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

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Contents

Abstract	v
1. Introduction	1
2. Research Question	2
3. Literature Review	4
4. Uganda's Land Tenure History	6
5. Survey Data	8
6. Method of Analysis	10
7. Descriptive Results	15
8. Conclusion	26
References	28

List of Tables

1. Companions used in the analysis	2
2. Descriptive statistics of variables	12
3. Tenure by region in number of households	15
4. Access to credit, formal and informal by region in number of households	16
4b. Comparison of credit access by region	16
5. Access to credit, formal and informal, by tenure in number of households	17
6. Access to credit, formal and informal, by certificate of title/ownership in number of households	18
7. Probit results	19
8. Balancing test results (pctest)	20
9. Results for access to credit	24
10. Results for access to informal credit	24
11. Results for access to formal credit	25

List of Figures

1. Uganda's agro-ecological zones	14
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ABSTRACT

The theorized impact of land tenure and titling on access to credit has produced mixed results in the empirical literature. Land tenure and titling is hypothesized to increase access to credit because of the enhanced land security provided and the newfound ability to use land as collateral. Using land as collateral and obtaining access to credit are paramount concerns in Uganda and in all of Africa, as greater emphasis is placed on the need to modernize the agricultural system. This paper uses a new approach in evaluating whether land tenure and titling have an impact on access to credit for rural households in Uganda. The new approach includes comparisons across four categories: (1) households who have customary land with versus without a customary certificate, (2) households who have freehold land with versus without a title, (3) households with a title or certificate having freehold versus customary tenure, and (4) households without a title or certificate having freehold versus customary tenure. Each comparison is then evaluated for the impact on access to any form of credit, formal credit, and informal credit. This analysis allows for an in-depth look into which element, tenure or title, is impacting access to credit and to which type of credit, formal or informal. To conduct this analysis, matching techniques are used, including propensity score matching and the Abadie and Imbens matching method. These two methods contain both strengths and weaknesses that allow the results to support to one another. The only significant finding of the matching was a positive impact on access to credit of freehold without title over customary without certificate. Results imply that tenure, not title, impacts credit access for rural households in Uganda.

Keywords: Uganda, land tenure, land titling, rural credit

1. 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, and 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. Some countries that have initiated or are currently developing titling programs include Peru, Vietnam, Cambodia, Colombia, Mexico, Honduras, Paraguay, Ghana, South Africa, Botswana, Turkey, and the Philippines.

The effects of tenure and titling, including increased access to credit, are hypothesized to be multiple and extensive for developing countries. 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 a tired subject that has been over examined. Indeed, many studies have scrutinized 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, the issue is still very topical, and the 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. Although a decade has passed since the Ugandan Land Act of 1998 was enacted, the issues of land tenure and rights remain at the forefront of Ugandans’ thoughts and policy debates. Newspapers report incidences of violence against tenants, returning IDPs (internally displaced people), and others involved in unsolved land disputes (Kalibbala 2008; Aciro 2008). Additionally, the Uganda parliament is currently considering an amendment to the Land Act aimed at resolving the many disputes that have arisen since 1998 and providing greater security to land occupants (Parliament of Uganda 2008).

Lack of access to rural credit is a major constraint to achieving the goals of the Ugandan government’s Poverty Eradication Action Plan and its Plan for Modernization of Agriculture. Policymakers need to know whether the land tenure reforms pursued under the 1998 Land Act are contributing to increased credit access, or could contribute to a greater extent, in order to build on the successes that are occurring. Alternatively, they need to know whether the Land Act should be revised to improve its effectiveness. It is therefore necessary that Ugandans continue to reassess the impact of tenure and title on their access to credit and other aspects of their lives. Utilizing household survey data from Uganda, this paper will seek to determine if land title and/or tenure rights status affect access to credit among rural households.

2. 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 percent of the parcels in this data set, are of customary tenure. In the hope of modernization, the Land Act was designed to facilitate the transition of Uganda from customary to freehold landownership (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). To do this the Land Act provided a path to freehold tenure with title, as well as provided customary landowners an intermediate option to obtain a certificate of customary ownership. This certificate serves as proof of customary ownership, but does not free the owner from the customary laws and restrictions that govern the land, including in many cases restrictions on the ability of the owner to sell or mortgage their land.

The question of impact will be applied to four comparisons of tenure and title status (see Table 1). The comparisons made will be between (1) households who have customary land with versus without a customary certificate (B-D in Table 1), (2) households who have freehold land with versus without a title (A-C in Table 1), (3) households with a title or certificate having freehold versus customary tenure (A-B), and (4) households without a title or certificate having freehold versus 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 versus customary tenure subject to the communal norms and traditions—lead to greater access to credit, or whether the proof of tenure status provided by a title or certificate increases access to credit. Although such comparisons are essential to distinguish the effects of tenure per se from those of titling, we have not seen this type of analysis in the previous literature.

Table 1. Companions 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	

Source: Compiled by authors.

The first comparison will be within customary households, between those with and without a customary certificate. This disaggregation is looking for whether certificates affect access to credit, which would identify any credit-related incentives. The second analysis is of freehold tenure households, between those with and without a title. The objective is to analyze whether a title impacts access to credit for freehold households and if there is a need for those with freehold to incur the cost of obtaining a titling. The third comparison is between freehold with title and customary with certificate. This comparison is important because if no difference exists, then it is possibly attributable to possession of any title/certificate and not the tenure status of the household, leaving little incentive for customary with certificate to shift to freehold with title. The final comparison is between freehold without title and customary without certificate. This level of analysis runs counter to the previous grouping, assessing whether differences in credit access exist between freehold and customary tenure, regardless of documentation. If differences exist in credit access, then it could be attributed to the tenure status and not

ownership of title/certificate. For each of the four comparisons, the analysis will investigate differences in access to any form of credit, as well as differences in access to formal or informal credit.¹

¹ Formal credit is comprised of credit from banks and microfinance institutions, while the informal credit consists of credit from friends, relatives, employers, landlords, local money lenders, shopkeepers or village-level associations. These classifications are based on the survey; however, microfinance institutions were categorized in the survey as “semiformal credit.” The number of observations in the formal and semiformal categories was too small to test for significance of impacts on each separately; thus, the formal and semiformal categories were combined.

