the Parcel is Good (=1)	3890	0.4161432	0.4621202	0	1
Soil Type/Land Quality of the Parcel is Fair (=1)	3890	0.4637649	0.463652	0	1
Soil Type/Land Quality of the Parcel is Poor (=1)	3890	0.1200919	0.3036869	0	1
Topography of the Parcel is Hilly (=1)	3890	0.0951006	0.2739194	0	1
Topography of the Parcel is Flat (=1)	3890	0.4644792	0.4713639	0	1
Topography of the Parcel is Gentle Slope (=1)	3890	0.389419	0.4535339	0	1
Topography of the Parcel is Steep Slope (=1)	3890	0.032442	0.1587441	0	1
Topography of the Parcel is Valley (=1)	3890	0.0184307	0.1140434	0	1
Topography of the Parcel is Other (=1)	3890	0.0001285	0.0080167	0	1
AEZ bimodal_medium (=1)	3890	0.1305913	0.3369961	0	1
AEZ bimodal_high (=1)	3890	0.2084833	0.4062763	0	1
AEZ unimodal_very_low (=1)	3890	0.0239075	0.1527805	0	1
AEZ unimodal_low (=1)	3890	0.0251928	0.1567305	0	1
AEZ unimodal_medium (=1)	3890	0.0089974	0.0944392	0	1
AEZ unimodal_high (=1)	3890	0.0894602	0.2854435	0	1
AEZ bimodal_low_medium (=1)	3890	0.0390746	0.1937973	0	1
AEZ bimodal_medium_high (=1)	3890	0.1426735	0.3497846	0	1
AEZ bimodal_low_high (=1)	3890	0.1395887	0.3466043	0	1
AEZ unimodal_low_medium (=1)	3890	0.1200514	0.3250634	0	1
AEZ bimodal_unimodal_medium (=1)	3890	0.0719794	0.2584871	0	1

Table 3 Tenure by Region

Tenure	Region				Total
	Central	Eastern	Northern	Western	
Freehold	19.00	60.00	5.00	129.00	213.00
Row %	8.92	28.17	2.35	60.56	100.00
Col %	2.33	4.96	0.60	12.50	5.48
Leasehold	19.00	3.00	2.00	7.00	31.00
Row %	61.29	9.68	6.45	22.58	100.00
Col %	2.33	0.25	0.24	0.68	0.80
<i>Mailo</i>	717.00	7.00	0.00	7.00	731.00
Row %	98.08	0.96	0.00	0.96	100.00
Col %	87.76	0.58	0.00	0.68	18.79
Customary	41.00	1140.00	824.00	888.00	2893.00
Row %	1.42	39.41	28.48	30.69	100.00
Col %	5.02	94.21	99.16	86.05	74.37

Table 4a. Access to Credit, Formal and Informal, by Regions

Region	Access to Credit		Access to Formal Credit		Access to Informal Credit	
	No	Yes	No	Yes	No	Yes
Central	372.00	444.00	621.00	195.00	380.00	436.00
%	45.59	54.41	76.10	23.90	46.57	53.43
Eastern	594.00	616.00	922.00	288.00	606.00	604.00
%	49.09	50.91	76.20	23.80	50.08	49.92
Northern	353.00	475.00	523.00	305.00	372.00	456.00
%	42.63	57.37	63.16	36.84	44.93	55.07
Western	563.00	467.00	848.00	182.00	566.00	464.00
%	54.66	45.34	82.33	17.67	54.95	45.05
Pearson chi2(3)		29.998		92.896		22.137
Pr		0.000		0.000		0.000

Table 4b. Comparison of Credit Access by Region

	Access to Credit			Access to Formal Credit			Access to Informal Credit		
	Central	Eastern	Northern	Central	Eastern	Northern	Central	Eastern	Northern
Eastern	-0.0350 0.538			-0.0010 1.000			-0.0351 0.536		
Northern	0.0296 0.790	0.0646 0.024		0.1294 0.000	0.1303 0.000		0.0164 0.985	0.0516 0.125	
Western	-0.0907 0.001	-0.0557 0.049	-0.1203 0.000	-0.0623 0.011	-0.0613 0.004	-0.1917 0.000	-0.0838 0.002	-0.0487 0.122	-0.1002 0.000
F			10.07			31.69			7.41
p value			0.000			0.000			0.001

