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Efficiency and Equity of Rural Land Markets and the Impact on Income: Evidence in Kenya and Uganda from 2003 to 2015

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Efficiency and Equity of Rural Land Markets and the Impact on Income: Evidence in Kenya and Uganda from 2003 to 2015

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Abstract

This study examines the evolution and impact of land sales and rental markets on agricultural efficiency in rural Kenya and Uganda using panel data spanning over 10 years. We first analyse the efficiency gains induced by land sales and rental markets by estimating the impact of participation in markets on unobserved farmer ability and land endowment. We do find evidence in both countries, that land markets induce efficiency by transferring land to households with higher farming ability. In both countries, the land market enhances equity by transferring land from land-abundant to land-constrained households. Although renting-in land increases crop income in Kenya, we find no evidence that renting in land enables households to escape from poverty. In contrast, increase in land owned helped decrease poverty incidence in Uganda. These findings points to potential weaknesses in the functioning of land markets in Kenya and Uganda which impedes their ability to contribute to poverty alleviation.

Key words: Land markets, Agriculture, Poverty, Uganda, Kenya
JEL codes: D63, O12, Q15

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Introduction

Rural households in Sub-Saharan Africa (SSA) essentially depend on land for their livelihood. However, land is becoming scarcer in several countries due to rapid population growth and stagnated agricultural productivity (World Bank 2008). Since the early 2000s, access to commercial agriculture has been increasing due to the supermarket revolution (Reardon et al. 2003), this has increased the number of commercial opportunities available to farmers. The educated now have increasing opportunities to earn higher income from non-agricultural employment in urban cities, thus inducing rural–urban migration as a diversification strategy. In this regard, land markets can enhance the welfare of rural households by equalizing factor endowments and encouraging increased land productivity. Whether land markets contribute to increased agricultural productivity and household welfare, however, depends on how the land market works. Since the factor endowment and institutional framework is different across countries and changes over time, a need has arisen to accumulate more recent evidence to better understand the role of the land market and its implications for agricultural productivity, equity, and welfare of farm households in SSA.

This study provides recent evidence on the evolution of land markets over a decade using panel data from two neighbouring SSA countries, namely, Uganda and Kenya.[1] Although some studies have considered the land markets in Uganda and Kenya, no study has used panel household data spanning over a decade after the mid-2000s, when the food price, agricultural land demand for commercial purposes, and population growth rate have gone up significantly. As with the comprehensive analyses of six SSA countries carried out by Deininger et al. (2017) in 2011, our comparison over time of two SSA countries gives us important insights on land policy.

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To understand who uses land markets, we examine the participation in both land sales and rental markets, and test whether these markets transfer land from less efficient but land-abundant to efficient but land-scarce households. The existing literature on land market participation in SSA tends to focus only on the land rental market (Jin and Jayne 2013, ; Chamberlin and Ricker-Gilbert 2016) because land sales transactions are not frequently observed after household formation.[2] Since we have access to the long-term panel data of transactions in the land sales market after household formation, we test whether the land sales market improves efficiency and equity.

This study also assesses the impact of land market participation on crop income, off-farm income, and household welfare. Most of the studies on SSA show that land market participation enhances efficiency and equity, but a few examine whether agricultural productivity improves with participation in the land market. Even when land is transferred to more efficient land-constrained households, the significance and magnitude of the impact remains an empirical question.[3] Also, increased participation in the land market due to issuance of land certification can facilitate labour movement from agricultural to non-agricultural jobs (de Janvry et al. 2015; Deininger et al. 2014), resulting in higher off-farm income. Households obtaining more land through market transactions, therefore, may not increase their total household income if the decrease in off-farm income overweighs the increase in agricultural income.

This study extends and compliments previous studies (Muraoka et al 2018; Chamberlin and Ricker-Gilbert 2016) which found that participation in land rental markets does not

[2] Exceptions are Deininger et al. (2017) and Deininger et al. (2009). The transactions in land sales market analysed in this study are different from land sales transactions at the time of family formation, which are examined in Ainembabazi and Angelsen (2016), Yamano et al. (2009), Wineman and Liverpool-Tasie (2017).

[3] There are studies such as Muraoka et al (2018) examining whether agricultural productivity is different in owned and rented in parcels. The results are mixed: some find that inputs applied and agricultural productivity in rented-in land is lower than those in owned parcels. In this study, we conduct analyses at household level since the decision of participating in land market and allocation of inputs in each parcel is made at household level to maximize the total production and profit.

necessarily lead to poverty alleviation. We shed light on potential factors impeding land markets from alleviating poverty. We show that selective migration and the distribution of land owned and farming ability may attenuate the impact of land market participation on poverty alleviation.

Our main findings are as follows. First, in both Uganda and Kenya, the land rental market is instrumental in transferring land from households with lower agricultural ability to those with higher agricultural ability. With regards to land sales market, we find that land sales market induces the transfer of land from households with lower agricultural ability to households with higher agricultural ability in Uganda but not in Kenya. On a whole, we find evidence in both countries that land markets induce agricultural efficiency. In terms of equity i.e. the transfer of land from land abundant to land constrained households, we find that land rental markets induce equity in Kenya and Uganda. However, land sales market induces equity in Uganda, but not in Kenya. In terms of welfare, in both Kenya and Uganda, an increase in the size of land rented-in enhances the value of crop production but does not enable households to escape from poverty.

To shed light on the potential weaknesses in the functioning of land markets in Kenya and Uganda which impedes their ability to contribute to poverty alleviation, we relate land owned and agricultural ability to measures of migration. The result suggest that there is selective migration in both Uganda and Kenya. In Uganda, households with high farming ability are more likely to have adult household members who have migrated for job related purposes. In Kenya, farming ability negatively correlates with indicators of migration. If talented households turn to migrate in Uganda, this can potentially attenuate any efficiency gain induced by land market participation

This article is structured as follows. Section 2 overviews the land markets in Uganda

and Kenya. Section 3 discusses the conceptual framework and empirical models related to land market participation. Section 4 describes the data used and descriptively explores the evolution of the land market. Section 5 gives the estimation results, and the last section concludes the paper.