3. LITERATURE REVIEW

The literature on land tenure and titling is extensive and growing as researchers seek definitive understanding of the impact of these on the poor of developing countries. Included in this exhaustive amount of research are the theories of how land tenure impacts credit. The effect occurs on three levels: demand, supply, and transactionary (Feder et al. 1988; Carter and Olinto 2003; Place and Hazell 1993; Besley 1995; Pinckney and Kimuyu 1994; Hayes et al. 1997; Gavian and Fafchamps 1996; Pender and Kerr 1999). Land tenure security may increase demand for credit: increased land security may result in the desire of families to invest more in their land, resulting in a greater demand for capital. The effect on the credit supply is an increase in the willingness of lenders to provide credit if borrowers have the ability to use secured land as collateral. With secure and titled land as collateral for credit, creditors can lawfully repossess land if necessary in the event of a default. In addition, the threat of repossessing collateral acts as an incentive to the borrower to repay the loan on time. The final theorized effect of secure and titled land tenure is through its effects on land transactions: secure land tenure may facilitate the emergence of efficient land markets, where land is employed for its best use. Transactions will become easier as people have official documentation of landownership, and potential buyers no longer have to worry about competing claims.

One of the first publications to develop this theory and present evidence in favor of the connection between title and credit was Feder et al. (1988). Using data from Thailand, evidence was presented in support of the hypothesis that if title provides land security, then land could be more easily transferred, along with providing unquestionable ownership. Feder et al. showed that the combination of these two facts results in land becoming usable as collateral; thus, the Thai farmers who had land titles had greater access to credit, used more credit, and at lower interest rates, with the outcome of increased productivity. Other studies have supported these conclusions; there was evidence in Gambia that increased individual rights lead to greater credit access and investment, resulting in higher productivity (Hayes et al. 1997). Studies of multiple African countries suggest that although access to credit is increased for those with title, this access does not increase the overall supply of credit but rather a redirecting of the credit (Barrows and Roth 1990). These results may provide the extra incentive needed for households to move towards titling.

However, the data have not been conclusive about the connection between titling and access to credit. Data from Ghana, Kenya, and Rwanda showed no significant relationship between tenure rights and investment in the land (Place and Hazell 1993). Additionally, a comparative study of Uganda's neighbors Tanzania and Kenya found similar results. Pinckney and Kimuyu (1994) found that neither of the countries' tenure systems increased access to land-secured loans, increased security through titling, or increased investment as a result. A glimpse of Uganda before the Land Act is provided by a study of an early, pilot land registration scheme in Rujumbura. The study found little use of credit in general and no link to registered/titled land. In fact, most credit was used by untitled landholders from informal sources for off-farm needs (Roth et al. 1994). These results may discourage hopeful proponents of titling, or they may suggest that different cultures use titling in different ways.

The lack of significant impact may not stem from the failure of the titling system, but rather from earlier adaptations by the society. A lack of formal titling describes much of Africa's past and present; as a result, borrowers and lenders were forced to make do with the circumstances at hand. If this is true, then even those who do obtain title may not see an impact on their access to credit, because lenders have already developed mechanisms for screening borrowers. These adaptations can be understood as adjustments by customary, indigenous practices to the existing situation, which lacked title (Pinckney and Kimuyu 1994; Goldstein and Udry 2005). This may include village money-lenders' relying on personal relationships over assets, as seen in southern India (Pender and Kerr 1999). If communities have never had to back their loans with land title, coupled with their considering the great importance of land as a source of survival, then the impact of titling may be limited in this setting.

For all the emphasis on the impact of titles on credit and investment, it could possibly be the other way around. Depending on the society, land tenure may not affect investment, but investment may affect land tenure (Aluma et al. 1993; Besley 1995; Sjaastad and Bromley 1997; Otsuka and Place 2001; Deininger and Jin 2006). The logic is that people invest in the land as a form of staking claim and increasing their perceived ownership. A frequent method is the planting of trees, because trees require time to grow fully. Following this train of thought, evidence from Ghana shows that the continuation of usufruct rights requires that farmers fallow the land for less time and continue to farm (Goldstein and Udry 2005). The result of insecure land rights is constant cultivation and minimal fallowing of the land. In a situation such as this, demand for titling may be limited because people are accustomed to acquiring secure ownership through physical investment in the land. Conversely, this may be the same society that needs titling the most so that landowners can utilize their land for the best use, whether under cultivation or left to fallow.

Nevertheless, it is the potential use of credit that makes access to it crucial for households in Uganda. Data from two districts in Uganda, Kumi and Rakai, found that limited access to credit hindered diversification of the household into nonfarm activities (Smith et al. 2001). Data from the African country Mali also supported this hypothesis, finding that a lack of capital was a significant reason for poor households not to diversify their income sources (Abdulai and CroleRees 2001). The poor households are unable to escape the trap of subsistence farming because of their limited access to credit. Unfortunately, access is further restricted in rural portions of Africa that remain underserved by lenders, exacerbating the problem (Goldstein and Udry 2005; Diagne 1999).

Credit not only affects Ugandan households' ability to transition away from agriculture, but also their agricultural activities. Nkonya et al. (2004) found that availability of informal credit was related to greater cereal production and increased labor intensity in crop production in Uganda. More recently, in a survey of Ugandans' desire to acquire full ownership rights of any type of land that they have only user rights over, respondents expressed great willingness through the large amount of money they were willing to pay to obtain full ownership rights (Deininger and Ali 2007). The willingness of so many Ugandans to pay implied that great economic benefits could be realized from legally recognized landownership. The existing restrictions on credit access caused by the lack of land tenure and title feed into the inability of poor households in Africa to break away from the subsistence approach and move into commercial farming or nonfarm enterprises.