Table 5 Access to Credit, Formal and Informal, by Tenure

Tenure	Access to Credit		Access to Formal Credit		Access to Informal Credit	
	No	Yes	No	Yes	No	Yes
Freehold	91.00	122.00	167.00	46.00	91.00	122.00
%	42.72	57.28	78.40	21.60	42.72	57.28
Customary	1434.00	1454.00	2146.00	742.00	1468.00	1420.00
%	49.65	50.35	74.31	25.69	50.83	49.17
Pearson chi2(1)		3.813		1.756		5.217
Pr		0.051		0.185		0.022

Access to Credit, Formal and Informal, by Certificates of Title/Ownership

Certificate	Access to Credit		Access to Formal Credit		Access to Informal Credit	
	No	Yes	No	Yes	No	Yes
Yes	120.00	123.00	181.00	62.00	124.00	119.00
%	49.38	50.62	74.49	25.51	51.03	48.97
No	1762.00	1879.00	2733.00	908.00	1800.00	1841.00
%	48.39	51.61	75.06	24.94	49.44	50.56
Pearson chi2(1)		0.089		0.040		0.231
Pr		0.765		0.841		0.631

Table 7. Probit Results

Variable	Customary with & without certificate	Freehold with & without title	Freehold and Customary with title	Freehold and Customary without title
Attend	0.067 (0.143)	-0.148 (0.431)	-0.022 (0.591)	0.275** (0.118)
Male	-0.071 (0.138)	-0.084 (0.379)	-0.522 (0.550)	-0.156 (0.111)
Age	0.004 (0.004)	0.007 (0.010)	0.018 (0.014)	0.004 (0.003)
adult_males	0.166*** (0.054)	0.217 (0.181)	-0.238 (0.185)	0.003 (0.054)
adult_females	0.131** (0.059)	-0.155 (0.201)	-0.247 (0.216)	0.063 (0.050)
roof_construction	0.326** (0.128)	0.701 (0.430)	1.948*** (0.688)	0.097 (0.091)
por_land_good	-0.071 (0.116)	0.168 (0.352)	0.965* (0.526)	0.272*** (0.091)
por_land_poor	0.118 (0.182)	-0.007 (0.480)	0.747 (0.642)	0.219 (0.141)
por_topo_hilly	0.330* (0.195)	1.988*** (0.560)	2.016*** (0.733)	-0.075 (0.165)
por_topo_gentle_slope	0.198 (0.126)	1.032** (0.473)	0.889 (0.573)	0.288*** (0.093)
por_topo_steep_slope	0.701*** (0.251)	- -	- -	-0.423 (0.357)
por_topo_valley	0.147 (0.415)	1.145 (0.990)	2.047* (1.151)	0.255 (0.339)
aze_3	0.408 (0.249)	0.132 (0.407)	-1.277* (0.697)	-0.355*** (0.117)
aze_6	0.7 (0.504)	- -	- -	-1.056*** (0.319)
aze_7	-0.018 (0.290)	- -	- -	-1.451*** (0.238)
aze_9	0.587** (0.240)	-0.478 (0.434)	-2.145*** (0.745)	-0.193* (0.109)
aze_10	0.680*** (0.250)	-0.102 (0.549)	-2.028*** (0.763)	-0.655*** (0.147)
aze_11	0.636** (0.264)	2.409** (1.084)	-1.393* (0.828)	-1.838*** (0.332)
aze_12	0.809*** (0.269)	- -	- -	-1.631*** (0.340)
_cons	-3.239*** (0.338)	-3.038*** (0.859)	-1.908* (1.126)	-1.675*** (0.219)
Pseudo R2	0.087	0.250	0.341	0.152
N	2692	202	86	2855

Note: No freehold reside in aze 4 and 6. No customary reside in aze 8.

Note: No freehold with title reside in 7, 8, or 12.

Values in parentheses are standard errors.

Table 8 Balancing Test Results (pstest)