2. Land Tenure System and Land Markets in Uganda and Kenya

Although the household and land size in Uganda and Kenya are similar, the land tenure systems and the informal land rental markets (borrowing) in the two countries are different. In this section, we provide the background of land tenure systems, land market development, and land-related policies in Uganda and Kenya.

The customary tenure system is still common in Uganda. In this system, land is allocated by the chief or by land clearing, and inherited by descendants. These traditional tenure systems are both *de facto* and *de jure* at the origin of land endowments, with regional differences in factor endowments and land market development. In regions with a high population density, people commonly migrate to other regions in search of arable land, thus facilitating land transactions via land markets for several decades (Baland et al. 2007).

Since the end of the 1990s, the land rental market in Uganda has been showing increasing participation. While 14% of households rented in land in 1999 (Deininger and Mpuga 2009), 19% did so in 2010 (Deininger et al. 2017). Non-market land transfers (borrowing) offer an avenue for rural households to adjust their land size in Uganda, in addition to sales and rental market participation. In 1999, the households borrowing land accounted for 21%, which is higher than the percentage of households that rented in land (Deininger and Mpuga 2008).

The ‘mailo’ tenure system is peculiar to Uganda. It was crafted under the Buganda

Agreement in 1900, dividing the land in central Uganda between the colonial and the major traditional authorities. This agreement resulted in considerable land concentration because the traditional authorities owned large blocks of land and therefore required tenant farmers, mostly migrants, to farm their land. Subsequent legislations and the increase in land titling gave the tenant farmers greater security and enabled mailo landlords to engage in land rentals and sales. In the 1980s, about 60% to 85% of mailo land was under a tenancy agreement (Kisamba-Mugerwa and Barros 1989). The Land Act of 1998 provided the long-term mailo tenants with the right to acquire freehold title, creating overlapping rights between the tenants and landlords. Although mailo tenants had strong rights over land and could transact land in the land market, there must have been differences in the functioning of the land rental markets across regions. According to Deininger and Mpuga (2009), only 1% of households in the Central region rented in land in 1992; this is lower than the proportion of households renting-in land in the other regions.

Kenya implemented land reforms relatively early following the Swynerton Plan of 1954. This land registration and titling programme focused on agricultural areas with high potential, enabling land-constrained productive farmers to access more land. In addition to the Swynerton Plan, Kenya implemented a land redistribution programme by allocating the land previously expropriated by white settlers to native Kenyan farmers. On the whole, the development of land markets in Kenya seemed to vary across regions. Pinckney and Kimuyu (1994) found very low participation in land sales markets in central Kenya even though most of the land had titles.

With regard to the land rental market, as previous studies have suggested, participation doubled from 10% in the late 1990s to 22% in 2007 (Wangila 1999; Yamano et al. 2008). Since no studies have described the participation in land rental market in Kenya after 2007, we do not know whether this increasing trend continued after 2007. In terms of efficiency of the land rental

market, Muraoka et al. (2018) examined how well land rental markets allowed households to obtain land for cultivation, using 2007 cross-sectional data, to find that land rental markets did not allocate land optimally. Since Muraoka et al. (2018) did not control for farming ability and other unobserved household heterogeneity affecting the participation of land rental markets, its findings are not conclusive. Unlike in Uganda, land borrowing arrangements are rare or non-existent in Kenya.

3. Conceptual and Empirical Framework

Bliss and Stern (1982) conceptualized a model to measure the efficiency of land rental markets. In a household utility maximization framework, the household decision to participate (rent-in, rent-out, or autarky) in land rental markets depends on the desirable or optimal household farm size at given output and input prices (wage, land rental cost adjusted by transaction costs) and endowments (land, labour, and agricultural ability). Households adjust their farm size to the optimal level by renting in, renting out, or staying out of land rental markets. However, if transaction costs are high in land rental markets, the optimal and realized farm sizes will often be different. A household's choice of an optimal farm land depends on its endowment of non-tradable assets such as agricultural ability.

From the above framework, a farmer will select a rent-in regime (rent-out) if the marginal product from farming an additional unit of land evaluated at his endowment level is greater (less) than the rental payment plus (minus) the associated transaction costs. Finally, a farmer will choose the autarky regime if the marginal product from farming an additional unit of land evaluated at his endowment level is less than the rental income he will receive as a landlord and greater than the rental fee he pays as tenant.

In practice, the outcome of participating in land markets may be different from theoretical predictions. In case of missing or imperfect credit markets, the access to land through land markets will depend on the households' agricultural ability and, most importantly, their land and wealth endowments. Consequently, resource-poor households with high agricultural ability may be excluded from the land market (Deininger and Jin 2008).

In the land sales market, a household maximizes its utility over the lifetime horizon by deciding on how much to consume, save, or invest in land to increase its land holdings. Land purchased in time *t* increases the household income in the following periods. Thus, endowments and agricultural ability as well as time preferences and credit constraints determine whether households purchase land or not. In addition, in case of no credit or insurance markets, the land market can induce land concentration through distress sales. The disposal of land through sales or rental markets can be the only available mechanism for poor households to cope with a negative shock (Carter and Barret 2006).

From the conceptual model, household agricultural ability is a key variable of interest in the land rental participation decision. Therefore, we first need to estimate the household's agricultural ability. Following Lanjouw (1999) and Jin and Deininger (2009), the household's agricultural ability can be estimated as the time-invariant (fixed effect) parameter in the household panel crop production function. A Cobb–Douglas production function for household *i* in village *j* at time *t* is specified in logarithmic form as

$$(1) \qquad lnQ_{ijt=}\alpha_{ij} + \beta_1 lnT_{ijt} + \beta_2 lnI_{ijt} + \beta_3 lnX_{ijt} + \beta_4 V_{jt} + \beta_5 V_j \times T_t + \varepsilon_{ijt},$$

where Q_{ijt}, T_{ijt}, and I_{ijt} are respectively the value of agricultural output, total farm land, and agricultural inputs (such as chemical fertilizer and improved seeds); X_{ijt} is a vector of other household characteristics such as the heads' gender, age, and years of schooling as well as the

value of household agricultural assets and total asset holding; V_{jt} is a vector of village-level controls such as distance to markets and district town and cumulative rainfall; and $V_j \times T_t$ is a vector of village by time dummies capturing the village system-wide productivity changes over time. Equation (1) is estimated using the household fixed effects model. Household agricultural ability (α_{ij}) is recovered as the unexplained household-specific time-invariant contribution to crop production. Though we generate household agricultural ability using an established methodology in the literature, we recognize that our measure of household agricultural ability may encompass any other household time invariant attribute that affects land productivity.