4. UGANDA'S LAND TENURE HISTORY

Uganda is a nation with a contentious land tenure past and an uncertain future. Original land rights were governed by the customary laws and norms of the society using the land, and many of these laws continue today. The main form of acquisition of customary land is through inheritance, usually father to son. The inheritance is frequently not ownership of the land, but only usufruct, as is the status of most customary land (Deininger and Castagnini 2006). No title is passed on with the land, and very little customary land was ever titled before the Land Act of 1998 (Aluma et al. 1993). In fact, customary land tenure was never recognized under the law until the 1995 Constitution of Uganda. Before then, customary landowners were seen as only tenants on government land (Mwebaza 1999). Beyond inheritance, customary law usually requires approval of village/tribal elders when selling a parcel of land; in some cases, the parcel can be sold to an outsider only if no other member of the community wishes to purchase the parcel (Baland et al. 2007). This allows village elders to maintain homogeneity in their community, as well as to stop hasty and irrational land sales that would leave families landless. In addition, mortgaging of customary land is almost unheard of, much for the same reasons that sale of land is closely guarded (Mwebaza 1999). Nevertheless, events in Uganda's history, including colonization, have created new forms of tenure with new land rights.

In 1900 the Uganda Agreement was signed between the British government and the Kingdom of Buganda. This agreement allowed the British to establish control over Uganda. In exchange, the British granted large tracts of land—19,600 square miles (mainly in central Uganda where the Buganda kingdom existed)—to the *kabaka* (king) and other dignitaries from within the kingdom. The land was measured in square miles, giving birth to the term *mailo*, which has now become the most difficult tenure status to address (Coldham 2000). Originally, the land was given with freehold rights, including the ability to rent, sell, or mortgage the land (Aluma et al. 1993). But, as much of the land lay unutilized, outsiders began squatting on the land and became known as *kibanja* holders. These *kibanja* tenants began to acquire legal status, which in turn curbed the rights of the *mailo* owners while increasing those of the occupants (Aluma et al. 1993). This competition of rights between the *mailo* owners and the tenants continues today and remains a serious problem.²

In addition to customary and *mailo* tenure status, early experiments with freehold land tenure occurred but were not widespread. Under the Agreement of 1900, a small amount of freehold land was allotted, mainly in the western region of the country, including parts of the districts of Mbarara, Bushenyi, Kasese, Kabarole, Kabale, and others (Aluma et al. 1993). The crown also granted another form of freehold, *adjudicated freehold*, given to churches and a few favored elites (Rugadya 1999). Adjudicated freehold conferred the same rights as freehold status, including the ability to acquire title and use the land as the owner wished.

In 1958, the Ugandan government sought to establish freehold tenure through a pilot program (Crown Lands Rules of 1958) conducted in the districts that are now known as Mbarara, Bushenyi, Kasese, Kabarole, Kabale, Kisoro, and Rukungiri (all located in the western region of the country) and Mbale and Kapchorwa (in the eastern region of the country) (Mugambwa 2007; Kamusiime, Rugadya, and Obaikol 2005; Kisamba-Mugerwa 1992).

Uganda continued under British rule with these three land tenures until 1962, when the country became independent. Just prior to independence, the British passed the Public Lands Act of 1962, which allowed Ugandans to settle on unoccupied government land. This act also forced the government to compensate and relocate customary occupants of land that the government had granted to others (Mugambwa 2007). Only 13 years later the tables turned when many Ugandans lost the right to their land as a result of the 1975 Land Reform Decree of President Idi Amin. The decree set forth that all land in Uganda was public land, with all forms of tenure converted into 99-year government leases. In addition to

² The amendment to the Land Act of 1998 that is currently under debate deals largely with the rights of lawful occupants versus those of owners, in regard to unlawful evictions (Parliament of Uganda 2008).

the loss of ownership, tenure was weakened even further by the government's new authority to confiscate land without consent (Hunt 2004).

Not for 20 more years was the issue of land tenure again addressed. The 1995 constitution sought to rectify the situation by first declaring that all the land of Uganda belongs to its citizens. In addition, the constitution established the four current land tenure holdings: freehold, customary, *mailo*, and leasehold. The document did not, however, address rights, implementation, or enforcement, but instead demanded parliament to develop a land act handling these issues within two years (Coldham 2000). To accomplish this monumental task, Uganda looked to the experiences of other countries and to their African neighbors for guidance.

Uganda shares borders with Tanzania and Kenya, two countries that took divergent tenure paths, between which Uganda sought a balance. In 1956 the colonial government of Kenya desired stability in the country, and thought it could be achieved by surveying and titling all of the customary land in the country. In contrast, Tanzania abolished all private landownership in the name of equity and forbade the buying, selling, or renting of land (Pinckney and Kimuyu 1994). Having witnessed the consequences of each country's decision, the government of Uganda sought a balance between the movement to free markets and the need to respect the customary laws of the people.

The resulting 1998 Land Act defined the rights of the four current classifications of tenure: freehold, leasehold, *mailo*, and customary.³ 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 may be obtained (Government of Uganda 1998, Land Act, Sec. 4.3). As a concession during the drafting of the act, *mailo* status was reinstated and given all the rights of freehold. However, *mailo* owners' use of their land became subject to the rights of lawful occupants.⁴ These occupants are required pay the *mailo* owners only a nominal rent, not to exceed 1,000 Ugandan shillings per year, which is less than US\$1 per year (Sec. 32.5). Additionally, occupants must be consulted before the owner undertakes action with the land (Sec. 4.4); thus, *mailo* owners have only very limited rights, unlike freehold landowners. Therefore, *mailo* owners have been excluded from our analysis because we expect *mailo* ownership or title to have little impact on credit access. Nevertheless, this issue is worthy of further investigation.