Variable	Customary with & without Certificate				Freehold with & without Title		
	Sample	Mean			Mean		
		Treated	Control	p> t	Treated	Control	p> t
Attend	Unmatched	0.78652	0.7808	0.898	0.80952	0.83854	0.735
	Matched	0.78652	0.7191	0.300	0.80952	0.95238	0.160
Male	Unmatched	0.77778	0.7777	0.999	0.7619	0.77083	0.927
	Matched	0.77528	0.74157	0.602	0.7619	0.7619	1.000
Age	Unmatched	48.067	43.588	0.006***	51.095	45.568	0.127
	Matched	47.708	51.742	0.072*	51.095	55.286	0.408
adult_males	Unmatched	1.5889	1.1619	0.000***	1.8095	1.2552	0.007***
	Matched	1.5955	1.618	0.897	1.8095	1.7619	0.903
adult_females	Unmatched	1.6222	1.2673	0.000***	1.4762	1.4063	0.765
	Matched	1.618	1.5169	0.529	1.4762	1.5238	0.865
roof_construction	Unmatched	0.700	0.45926	0.000***	0.90476	0.67188	0.028**
	Matched	0.69663	0.65169	0.525	0.90476	0.80952	0.390
por_land_good	Unmatched	0.39529	0.43539	0.418	0.50302	0.46291	0.717
	Matched	0.3885	0.40362	0.826	0.50302	0.63925	0.349
por_land_poor	Unmatched	0.11479	0.09104	0.402	0.15986	0.11895	0.579
	Matched	0.11608	0.09188	0.578	0.15986	0.19048	0.796
por_topo_hilley	Unmatched	0.10856	0.08222	0.335	0.36413	0.07792	0.000***
	Matched	0.10978	0.09809	0.776	0.36413	0.32974	0.809
por_topo_gentle_slope	Unmatched	0.40056	0.33961	0.192	0.47062	0.46847	0.984
	Matched	0.40506	0.4448	0.561	0.47062	0.59613	0.391
por_topo_steep_slope	Unmatched	0.07642	0.0353	0.022**	0.000	0.01338	0.577
	Matched	0.07727	0.05506	0.509	0.000	0.000	.
por_topo_valley	Unmatched	0.02648	0.01598	0.348	0.04762	0.01954	0.346
	Matched	0.02678	0.0172	0.550	0.04762	0.000	0.323
por_topo_other	Unmatched	0.000	0.00018	0.858	0.000	0.000	.
	Matched	0.000	0.000	.	0.000	0.000	.
aze_3	Unmatched	0.18889	0.15475	0.380	0.33333	0.22396	0.264
	Matched	0.19101	0.11236	0.145	0.33333	0.38095	0.755
aze_4	Unmatched	0.000	0.03324	0.079*	0.000	0.000	.
	Matched	0.000	0.000	.	0.000	0.000	.
aze_5	Unmatched	0.000	0.03431	0.074*	0.000	0.01042	0.640
	Matched	0.000	0.000	.	0.000	0.000	.
aze_6	Unmatched	0.01111	0.01215	0.929	0.000	0.000	.
	Matched	0.01124	0.02247	0.563	0.000	0.000	.
aze_7	Unmatched	0.05556	0.11901	0.065**	0.000	0.01563	0.566
	Matched	0.05618	0.03371	0.472	0.000	0.000	.
aze_8	Unmatched	0.000	0.000	.	0.000	0.01042	0.640
	Matched	0.000	0.000	.	0.000	0.000	.
aze_9	Unmatched	0.24444	0.1644	0.045**	0.28571	0.32292	0.730
	Matched	0.24719	0.29213	0.502	0.28571	0.2381	0.733
aze_10	Unmatched	0.23333	0.10579	0.000***	0.14286	0.08854	0.420
	Matched	0.22472	0.26966	0.490	0.14286	0.19048	0.688
aze_11	Unmatched	0.12222	0.16154	0.317	0.04762	0.00521	0.056*
	Matched	0.1236	0.1573	0.520	0.04762	0.04762	1.000
aze_12	Unmatched	0.11111	0.09578	0.628	0.000	0.00521	0.742
	Matched	0.11236	0.07865	0.447	0.000	0.000	.

* p<.1; ** p<.05; *** p<.01

Table 8 Balancing Test Results (pstest) cont...