Participation in land market is estimated using the following model:

$$lnR_{ijt=}\gamma_1\alpha_{ij} + \gamma_2 lnA_{ijt} + \gamma_3 lnX_{ijt} + \gamma_4 V_{jt} + \gamma_5 T_t + \mu_{ij} + \varepsilon_{ijt}, \quad (2)$$

where R_{ijt} is a continuous measure of the size of land rented in at time t or land purchased between time t and t + 1, and the main variable of interest in this estimation. A_{ijt} is the landholding, and $\mu_{ij}$is the household fixed effects. Land rental markets induce efficiency in crop production by enabling households with higher farming ability (α_{ij}) to access an optimal amount of farm land. Consequently, the sign of the coefficient on parameter α_{ij} in the land rental equation (γ_1) is of primary interest in this study. While we are more interested in the sign than magnitude of the coefficient on α_{ij}, the coefficient on α_{ij} is likely to be biased downward. Several studies have found the plots offered for rent to be of lower soil fertility compared to own-cultivated plots (Benin et al. 2006; Yamano et al. 2009).[4] However, since the impact of rented-in land on household welfare is estimated via the household fixed effects, and assuming that soil quality does not change much over a short period of time, the possibility of downward bias should not be of much concern. The coefficient on landholding (γ_1) indicates the extent to

[4] Yamano et al. (2009) used the first round (2004) of the data used in this study for the analysis in Kenya.

which pre-rental (pre-purchased) land holdings determine the land rental (sales) market participation decision. Following Skoufias (1995), the coefficient of +1 for the land rented-out or -1 for land rented in would indicate a fully efficient land rental market.

To minimize the omitted variable bias in estimating the rental market participation decision in equation (2), we follow Mundlak (1978) and Chamberlain (1984), and add the household-level time averages of all time-varying variables in the model. These time averages are called the Mundlak-Chamberlain (MC) device. This is done assuming that the unobserved time-invariant household-level factors are correlated with the household-level time-constant averages (Wooldridge 2010; Chamberlin and Ricker-Gilbert 2016).

For assessing the impact of rental participation on welfare, we first estimate the household fixed effect models. The net rented-in land is the main variable of interest. The outcome variables of interest are the real per capita household income, real per capita crop income, real per capita off-farm income, and poverty status.[5] The regression equation is specified as follows:

$$lnY_{ijt=}\phi_1 R_{ijt} + \phi_2 lnA_{ijt} + \phi_3 lnX_{ijt} + \phi_4 V_{jt} + \phi_5 T_t + \lambda_{ij} + \varepsilon_{ijt}, \quad (3)$$

where Y_{ijt} is alternately the real per capita income, per capita crop income, and per capita off-farm income of household *i* in village *j* at time *t*. R_{ijt} is a continuous measure of the net land rented in at t or land purchased between t-1 and t, and the main variable of interest in this estimation. λ_{ij} is the household fixed effect encompassing the household-level time-invariant factors such as farming ability.

[5] Off-farm income is sum of agricultural wage, non-agricultural wage and salary, and non-farm self-employed income. Total household income consists of crop income, off-farm income, livestock income, and non-labour income. Poverty status is an indicator variable taking one if per capita income is less than poverty line. The national rural poverty line in Kenya was Ksh 1490/Month/Person in 2004 (Suri et al. 2008). We adjust 2012 incomes to 2004 price level. In Uganda, we adjust all income and expenditure values to 2005 price level and used the 2005 poverty line (USD 166) as reported in Kijima et al. (2006).

By estimating equation (3) using household fixed effects, we control for the time-invariant unobserved confounders, which are likely to be correlated with the rental participation decision and household income. Farming ability is observed as a generated variable correlated with land market participation, but time-demeaning makes its inclusion in equation (3) redundant. Arguably, soil fertility might be correlated with land market participation decisions (Benin et al. 2006; Yamano et al. 2009), but considering the long panel (2003-2015 for Uganda and 2004-2012 for Kenya) data used in this study, changes in soil quality cannot be ruled out. Similarly, other unobserved factors such as risk and time preferences, managerial skills, and land management practices may bias the estimate of land market participation on household income. Note that village-wide changes are controlled for by including village-level controls and year dummies. A binary indicator of adult death in the household during the previous two years is also included.

Jin and Jayne (2013) used a dynamic panel data approach along with the time-differencing operator and lag values as instruments for current values. We do not use this approach for at least two reasons. First, Uganda has sufficient lags (five rounds of survey data), but Kenya does not have sufficient lags (three rounds of survey data) to implement this strategy. Also, the lag values serving as instruments are likely to be weakly correlated with the current values if the time between the survey rounds is relatively long. On the whole, households do not randomly choose to rent in or rent out land, and since this study uses observational data, we interpret the estimated impact of land market participation cautiously.