Leasehold tenure is a carryover from Amin's era, with many households still under land leases from the government, while others are traditional leases held by private citizens. Those occupants holding land leases from the government do have the ability to convert to freehold land as laid out by the Land Act (Sec. 29). Therefore, leasehold is also excluded from the analysis because leasehold does not provide the right to mortgage the land and because this form of tenure is relatively rare, with very few observations in our data. Regarding customary tenure, the Land Act chose to recognize the customary power and rights that still exist in Uganda, but it includes provisions for converting customary tenure to freehold. Customary rights are contingent on local customs. "Any decision taken in respect of land held under customary tenure...shall be in accordance with the custom, traditions and practices of the community concerned" (Sec. 28). If allowed under the customary law of the land, the owner may sell, lease, or mortgage the land; but as noted previously, these occurrences are very limited (Baland et al. 2007; Mwebaza 1999). Owners may obtain a certificate of customary ownership, which can be converted into freehold title upon surveying of the land (Secs. 5 and 10). It has been over a decade since the passage of the Land Act, but its relevance has not diminished; in fact, it appears to have increased.⁵

³ In addition, the 1998 Land Act established a Land Commission and Land Boards. The Land Commission is responsible for the management of government-owned land, while the Land Boards are charged with conducting land registrations and transfers at the district level (Secs. 47 and 57). The Land Tribunals were created at the district level to handle land disputes (Sec 75). The Land Act failed to identify a source of funding for these new endeavors.

⁴ These lawful occupants are defined as having lived on the land for at least 12 years or with the owner's permission, therefore enjoying occupancy security while paying a nominal rent. Lawful occupants may also apply for a certificate of occupancy, which can be inherited or sublet (Sec. 30). However, if the land is left unattended for three or more years, the occupancy lapses and the *mailo* owner regains control of the land.

⁵ Unfortunately, there are no reliable estimates of the extent of titling since 1998.

5. SURVEY DATA

The survey was conducted by the Uganda Bureau of Statistics in 2005–2006 at both the household and parcel level. The last Ugandan household survey was conducted in 2002–2003 and included questions about labor and the informal sector. In contrast, this survey included an agricultural module in addition to the standard socioeconomic household questionnaire. These surveys are used as an assessment tool for Uganda's progress toward meeting the objectives of the Millennium Development Goals and the Poverty Eradication Action Plan (Uganda Bureau of Statistics [UBOS] 2006).

Questions in the socioeconomic component of the survey pertained to education, health, employment, living conditions, household assets, loans, expenditures, and welfare indicators. The agricultural portion consisted of questions about ownership rights, usage rights, investments, crops, inputs, land characteristics, cattle, and agricultural knowledge.

To draw the sample, two-stage sampling was used; the first stage drew enumerations areas (EAs) using probability proportional to size (PPS). The technique of PPS results in the probability of an EA's being selected as proportional to its size/population (Rosén 1997). The second stage then used stratified random sampling to select the households. The households were categorized by land and farming status, resulting in four classifications: non-farming households, small-scale farm households (with less than 2.5 acres), medium-scale farm households (more than 2.5 but less than 5 acres), and large-scale farm households (5 acres or more). After the households were classified, they were then selected to proportionately represent the EA, with 10 households in each EA. If all of the EA was involved in agriculture, then all 10 households would be asked to participate in the agricultural survey; if half of the EA owned 5 acres or more, half of the households surveyed would have 5 acres or more (UBOS 2006).

To collect the data, two visits were made to each household: the first visit was between May and October 2005, and the second visit was between November 2005 and April 2006. On the first visit the agricultural module was administered to every household that was engaged in agricultural activities. The socioeconomic survey was also administered at this time, but only to 5 out of the 10 households in each EA. During the second visit the agricultural section was again administered to all that were involved in agriculture, while the socioeconomic survey was given to the other 5 households that did not receive the survey in the previous visit. The result was 783 EAs (including 30 in internally displaced persons camps) selected, with a total of 7,426 households comprised of 42,227 members surveyed, covering every district in Uganda. The agricultural survey included 13,990 parcels, of which 9,144 were under ownership rights, while 4,846 parcels were under usage rights.

Though a well-drawn sample, UBOS did encounter some possible problems and resulting constraints with the data. In the agricultural module, the farmer was asked the size of the parcel. In some circumstances the farmers did not know or could only make a guess about the size. To overcome this problem, surveyors intended to use a GPS tool to measure all parcels. Unfortunately, many respondents and/or communities refused to allow measurements of land to be taken (UBOS 2006). Additionally, measurements were not taken at all for households in IDP camps because the parcels were usually far from the camp (UBOS 2006). Therefore, this paper will use the GPS calculations when they are available, and will replace those missing GPS values with the farmers' estimates. Additional problems arose with the timing of the two visits. The information that was collected on the agricultural activities occurred many months before the survey, thus relying on the recall abilities of the households and creating the potential for errors in recollection.

From the 7,426 households, 5,877 were agricultural households, and from those, 4,672 have ownership rights over at least one parcel of land. Since the survey distinguished between ownership and usage, the decision was made to focus on those with ownership, as the purpose of the law is to develop a pathway to landownership. From that sample of 4,672 landowners, 4,113 were classified as rural; and with some trimming of outliers from the data, the ultimate subset for this paper was 3,890.⁶ Once the

⁶ Trimming included outliers of age, ownership years, and size of land, (i.e. age greater than 99 years and land size greater

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, and 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, then only one tenure status was selected.⁷ For those with freehold and another tenure status, freehold became the classification. The idea is that if a household has one parcel of freehold, then that is most likely the parcel that would be used for loan security; thus the household was classified as a freehold household. *Mailo* and leasehold, since they do not confer complete ownership rights and the ability to mortgage, were discarded from the sample of analysis. The remaining households were wholly customary, as these are the intended target of the Land Act. This need for classification could have been overcome only 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.⁸

than 400 acres).