Variable	Freehold & customary with Title/Cert				Freehold & customary without Title/Cert		
	Sample	Mean		p> t	Mean		p> t
Attend	Unmatched	0.80952	0.78652	0.818	0.83854	0.7808	0.06*
	Matched	0.80952	0.95238	0.160	0.84211	0.82105	0.585
Male	Unmatched	0.7619	0.77778	0.877	0.77083	0.7777	0.825
	Matched	0.7619	1.000	0.017**	0.76842	0.69474	0.106
Age	Unmatched	51.095	48.067	0.416	45.568	43.588	0.081*
	Matched	51.095	47.619	0.531	45.242	45.321	0.961
adult_males	Unmatched	1.8095	1.5889	0.447	1.2552	1.1619	0.114
	Matched	1.8095	1.6667	0.692	1.2579	1.1526	0.219
adult_females	Unmatched	1.4762	1.6222	0.523	1.4063	1.2673	0.013***
	Matched	1.4762	1.3333	0.535	1.4158	1.2526	0.066*
roof_construction	Unmatched	0.90476	0.700	0.055*	0.67188	0.45926	0.000***
	Matched	0.90476	0.80952	0.390	0.67368	0.71053	0.438
por_land_good	Unmatched	0.50302	0.39529	0.340	0.46291	0.43539	0.426
	Matched	0.50302	0.65872	0.266	0.46778	0.4235	0.365
por_land_poor	Unmatched	0.15986	0.11479	0.552	0.11895	0.09104	0.161
	Matched	0.15986	0.1746	0.894	0.12021	0.12841	0.800
por_topo_hilley	Unmatched	0.36413	0.10856	0.001***	0.07792	0.08222	0.820
	Matched	0.36413	0.22656	0.292	0.07347	0.07682	0.894
por_topo_gentle_slope	Unmatched	0.47062	0.40056	0.528	0.46847	0.33961	0.000***
	Matched	0.47062	0.50113	0.832	0.4734	0.50489	0.513
por_topo_steep_slope	Unmatched	0.000	0.07642	0.155	0.01338	0.0353	0.069*
	Matched	0.000	0.000	.	0.01352	0.00808	0.549
por_topo_valley	Unmatched	0.04762	0.02648	0.551	0.01954	0.01598	0.648
	Matched	0.04762	0.02801	0.725	0.01975	0.02214	0.841
por_topo_other	Unmatched	0.000	0.000	.	0.000	0.00018	0.793
	Matched	0.000	0.000	.	0.000	0.000	.
aze_3	Unmatched	0.33333	0.18889	0.150	0.22396	0.15475	0.011**
	Matched	0.33333	0.28571	0.746	0.22632	0.23158	0.903
aze_4	Unmatched	0.000	0.000	.	0.000	0.03324	0.010***
	Matched	0.000	0.000	.	0.000	0.000	.
aze_5	Unmatched	0.000	0.000	.	0.01042	0.03431	0.072*
	Matched	0.000	0.000	.	0.01053	0.000	0.157
aze_6	Unmatched	0.000	0.01111	0.631	0.000	0.01215	0.125
	Matched	0.000	0.000	.	0.000	0.000	.
aze_7	Unmatched	0.000	0.05556	0.273	0.01563	0.11901	0.000***
	Matched	0.000	0.000	.	0.01579	0.01053	0.654
aze_8	Unmatched	0.000	0.000	.	0.01042	0.000	0.000***
	Matched	0.000	0.000	.	0.000	0.000	.
aze_9	Unmatched	0.28571	0.24444	0.698	0.32292	0.1644	0.000***
	Matched	0.28571	0.14286	0.270	0.32632	0.33684	0.828
aze_10	Unmatched	0.14286	0.23333	0.369	0.08854	0.10579	0.450
	Matched	0.14286	0.04762	0.305	0.08947	0.1	0.727
aze_11	Unmatched	0.04762	0.12222	0.326	0.00521	0.16154	0.000***
	Matched	0.04762	0.19048	0.160	0.00526	0.00526	1.000
aze_12	Unmatched	0.000	0.11111	0.111	0.00521	0.09578	0.000***
	Matched	0.000	0.000	.	0.00526	0.01053	0.563

* p<.1; ** p<.05; *** p<.01

Table 9 Results for Access to Credit

Access to any form of credit								
	Customary with and without title		Freehold with and without title		Freehold and customary with title		Freehold and customary without title	
	Kernel	Imben	Kernel	Imben	Kernel	Imben	Kernel	Imben
ATT	0.133	0.054	0.000	-0.192	0.263	0.009	0.132*	0.090**
S.E.	(0.110)	(0.057)	(0.213)	(0.124)	(0.283)	(0.158)	(0.077)	(0.042)
N	2733	2733	202	202	87	87	2896	2896

* p<.1; ** p<.05; *** p<.01

Table 10 Results for Access to Informal Credit

Access to Informal Credit Sources								
	Customary with and without title		Freehold with and without title		Freehold and customary with title		Freehold and customary without title	
	Kernel	Imben	Kernel	Imben	Kernel	Imben	Kernel	Imben
ATT	0.122	0.027	0.000	-0.192	0.263	0.009	0.132***	0.096**
S.E.	(0.102)	(0.057)	(0.235)	(0.124)	(0.283)	(0.158)	(0.058)	(0.042)
N	2733	2733	202	202	87	87	2896	2896