4. Data Source and Descriptive Statistics

This study uses household and community-level data collated for Kenya and Uganda as part of

the longitudinal rural household panel survey project called Research on Poverty, Environment, and Agricultural Technology (RePEAT).[6] The survey instruments considered for both countries are very similar. Data collection in Kenya was carried out in 2004, 2007, and 2012, while that in Uganda was conducted in 2003, 2005, 2009, 2012, and 2015. The baseline survey conducted for Uganda in 2003 covered 94 local council 1 (LC1s), the lowest administrative unit), randomly sampling 10 households from each LC1.[7] The 2005, 2009, 2012, and 2015 survey rounds successfully captured data from 892, 816, 779, and 767 of the original households, respectively. On the whole, 647 households were surveyed in all the survey rounds. The overall attrition rate for Uganda was 30%. A total of 899 households were randomly sampled for Kenya from 99 sub-locations (the lowest administrative unit at the time of the survey) in the first round in 2004, out of which 718 were surveyed in the second round in 2007 and 751 in 2012. We constructed a balanced panel data of 629 agricultural households for Kenya by including those who were interviewed in all the three survey rounds.[8] The attrition rate for Kenya was 16%.[9]

Table 1 presents the changes in land holdings and the key land market features in Uganda and Kenya. The size of land owned and accessed (owned plus rented in/borrowed) in Uganda is slightly greater than that in Kenya (2.2 and 2.7 hectares in Uganda and 1.7 and 1.8 hectares in Kenya, respectively). Since the number of family members is almost the same in these countries, the land owned per capita in Kenya is smaller than that in Uganda (0.25 and 0.30, respectively). The size of land owned has decreased slightly in both countries. In Uganda, the share of land acquired through the sales market increased marginally from 46% in 2003 to 47%

[6] Details of the sampling procedure are provided in Kijima et al. (2006).
[7] LC1 is the smallest administrative unit in Uganda
[8] The 2007 survey initially targeted 774 households but due to budget constraints, households in 23 sub-locations in Eastern province were dropped. The attrition rate between the first and second round is 7%. Attrition between the first (2004) and last round (2012) is 16%
[9] Since we find that attrition was not random, all the models are estimated with the inverse probability weight of attrition (IPW).

in 2015, whereas the land obtained through inheritance and gift declined slightly, indicating a shift from the traditional to market-based land allocation mechanism. In Kenya, the share of purchased land in owned land has remained stable at approximately 30%. As explained earlier, there is significant difference between these countries in formality of the land owned: while more than 80% of the households in Kenya own land certificates, less than 10% of the households in Uganda own land certificates. This situation has not changed over the last 10 years.

As regards land transactions during the last 12 months, about 20% of households in both countries rented in land, while only 1% of households in Kenya and 5% of households in Uganda purchased land. While 16% of households in Uganda borrowed land in 2003 without paying rents in order to adjust their land holdings, this trend declined over time as land became scarcer. As regards the land transactions between the survey rounds (in 3 to 5 years), less than 10% of households in both countries purchased land, while about 3% of households in Uganda and 1% of households in Kenya sold land. Although land sales market is an important mechanism to adjust the operational size of cultivated land, in both countries land sales market are still trivial albeit a relatively active sales market in Uganda compared to Kenya.

Table 2 stratifies our sample by land rental market participation, showing the characteristics of the households participating in different land rental regimes. In both Uganda and Kenya, land-abundant households actively rented out land, while land-constrained households actively rented in land. In both countries, households that rented in land showed larger family sizes than those that rented out land. On the whole, land-abundant households in both Uganda and Kenya tended to rent out excess land to land-constrained but labour-endowed households.[10]

[10] In this study we use the OECD equivalence scale to obtain an adult equivalence of household size. We assign a value of 1 to each adult, 0.5 to each child and 0.5 to each old person (age above 65).

In Kenya, households renting in land were better off (measured by income, asset, and poverty status) than those who rented out land or did not participate in land rental markets. Although in Uganda households who rented out land were better off than those who rented in land in 2005, by 2015 households who rented in land were better off compared to those who rented out land. In terms of migration, land abundant households in Uganda .i.e. households which borrowed-out land are more likely to have an adult household member who is a migrant worker while in Kenya, land constrained households .i.e. households which rented-in land are more likely to have an adult household member who is a migrant worker[11]. These differences in migration patterns may be driven by differences in the level of development of off farm opportunities and local labour markets. No major differences were found in other household characteristics such as household head's gender, age, and education level between groups stratified by land rental market participation.

Agricultural production, input use, agro-ecological condition, and market access are shown in the first two columns of table 3, where the application of inorganic fertilizer is only 2.6 kg in Uganda but close to 30 kg in Kenya. Organic fertilizer is used more in both countries. While the majority of Kenyan households used improved seeds, only about half of the households in Uganda used improved seeds. Ugandan households have better agro-ecological conditions (annual rainfall 1165 mm vs. 630 mm) and access to markets (6 km vs. 9 km) than Kenyan households.

5. Econometric Results

In this section, we discuss the results of the Cobb–Douglas production function estimation, rental

[11] A migrant worker is an adult household member who has spent at least six months away from home for job related reasons.

and sales market participation, and impact of rental market participation on welfare. We discuss the results for Kenya and Uganda jointly.

5.1 Production Function

The descriptive statistics and estimation results of equation (1) for Kenya and Uganda are presented in table 3. While fertilizer application, household asset, size of cultivated land, and adoption of improved maize seeds correlate positively with agricultural production in Uganda, fertilizer application, household size, improved maize seeds, and size of cultivated land are key determinants of agricultural production in Kenya. From these estimations, we generate household farming ability as the unexplained time-invariant dimension of crop production. Figure 1 plots the farming ability and size of owned land in the first round of the survey. While there could be a clearer positive correlation between farming ability and land size in Kenya, no such correlation exists in Uganda, suggesting that participation in the land market can have different implications for household welfare in Kenya and Uganda.

5.2 Land Rental Market Participation

The estimation results of equation (2) for Uganda and Kenya are presented in table 4. Tobit model is combined with the MC device. Household farming ability increases the size of rented-in land in both Uganda and Kenya. While land borrowing provides an additional avenue for households to adjust their land holding in Uganda, borrowed land also increased with farming ability. This implies that land rental markets (both formal and informal) provide a platform for talented households to access the desired amount of farm land. This is in consonance with the efficiency argument that land markets induce efficiency by transferring land from less able to

more able producers. This finding is in line with previous studies such as Chamberlin and Ricker-Gilbert (2016), Deininger and Mpuga (2009), and Jin and Deininger (2009). For Kenya, Jin and Jayne (2013) found that households with higher farming ability are more likely to rent in than rent out land.