⁷ 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.

⁸ When restricted to single-parcel households, the sample was cut in half to a mere 1,900 households, of which only 6 percent 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 are available from the author upon request.

6. 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 between those who began without title and those who obtained title later, to investigate how this impacted their credit access (reflexive or double difference analysis). However, this survey is not panel data.⁹ 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 of common support (reducing the impact of outliers), thus minimizing bias in the results.¹⁰ A variety of methods for matching exist, 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). “Matching is a method of sampling from a large reservoir of potential controls to produce a control group of modest size in which the distribution of covariates is similar to the distribution in the treated group” (Rosenbaum and Rubin 1983, pg 48). This method seeks to match “treatment” (e.g., with title) and control (e.g., without title) households that are similar in terms of their observable characteristics that are expected to jointly affect the tenure and title status, and access to credit, such as household and land characteristics. If multiple variables are being matched upon, some distance metric is needed to aggregate the multidimensional values of the covariates into a single scalar for matching. PSM is based on matching on the estimated probability (or “propensity score”) of observations being in the treated group, $P(X)$. This assumes that matching on $P(X)$ is as valid as matching on X . With this method of matching, the relevant characteristics are first identified, vector X , then inserted into a probit model to predict titling or tenure.¹¹ From the probit, a propensity score is found; this is the probability of the household participating in the titling program conditional on vector X , $P(X) = \Pr(d=1|X)$ (Rosenbaum and Rubin 1983; Jalan and Ravallion 2003a & 2003b; Meng and Ryan 2004; Heckman, Ichimura, and Todd 1998). Using this propensity score, which represents the probability of participating in the program (titling or tenure status in our case), a counterfactual is identified, having a similar propensity score, allowing treated and untreated households to be matched.

After running a probit of household characteristics (which are noted below) on title or tenure status (using each of the four binary comparisons previously mentioned), a propensity score will be predicted for each household. This score is the predicted probability of being treated (whether or not actually treated), allowing households to be matched using this score that represents observable characteristics of the household.

In kernel matching, the treatment household is matched with a weighted average of all the control households, with greater weight given to “closer” households (Heckman et al. 1998; Jalan and Ravallion 2003a; Gilligan and Hoddinott 2006). Different forms of weighting exist that can be used with kernel

⁹ Though questions were asked during two different crop seasons, this is not relevant to the credit question. Regarding credit access, the question was asked if the household has access to credit now and also 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).

¹⁰ Matching only deals with selection on observables, while IV estimation can address problems of selection on unobservables.

¹¹ Other models could be used to predict the propensity score, such as a logit model. A probit model assumes that the error in the participation equation is normally distributed; other assumptions about this error term would yield different models.

matching; this paper will use the normal density weighting function.¹²¹³ The advantage of kernel over other PSM, such as the nearest neighbor or five 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.¹⁴ 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 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 (2006a) 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.

The 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, this method matches using the differences in the values of the covariates, weighted by a matrix, to create a distance metric of nearness.¹⁵ The advantage of this method is that the correct standard errors are calculated, and it allows for a bias correction. Some user specifications to the Abadie and Imbens matching included estimating the average treatment effect for the treated (ATT), which allows for easy comparison with the other matching method. The number of matches per observation was specified at five nearest neighbors. As mentioned earlier, the bias-corrected matching estimator was used, which “...adjusts the difference within the matches for the differences in their covariate values” (Abadie et al. 2004). 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; its nearest neighbor method is more arbitrary than PSM because it uses an arbitrary distance metric based on the covariates to match—a metric 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). Because 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 because 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.

Incorporated in both methods of analysis are the covariates from the data. These 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

¹² We also used the Epanechnikov kernel weighting function in one set of analyses. The results were little different from the results using the normal density weighting function.

¹³ For further information on the Kernel Matching Formula see Heckman, Ichimura, and Todd, 1998.

¹⁴ The only incidence of dropped observations due to a lack of common support was for comparison of freehold with title and customary with title; four observations were dropped.

¹⁵ For further information on the Abadie and Imbens Matching Formula please see Abadie et al. 2004.

quality land. To control for these parcel characteristics with households that have multiple parcels, proportions were introduced, that is, 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.

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

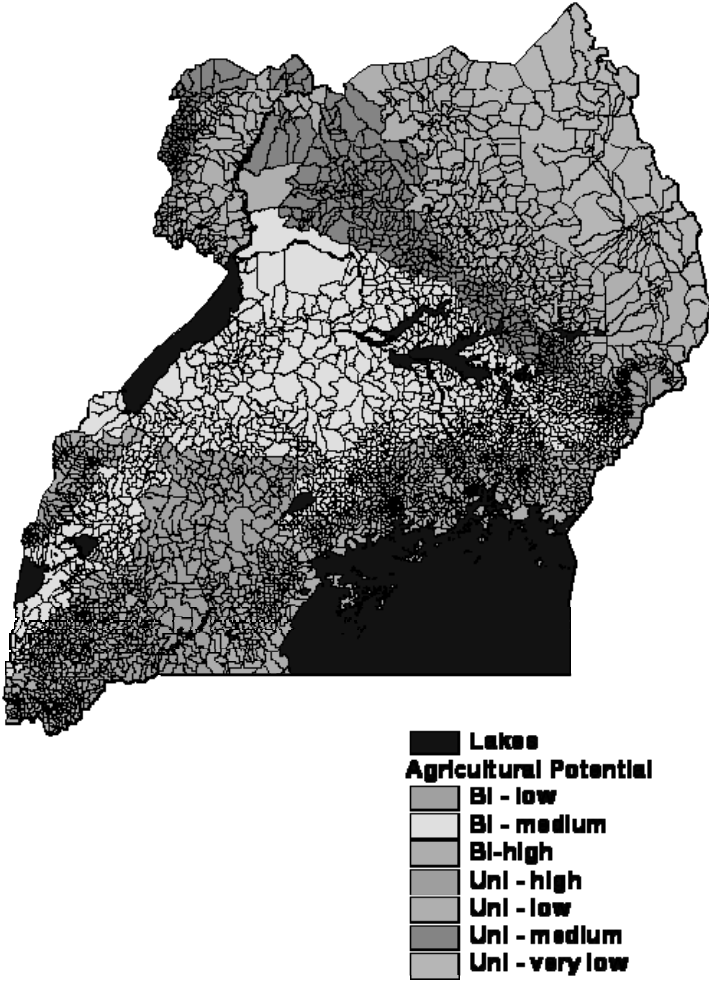
Source: Compiled by authors.