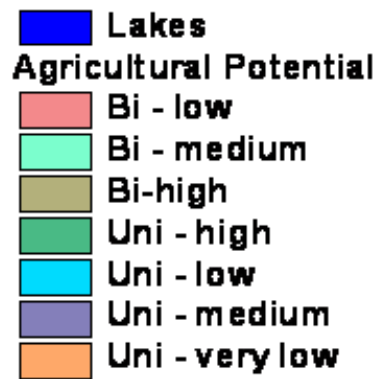
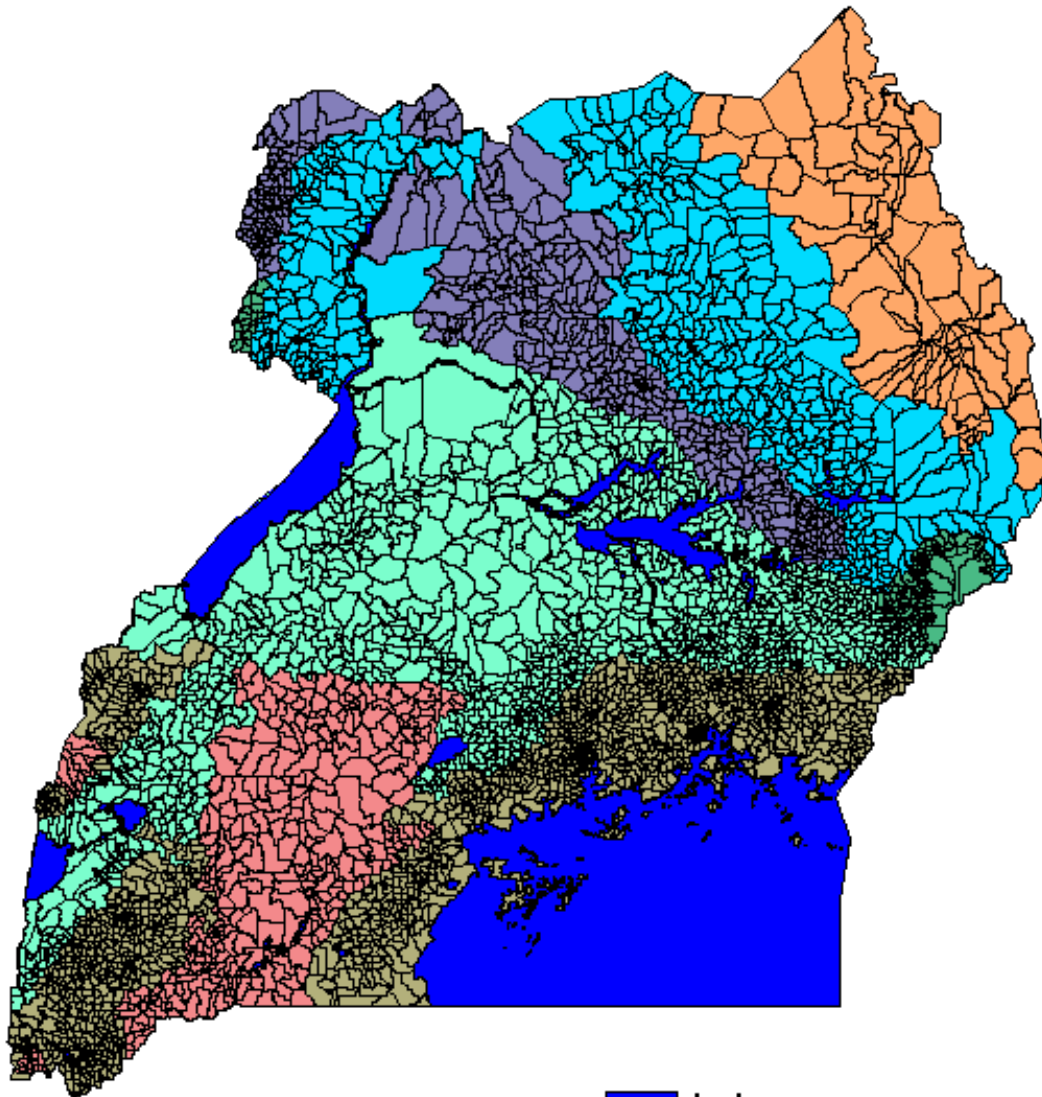
* p<.1; ** p<.05; *** p<.01

Table 11 Results for Access to Formal Credit

Access to Formal Credit Sources								
	Customary with and without title		Freehold with and without title		Freehold and customary with title		Freehold and customary without title	
	Kernel	Imben	Kernel	Imben	Kernel	Imben	Kernel	Imben
ATT	-0.011	0.017	0.048	-0.067	0.263	0.171	0.000	-0.017
S.E.	(0.072)	(0.050)	(0.205)	(0.109)	(0.218)	(0.145)	(0.049)	(0.035)
N	2733	2733	202	202	87	87	2896	2896

* p<.1; ** p<.05; *** p<.01

Map 1



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