A key relationship of interest is how the amount of land owned affects land market participation, because the land rental market can worsen inequality if land-scarce households rent out land to land-abundant households. From our results, households with smaller owned land tend to rent in land in both Uganda and Kenya. Interestingly, informal land markets i.e. land borrowing provides an additional mechanism for the equitable redistribution of land in Uganda. On a whole, this finding is in-line with the argument that land markets enhance equity in land redistribution by enabling more endowed households to transfer land to less endowed households. The coefficients on land endowment (-0.09 and -0.03 in the rent-in equation for Kenya and Uganda, respectively) indicate higher adjustment of the land-to-labour ratios through rental markets in Kenya than in Uganda. As regards the impact of household labour endowment on land market participation, we observe a positive correlation in both countries albeit not statistically significant in Kenya. On whole, the results suggest that households with more family labour in both countries are more likely to rent in land.

As regards regions (provinces), the land rental market seems to be more active in the Eastern and Western regions of Uganda, where the customary tenure system is common, compared to the Central region, where the mailo tenure system is prevalent. Although the Ugandan government attempted to increase the tenure security of mailo tenants, the land rental market seems to function less, probably because of its overlapping ownership on mailo land. In Kenya, land rental markets seem to be more active in the Rift valley than in other provinces. This

regional difference may reflect the land distribution in Kenya since the Rift valley province has a few large land owners and smallholder families who migrated for agricultural work in the past. These results for Uganda suggest that the practice of borrowing land was less common in 2015 compared to in 2005.

On the whole, these results support the argument that land markets induce efficiency by transferring land from less efficient to more efficient households. There is also evidence in support of the equity argument stipulating that land markets enhance equity in land redistribution by enabling more endowed households to transfer land to less endowed ones.

5.3 Participation in Land Sales Market

The factors associated with land purchase and sales from 2003 to 2015 in Uganda and from 2004 to 2012 in Kenya are presented in table 5. Land abundant households in Uganda seem to be more likely to sell land. However, in Kenya, households' ownership of land has no effect on how many hectares of land are purchased or sold. These results are in-line with the descriptive statistics presented in table 1 showing that land sales market is more active in Uganda compared to Kenya.

With regards to the efficiency of land sales market, household farming ability is significantly correlated with land purchase in Uganda suggesting that talented households adjust the operational size of their farms through land sales market. In Kenya, we do not find any significant relationship between farming ability and participation in land sales market. Land rental markets are more important than the sales market for enhancing efficiency in the short run. The land sales market can induce land concentration through distress sales of poor land-constrained households, but we find no evidence that the land sales market induces land

concentration in either Uganda or Kenya.

5.4 Land Market Participation and Welfare

The estimation results of equation (3) are presented in table 6. In both Kenya and Uganda, the net rented in land is positively correlated with the value of crop production and crop income. The association between renting-in land and value of crop production is as expected, because renting in land increases the scale of farming and thus production[12].

We further examine the possibility of renting in land crowding out the effect of off-farm income. In both Kenya and Uganda, the net land rented in is negatively associated with off-farm income suggesting that land rental markets may preclude households in both countries from participating in off-farm activities. This could be why renting in land does not significantly increase the total household income in neither Kenya nor Uganda.

The results relating land market participation to household poverty status are presented in the last column of table 6. We do not find evidence that the amount of land rented in decreases the likelihood of being poor in either Uganda or Kenya. Informal land markets i.e. land borrowing does not reduce the likelihood of poverty in Uganda. Unlike Kenya, own land holding significantly reduces the likelihood of being poor in Uganda. This finding is consistent with Jin and Jayne (2013), who found that rental market participation in Kenya induces crop and household income, but has no impact on poverty reduction. Chamberlin and Ricker-Gilbert (2016) found similar results for Zambia. Transaction costs may also attenuate the impact of land markets by precluding certain households from participating in land markets. Chamberlin and Ricker-Gilbert (2018) show that high transaction costs preclude youths from participating in land markets in Tanzania.

[12] Given that very few households participate in land sales market, we drop land sales market participation from the welfare analysis.

We examine the differential effect of land markets on poverty status in Uganda and Kenya from the relationship between land holdings and farming ability under non-parametric regression. Figure 1 shows a positive correlation between land holdings and farming ability in Kenya, but no relationship in Uganda. Thus, the shifting of land from land-abundant to land-scarce households in Kenya can decrease efficiency. In addition, although land rented in can increase crop income, the marginal effect can be smaller for the poor[13]. The skewed distribution of returns on land rental market participation has been observed in other studies. For example, Chamberlin and Ricker-Gilbert (2016) found that renting in land in Malawi induced positive returns for wealthier/large-scale farmers, while poor/small-scale farmers suffered economic losses. table 3 (appendix) sheds more light on the reasons why land markets may not induce poverty reduction. The result seems to suggest that there is selective migration in both Uganda and Kenya. In Uganda, households with high farming ability are more likely to have adult household members who have migrated for job related purposes. In Kenya, farming ability negatively correlates with indicators of migration. If talented households tend to migrate in Uganda, this can potentially attenuate any efficiency gain induced by land market participation.

6. Conclusion

This study examines the factors related to rural households' decision to participate in land rental and sales markets and its impact on agricultural production and welfare. We examine Kenya and Uganda for a period spanning more than 10 years. The two neighbouring East African countries present interesting similarities and contrasts that certainly impact the development of their land markets and the potential benefits from land market participation. We find the land rental and

[13] Results of quintile regression show that the benefit of participating in land rental markets are very small for poor/small scale farm households compared to relatively wealthy/large scale farm households

sales market participation of both countries to be similar, at about 20% and 5% of rural household participation, respectively. Less than 10% of households in Uganda still depend on the traditional land transaction mode, borrowing. The land rental and sales markets in the two countries, however, perform differently in many ways.

The land rental markets in Uganda and Kenya are efficient in that they transfer land from households with lower farming ability to those with higher farming ability. This supports the argument that land markets induce agricultural efficiency. In terms of equity, land sales and formal and informal land rental markets (borrowing) in Uganda transfer land from land-abundant to land-constrained labour endowed households. However, in Kenya, only the land rental market transfers land from land-abundant to land-constrained labour endowed households. While the transactions in the land rental markets of both countries adjust their land-to-labour ratio only partially, the magnitude of the adjustment is higher in Kenya than in Uganda.