Other variables related to land include the size of the land. As land size increases there may be 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 because there would be 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 regard to the household, control variables of the household head are included: sex, age, and school attendance.

The final set of covariates is the agro-ecological 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 rainy season; and bimodal, or “bi,” for two rainy seasons) and for their agricultural potential (including high, medium, low, and very low). The resulting categories are uni_very_low, uni_low, uni_med, uni_hi, bi_low, bi_med, and bi_high. These zones were mapped onto Uganda using GIS techniques (see Figure 1). The hope in the present study was to match the data from the UBOS survey, which included GPS locations of households, with the geo-referenced zones. However, difficulties arose when mapping the locations of the survey households, and so exact mapping was abandoned in favor of district-level matching.¹⁶ Using the Uganda data from Ruecker et al. (2003), each district was classified by the zone it fell into. Some districts fell into two zones, resulting in the creation of five more, mixed categories: bi_low_med, bi_med_high, bi_low_high, uni_low_medm, bi_uni_med. The resulting 12 categories allow classification of each district by its agricultural characteristics, which may not have been observed in the survey and contain distinctly different characteristics. By examining Figure 1 it is evident that the northern portion of the country experiences only one rainy season and has lower agricultural potential than the bimodal central and southern portions of Uganda. These differences may impact tenure and security; thus the fixed effects will control for unobserved difference between the zones.

¹⁶ The coordinates from the survey were in UTM, and upon transforming them into latitude and longitude, problems were encountered. Most households were mapped in Egypt and the DRC.

Figure 1 Uganda's agro-ecological zones



Source: Compiled by authors.

7. DESCRIPTIVE RESULTS

Before econometric analysis is undertaken, an in-depth investigation into the descriptive statistics can provide a solid foundation for understanding and interpreting the data. Of the 3,890 rural households, 75 percent are of customary tenure and 5 percent are of freehold tenure; the remainder are *mailo* (19 percent) and leasehold (1 percent). Interestingly, all of the tenures except customary are heavily concentrated in one of the regions of the country: the majority of freehold are in the western region (61 percent), the *mailo* are clustered in the central region (98 percent—not surprising considering the *mailo* status applies mainly to the Buganda kingdom, located in central Uganda), and leasehold is mostly in the central as well (61 percent); but customary is spread throughout the rest of the country (39 percent in eastern, 31 percent in western, and 28 percent in the northern; see Table 3).

Table 3. Tenure by region in number of households

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

Source: Compiled by authors.

There also appear to be regional differences in access to credit that are statistically significant (see Table 4). Access to credit hovers around 50 percent for all four regions but is highest in the northern region, at 57 percent. Informal rates are nearly the same at around half the population; again the north is the highest with 55 percent access. As for formal credit, access rates are around one fifth for the central, eastern, and western regions; however, in the north the rate jumps to 36 percent. One possibility for greater access in the north may be the concentration of government resources in the development and reconstruction of this region after the intense civil war with the Lord's Resistance Army. Table 4b shows 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 from the eastern and northern regions.

Table 4. Access to credit, formal and informal by region in number of households

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

Source: Compiled by authors.

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			-0.0010			-0.0351		
	0.538			1.000			0.536		
Northern	0.0296	0.0646		0.1294	0.1303		0.0164	0.0516	
	0.790	0.024		0.000	0.000		0.985	0.125	
Western	-0.0907	-0.0557	-0.1203	-0.0623	-0.0613	-0.1917	-0.0838	-0.0487	-0.1002
	0.001	0.049	0.000	0.011	0.004	0.000	0.002	0.122	0.000
F			10.07			31.69			7.41
P value			0.000			0.000			0.001

Source: Compiled by authors.

With regard to credit access, the comparison of access between freehold and customary tenure may appear counterintuitive. Of all freehold households, 57 percent have access to any form of credit, compared with 50 percent of customary households that have access to any form of credit, a difference that is significant at the 10 percent level. For formal credit, 21 percent of freehold households have access, and 26 percent of customary households have access, a difference that is not significant. For informal credit, a significant difference does exist: 57 percent of freehold households have access, and only 49 percent of customary households have access (see Table 5). It appears that when considering only tenure and not title, freehold increases overall access, driven by greater access to informal credit, but customary households surprisingly have somewhat greater access to formal credit (though this difference is not statistically significant).

Table 5. Access to credit, formal and informal, by tenure in number of households

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

Source: Compiled by authors.