In both Uganda and Kenya, renting-in land enhances household welfare. While renting in land increases crop income in Kenya, we find no evidence that it enables households to escape from poverty. Our results suggest that renting in land may decrease off-farm income thereby attenuating the positive impact of land rented-in on household income. In addition, Muraoka et al (2018) found that the adoption of modern production technologies is significantly lower on rented-in plots compared to own plots thereby leading to negligible net benefit from renting in land in Kenya. It Thus seem that the increase in crop income in absolute terms due to the land rental markets is not large enough to significantly change poverty status in either Kenya or Uganda.

Though over 80% of households in Kenya have land certificates, the proportion of households participating in land markets is similar to that of Uganda where less than 10% of

households have land certificates. From this study, the benefits of land market participation cannot be fully harnessed by only strengthening and clarifying land rights. The distribution of farming ability and land owned as well as their correlation seems to affect the demand for and supply of land and poverty reduction.

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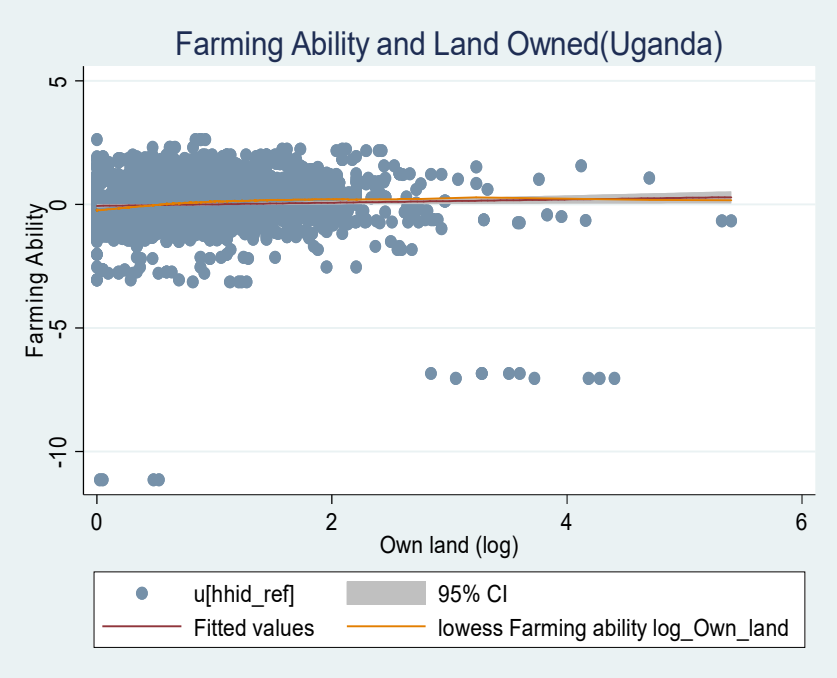
Figure 1: Farming Ability and Land Holdings



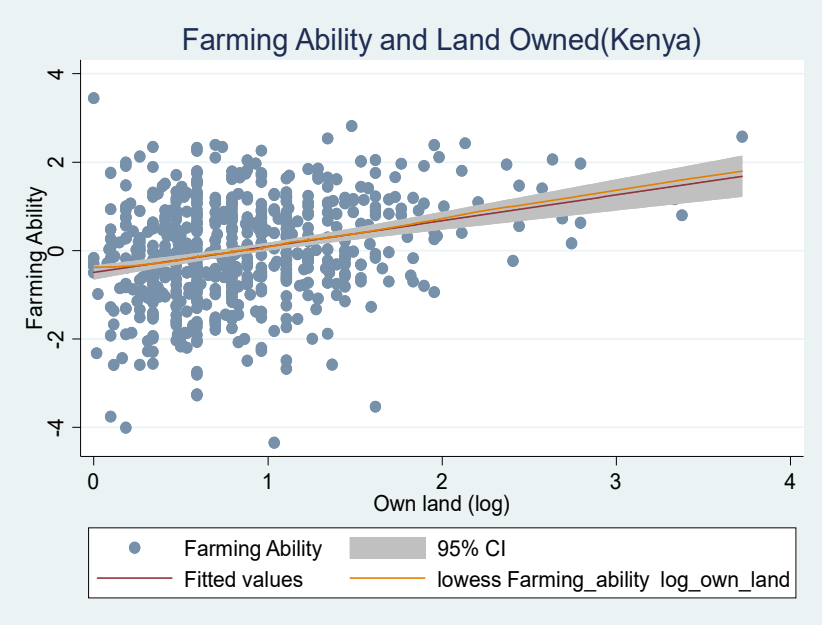


Table 1: Summary Statistics(Whole sample)

	Uganda					Kenya		
	2003	**2005**	**2009**	**2012**	**2015**	**2004**	**2007**	**2012**
Household Size	7.19	7.57	7.37	7.24	6.55	6.89	7.70	7.96
Size of Land Accessed(Hectares)	2.71	3.03	2.81	2.74	3.16	1.86	1.82	1.74
Size of land Owned(Hectares)	2.20	2.42	2.16	1.45	2.38	1.76	1.70	1.63
Share of HHs with any land certificate	0.05	0.08	0.07	0.08	0.08	0.83	na	0.86
Share of HHs with at least one purchased plot	0.56	0.57	0.57	0.68	0.61	0.34	0.32	0.34
Share of area inherited out of owned land	0.53	0.08	0.04*	0.42	0.51	0.66	0.68	0.66
Share of area purchased out of owned land	0.46	0.57	0.36	0.56	0.47	0.31	0.30	0.31
Last 12 months								
Share of HHs who Rented In land	na	0.20	0.21	0.17	0.17	0.18	0.22	0.16
Share of HHs who Rented Out Land	na	0.06	0.07	0.08	0.10	0.00	0.07	0.09
Share of HHs who Borrowed In Land	na	0.16	0.03	0.10	0.06	0.01	0.01	0.01
Share of HHs who Borrowed Out Land	na	0.07	0.07	0.06	0.06	na	na	Na
Share of HHs who Rented-In & Out land	na	0.01	0.00	0.00	0.01	0.00	0.00	0.00
Share of HHs who Purchased Land	0.05	0.03	0.03	0.06	0.01	0.01	0.02	0.01
Between survey rounds								
Share of HHs who purchased land		0.09	0.04	0.07	0.04		0.01	0.01
Share of HHs who sold land		0.03	0.03	0.03	0.05		0.00	0.01
Number of Households	940	831	909	896	1378	899	714	751

1) Authors computation from RePEAT surveys in Uganda and Kenya

* The mode of land acquisition was not elicited in the 2005 and 2009 surveys. These statistics are dodgy since they are extrapolated from the 2005 and 2012. We should probably not report them.

Table 2: Households Characteristics by land Market Participation

Panel A: Uganda	2005					2015				
	Rented In	**Rented Out**	**Borrowed In**	**Borrowed Out**	**Autarky**	**Rented In**	**Rented Out**	**Borrowed In**	**Borrowed Out**	**Autarky**
Size of Land Owned(Hectares)	1.25	2.97	0.71	3.19	2.73	1.36	3.16	0.53	3.42	2.53
Area under cultivation (Ha)	1.35	1.51	1.12	1.51	1.32	2.08	2.97	1.22	3.45	2.03
Per Capita Income(USD)	226.51	288.93	220.48	164.55	205.93	254.58	208.46	206.02	233.11	169.05
Value of All Assets(USD)	177.24	226.07	187.99	255.44	212.11	145.66	152.34	209.25	421.18	173.36.84
Proportion of Poor Households	0.49	0.46	0.55	0.35	0.51	0.36	0.32	0.33	0.33	0.31
1 if Male Headed household	0.92	0.83	0.77	0.80	0.85	0.84	0.84	0.71	0.76	0.78
Head's years of schooling	6.25	6.02	5.9	6.36	6.44	5.45	6.25	4.5	5.67	5.28
Age in years of Household Head	41.77	51.86	39.79	59.80.74	48.26	57.15	51.74	41.87	54.25.	54.58
Household Size	7.71	7.21	6.37	9.50	7.61	6.66	7.26	6.71	8.57	6.43
1 if Migrant household	0.15	0.13	0.16	0.28	0.17	0.39	0.4	0.36	0.46	0.45
Adult Equivalent	4.79	4.79	3.78	6.10	4.86	5.03	4.47	4.23	6.21	4.16
Number of Households	105	22	26	5	484	93	56	9	9	498

Note: Migrant household takes the value 1 if an adult household member has spent at least six months away from home for job related purposes

Panel B: Kenya	2007			2012		
	Rented In Only	**Rented Out Only**	**Autarky**	**Rented In Only**	**Rented Out Only**	**Autarky**
Size of Land Owned(Hectares)	1.08	4.57	1.6	1.79	3.43	1.54
Area under cultivation (Ha)	1.51	1.31	1.15	1.48	1.29	1.12
Per Capita Income(USD)	265.48	218.83	245.91	493.35	428.98	419.24
Value Of All Assets(USD)	582.37	623.58	511.63	1506.64	976.52	1255.59
Proportion of poor Households	0.56	0.71	0.65	0.34	0.54	0.45
1 if Male Headed household	0.8	0.67	0.71	0.8	0.71	0.70
Head's years of Schooling	7.94	5.38	7.33	10.32	6.33	8.11
Age in years of Household Head	54.88	59.4	58.01	57.74	61.61	60.60
1 if Migrant household	0.34	0.24	0.36	0.4	0.24	0.35
Household Size	8.18	7.37	7.59	8.14	7.91	7.93
Adult Equivalent	5.92	5.37	5.54	6.54	5.96	6.20
Number of Households	153	52	508	112	67	572

1)Authors computation from RePEAT; 2) Monetary values have been adjusted for inflation

Table 3: Crop Production Function

	Uganda	Kenya	Uganda	Kenya
Per capita value of agricultural output	116.5	150		
(USD)	301	695		
Heads years of schooling	5.8	7.2	0.002	0.011
	3.7	6.9	(0.011)	(0.016)
Heads age in years	50	57	-0.002	0.007
	14.7	13.8	(0.005)	(0.015)
1 if Head is male	0.88	0.75	-0.146	0.199
	0.37	0.43	(0.202)	(0.392)
Adult equivalent	4.6	5.7	0.025	0.058
	2.46	2.6	(0.017)	(0.083)
Inorganic fertilizer application in Kg	2.6	27.4	0.062***	0.223**
	13.9	38.1	(0.017)	(0.103)
Organic fertilizer application in Kg	68	212	0.021*	0.034
	409	808	(0.012)	(0.071)
1 if used improved seeds	0.57	0.83	0.509***	0.623*
	0.49	0.37	(0.158)	(0.32)
Log value of total assets	233	930	0.199***	0.231
	89	3,653	(0.046)	(0.145)
Log of cultivated land	2.26	1.41	0.540***	1.108***
	3.5	1.38	(0.066)	(0.343)
1 if own any land document	0.07	0.84	-0.025	0.358
	0.26	0.36	(0.094)	(0.593)
Log of Rain fall(5 year average)	1,160	635	-0.251***	0.271
	1,201	777	(0.027)	(1.04)
Log of distance in Km to district town	23.2	22.3	0.06	0.041
	30	31	(0.058)	(0.212)
Log of distance in Km to nearest market	5.6	8.66	-0.066	0.041
	7	5.6	(0.043)	(0.384)
Constant			11.949***	1.861
			(0.335)	(7.288)
Observations	3,216	1,884	3,216	1,885
R-squared			0.677	0.643
District Specific Time Trend FE			YES	YES

Note: Results from Household fixed effect estimation. SEs are robust to clustering at community level. *p<0.10, **p<0.05 and ***p<0.01. Summary statistics are in level form

Table 4: Determinants of Land Market Participation(Tobit estimation)