Turning to those with formal certificates, less than 10 percent of freehold households have certificates of title (21 households), and only 3 percent of customary households have certificates (91 households). The small percentage of freehold households with certificates of title requires some comment. This could be the result either of truly freehold households who have not kept their title up-to-date or never obtained one, or of households misreporting land as freehold that legally has another rights status. Although the Land Act provides that a title may be acquired for freehold land, this is not a requirement. Specifically, Section 4.2 of the Land Act states, “For the avoidance of doubt, a freehold title may be created which is subject to conditions, restrictions or limitations which may be positive or negative in their application, applicable to of the incidents of the tenure” (Government of Uganda 1998). This clause leaves room for Ugandans to own freehold land without obtaining a title for the land. Given the substantial costs of obtaining a title, which requires a cadastral survey of the land, it is not surprising that many households with freehold tenure would not seek titling, particularly if they do not feel threatened or see no strong reason to pay these costs. According to the Land and Equity Movement in Uganda (pg 1), “surveying is an expensive process, [therefore] only the rich would ever be able to afford title.”

There is also the possibility that people are mistaken about or misreport their land tenure status. Only 23 percent of all of the surveyed households that reported having freehold tenure are in the nine western and eastern districts, where the pilot land titling program in the late 1950s established freehold tenure with title. Therefore, it is possible that people are mistakenly reporting that their land tenure status is freehold, when actually the land may be legally of another status. It could be that people in rural Uganda have been exposed to the term *freehold* so much in the past decade that they assume that they have freehold status without this being legally true. Nevertheless, if a person does claim that their land is freehold, it may imply that the owner feels very secure in the ownership of and control over the land.¹⁷ Hence, some of those who report that they have freehold tenure may have this status in a de facto sense, even if this is not their de jure property rights status. This de facto tenure security may be as important as, or even more important than, the de jure status of the land, especially in accessing informal credit.

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 titles, their access to any form of credit is nearly identical to customary households with

¹⁷ The belief in the security of ownership held by the owner may be sufficient for lenders (especially informal lenders) because there is the possibility that land tenure status is used only as a screening device and not as collateral that can be repossessed. For example, in this survey, only 23.5 percent of borrowers from formal banking institutions and only 25 percent of borrowers from microfinance institutions used land as collateral. In total, only 12 percent of all borrowers were required to use land as collateral; the result is land’s losing its significance as collateral and instead land tenure potentially being used as a screening device. The analytical results reported below support this interpretation.

certificates (52 percent for freehold households with titles, 51 percent 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 percent for freehold with a title and 26 percent for customary with a certificate). However, of households without a title or certificate, customary has greater access to formal credit (21 percent for freehold without a title and 26 percent for customary without a certificate). With regard to accessing informal credit, freehold households with titles of ownership do slightly better than customary households with certificates, 52 percent versus 48 percent, respectively. None of the differences are significant, however, even at the 10 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 factors that are biasing the descriptive analysis (i.e., AEZs, land quality, or human capital endowments) may exist.

Table 6. Access to credit, formal and informal, by certificate of title/ownership in number of households

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

Source: Compiled by authors.

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 see 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 percent 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 for the 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.

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)
Land quality good	-0.071 (0.116)	0.168 (0.352)	0.965* (0.526)	0.272*** (0.091)
Land quality poor	0.118 (0.182)	-0.007 (0.480)	0.747 (0.642)	0.219 (0.141)
Topography hilly	0.330* (0.195)	1.988*** (0.560)	2.016*** (0.733)	-0.075 (0.165)
Topography slope	0.198 (0.126)	1.032** (0.473)	0.889 (0.573)	0.288*** (0.093)
Topography steep slope	0.701*** (0.251)	- -	- -	-0.423 (0.357)
Topography valley	0.147 (0.415)	1.145 (0.990)	2.047* (1.151)	0.255 (0.339)
AEZ 3	0.408 (0.249)	0.132 (0.407)	-1.277* (0.697)	-0.355*** (0.117)
AEZ 6	0.7 (0.504)	- -	- -	-1.056*** (0.319)
AEZ 7	-0.018 (0.290)	- -	- -	-1.451*** (0.238)
AEZ 9	0.587** (0.240)	-0.478 (0.434)	-2.145*** (0.745)	-0.193* (0.109)
AEZ 10	0.680*** (0.250)	-0.102 (0.549)	-2.028*** (0.763)	-0.655*** (0.147)

Table 7. Continued

Variable	Customary with & without certificate	Freehold with & without title	Freehold and Customary with title	Freehold and Customary without title
AEZ 11	0.636** (0.264)	2.409** (1.084)	-1.393* (0.828)	-1.838*** (0.332)
AEZ 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

Source: Compiled by author.

Notes: No freehold plots were found in AEZ 4 and 6. No customary reside in AEZ 8. No freehold with title reside in AEZ 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		p> t	Mean		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
Land Quality 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
Land Quality 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
Topography Hilly	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
Topography 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

Table 8. Continued

		Customary with & without certificate			Freehold with & without title		
		Mean	Mean		Mean		
Topography 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	.
Topography 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
Topography 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	.

Table 8. Continued

Variable	Freehold & Customary with Title/Cert.				Freehold & Customary without Title/ Cert.		
	Sample	Mean		p> t	Mean		p> t
		Treated	Control		Treated	Control	
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
Land Quality 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
Land Quality 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
Topography Hilly	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
Topography 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
Topography 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
Topography 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
Topography Other	Unmatched	0.000	0.000	.	0.000	0.00018	0.793
	Matched	0.000	0.000	.	0.000	0.000	.
AEZ 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
AEZ 4	Unmatched	0.000	0.000	.	0.000	0.03324	0.010***
	Matched	0.000	0.000	.	0.000	0.000	.
AEZ 5	Unmatched	0.000	0.000	.	0.01042	0.03431	0.072*
	Matched	0.000	0.000	.	0.01053	0.000	0.157
AEZ 6	Unmatched	0.000	0.01111	0.631	0.000	0.01215	0.125
	Matched	0.000	0.000	.	0.000	0.000	.
AEZ 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

Table 8. Continued

		Freehold & Customary with Title/Cert.			Freehold & Customary without Title/ Cert.		
		Mean	Mean		Mean	Mean	
AEZ 8	Unmatched	0.000	0.000	.	0.01042	0.000	0.000***
	Matched	0.000	0.000	.	0.000	0.000	.
AEZ 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
AEZ 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
AEZ 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
AEZ 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

Source: Compiled by authors.

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

Using the kernel PSM and Abadie and Imbens matching methods, the four comparisons of tenure and title/certificate were assessed as follows: (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 was 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 24 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.¹⁸ 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 a title has no impact or even hinders access to credit for freehold households. However, caution must be taken, as this is the smallest group of the four, with only 21 freehold households having title. Regarding the matching between freehold with title and customary with certificate, the result was in the anticipated, positive direction, although not statistically significant at the 10 percent level. The final matching for access to credit was conducted on freehold and customary without certificates, producing statistically significant results. The kernel showed an impact at the 10 percent significance level that freehold had a 13 percent better chance of obtaining credit than customary households. Results from the Abadie and Imbens estimator were not as large, 9 percent impact, but were statistically significant at the 5 percent level. This could imply that title or certificate of ownership is not as greatly important as one's actual tenure status.

¹⁸ In comparison 1, customary with title is the treatment and customary without title is the control. In comparison 2, freehold with title is the treatment and freehold without title is the control. In comparison 3, freehold with title is the treatment and customary with title is the control. In comparison 4, freehold without title is the treatment and customary without title is the control.

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	-0.192	0.263	0.009	0.132*	0.090**
S.E.	-0.11	-0.057	-0.213	-0.124	-0.283	-0.158	-0.077	-0.042
N	2733	2733	202	202	87	87	2896	2896

Source: Compiled by authors.

Notes: * p<.1; ** p<.05; *** p<.01; S.E. = Standard Error

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, and thus the results differ little between access to informal credit 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 10 percent level to the 1 percent level, while the impact remained at 13 percent greater access for freehold tenure.

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	-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

Source: Compiled by authors

Notes: * p<.1; ** p<.05; *** p<.01; S.E. = Standard Error

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, as informal credit remains the dominant form. 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 of credit.¹⁹ These issues of credit supply are outside the focus of this paper but warrant further investigation.

¹⁹ The top reason for not applying for credit with a formal institution was inadequate security (freehold 30 percent, and customary 24 percent). 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.

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	-0.017
S.E.	-0.072	-0.05	-0.205	-0.109	-0.218	-0.145	-0.049	-0.035
N	2733	2733	202	202	87	87	2896	2896

Source: Compiled by authors

Notes: * p<.1; ** p<.05; *** p<.01; S.E. = Standard Error

8. CONCLUSION

In Uganda the importance of access to rural credit is recognized throughout the country, and so is the impact of land tenure and title on access to that credit. In Uganda's Plan for Modernization of Agriculture (2005), lack of access to credit is identified as a major impediment to rural farmers acquiring non-labor inputs and surviving during agricultural downturns. The plan also notes the potential of the land tenure reforms to positively impact the modernization of agriculture, but stresses the unreached potential of the situation. The importance of access to credit is not limited to Uganda but is a continent-wide problem. The African Development Bank (2002) has identified the lack of access to credit in rural Africa as a significant hindrance to the agricultural and social development of the region. The continued emphasis on promoting freehold tenure and titling, with the corresponding positive effects on credit access, has pushed many African countries, including Uganda, to adopt land titling systems. This paper took on these hypotheses and assessed the impact of different titles/certificates and land tenures on credit access. The only statistically significant difference in access to any credit and to informal credit was found between freehold and customary without title, which happened to be the largest group. The impact, however, was not present in formal credit, contrary to the original hypothesis that freehold would impact access to formal credit, with only some effect on informal credit. The reason for the limited impact of tenure and title on formal credit may be the limited supply of formal credit; with such 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 lenders' ability to use land as formal recoverable collateral, is the use of tenure status as a screening device rather than as collateral by informal lenders. This hypothesis requires further research that is beyond the scope of this paper.

As mentioned before, the existing literature has been mixed in its findings regarding the impact of tenure on access to credit. This may be a result of less intensive scrutiny, as the approach presented here allows for a multidimensional view of the impact of tenure and title on credit access. Beyond the results of this paper, the comparisons used provide an innovative approach that is applicable to evaluating tenure and title in other areas of interest. Possibilities may include analysis of the four comparison groups by land management techniques, agricultural output, gender restrictions on landownership, and many other issues related to land. By using a two-stage comparison, first within tenure status between title/no title, and then within title/no title between tenure status, researchers can obtain a more complete understanding of which aspect—tenure or title—is actually impacting the results.

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. Though not the end goal of the Land Act, which was the transition to a completely titled, freehold country, there is reason for hope. The positive impact of freehold over customary tenure on credit access may provide the incentive for customary households to transition to freehold, which is the purpose of the Land Act of 1998. Therefore, the government of Uganda should work to promote the increased opportunities for those with freehold, while fostering a desire for titling. This goal is possible if the Ugandan government first increases awareness of the Land Act, which is critical to further progress toward a free land market.²⁰ A case study of Uganda's land laws cited that dissemination of information is severely limited, but that increased knowledge of the Land Act has the potential for large economic benefits (Deininger et al. 2006). Once information is provided to Ugandans about their rights and responsibilities as landowners, the path to tenure and titling must be simplified and mainstreamed. Currently the path from customary to freehold includes monetary costs, temporal costs, and documentation, which implies a degree of literacy of the applicant; these constraints

²⁰ When asked if they knew about the changes in the land tenure system brought about by the Land Act of 1998, of the entire sample, only 16 percent of household heads and 10 percent of spouses responded yes.

create a difficult and sometimes insurmountable situation for rural Ugandans (Mwebaza 1999). Combining these two strategies may allow more Ugandans, and Africans, to experience a positive impact on their access to credit, resulting from their new tenure status.

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