	Uganda		Kenya
	Net rented in (ha)	Net borrowed in (ha)	Net Land rented In (ha)
Farming Ability	0.021***	0.005	0.063***
	(0.005)	(0.003)	(0.021)
Log of land owned	-0.037**	-0.043***	-0.094**
	(0.016)	(0.01)	(0.038)
Household size (adult equivalent scale)	0.009**	0.001	0.005
	(0.04)	(0.001)	(0.007)
Regions			
East	0.119***	-0.009	
	(0.029)	(0.02)	
West	0.156***	-0.010	-0.187**
	(0.03)	(0.03)	(0.066)
Central			-0.084*
			(0.035)
Nyanza			-0.139*
			(0.067)
Survey year			
2009	0.077*	-0.066***	
	(0.03)	(0.01)	
2012	0.079*	-0.004	0.028
	(0.04)	(0.03)	(0.022)
2015	0.057	-0.045***	
	(0.04)	(0.01)	
Observations	2,588	2,588	1,258

Note: Average marginal effects shown in table. Estimation employs the Mundlak Chamberlin device which entails including time averages of all time varying covariates (not shown). Additional controls include house head's age, years of schooling, and gender, Total value of assets, indicator of adult dead within 2 years of survey, indicator of land document ownership, log of distance in km from each community to the nearest market and nearest district town, community level 5 year cumulative average of rainfall. Reference region for Uganda is Central while Rift Valley is the reference for Kenya. Reference year for Uganda is 2005 while it is 2007 for Kenya. Region and year interactions are also included. Clustered robust standard errors shown in parenthesis are bootstrapped at 250 replications to account for the generated regressor (farming ability).*p<0.10.**p<0.05. and ***p<0.01. 2003 and 2004 surveys for Uganda and Kenya respectively are not used in the estimation.

Table 5: Determinants of Land Market Transaction(Tobit estimation)

	Uganda		Kenya	
	Land Purchase(ha) between surveys (t and t+1)	Land Sold(ha) between survey	Land Purchase(ha) between surveys (t and t+1)	Land Sold(ha) between survey
Farming Ability	0.015**	0.020**	-0.003	0.004
	(0.006)	(0.01)	(0.014)	(0.024)
Log of land owned	-0.049**	0.023	-0.044	0.031
	(0.02)	(0.018)	(0.045)	(0.068)
Household size	0.000	0.003	-0.000	-0.001
(adult equivalent scale)	(0.003)	(0.004)	(0.004)	(0.007)
Regions				
East	-0.009	0.004		
	(0.03)	(0.03)		
West	0.020	0.003	0.051	0.080
	(0.029)	(0.03)	(0.094)	(0.328)
Central			-0.033	-0.052
			(0.051)	(0.132)
Nyanza			0.046	0.102
			(0.08)	(0.323)
Survey year				
2003/2004	-0.038	-0.072	-0.006*	0.008
	(0.048)	(0.120)	(0.03)	(0.03)
2005	-0.042	-0.020		
	(0.049)	(0.041)		
2009	0.031	-0.033		
	(0.03)	(0.037)		
Observations	2,588	2,588	1,258	1,258

Average marginal effect results. The estimation employs the Mundlak Chamberlin device which entails including time averages of all time varying covariates (not shown). Additional controls include house head's age, years of schooling, and gender, Total value of assets, indicator of adult dead within 2 years of survey, indicator of land document ownership, log of distance in km from each community to the nearest market and nearest district town, community level 5 year cumulative average of rainfall. Reference region for Uganda is Central while Rift Valley is the reference for Kenya. Reference year for Uganda is 2015 while it is 2007 for Kenya. Region and year interactions are also included. Clustered robust standard errors shown in parenthesis are bootstrapped at 250 replications to account for the generated regressor (farming ability).
*p<0.10.**p<0.05. and ***p<0.01

Appendix

Appendix Table 1: Determinants of Land Market Participation (Tobit estimation)

	Kenya		Uganda			
	Land rented In(ha)	Land rented out(ha)	Land rented In(ha)	Land rented out(ha)	Land Borrowed In(ha)	Land borrowed out(ha)
Farming Ability	0.071***	-0.061*	0.022***	0.005	0.006*	0.004
	(0.023)	(0.032)	(0.007)	(0.004)	(0.004)	(0.003)
Log of land owned	-0.102***	0.164*	-0.037***	0.005	-0.045***	0.015**
	(0.04)	(0.096)	(0.013)	(0.007)	(0.009)	(0.007)
Household size (adult equivalent scale)	0.006	-0.0124	0.008**	0.001	0.001	-0.002*
	(0.007)	(0.009)	(0.004)	(0.002)	(0.002)	(0.001)
Regions						
East			0.129***	0.071***	-0.009	0.012
			(0.035)	(0.02)	(0.011)	(0.013)
West	-0.220***	0.158	0.155***	0.077***	-0.019	0.001
	(0.069)	(0.142)	(0.037)	(0.02)	(0.013)	(0.016)
Central	-0.0864**	-0.0657*				
	(0.042)	(0.063)				
Nyanza	-0.147**	0.0924				
	(0.065)	(0.114)				
Survey year						
2009			-0.057	-0.054	-0.071***	-0.004
			(0.042)	(0.162)	(0.017)	(0.017)
2012	0.0048	-0.014	0.021	-0.025	-0.003	-0.012
	(0.03)	(0.05)	(0.035)	(0.122)	(0.013)	(0.017)
2015			0.022	-0.015	-0.041***	-0.056***
			(0.036)	(0.089)	(0.015)	(0.021)
Observations	1,258	1,258	2,588	2,588	2,588	2,588

Note: Average marginal effects shown in table. Estimation employs the Mundlak Chamberlin device which entails including time averages of all time varying covariates (not shown). Additional controls include house head's age, years of schooling, and gender, Total value of assets, indicator of adult dead within 2 years of survey, indicator of land document ownership, log of distance in km from each community to the nearest market and nearest district town, community level 5 year cumulative average of rainfall. Reference region for Uganda is Central while Rift Valley is the reference for Kenya. Reference year for Uganda is 2005 while it is 2007 for Kenya. Region and year interactions are also included. Clustered robust standard errors shown in parenthesis are bootstrapped at 250 replications to account for the generated regressor (farming ability).*p<0.10.**p<0.05. and ***p<0.01. 2004 is not used in estimation for Uganda since information on land rented out was not asked in 2004 survey.

Appendix Table 2: Land Market Participation and Household Welfare(Tobit analysis)

	Uganda					Kenya				
	Value of Crop Production USD	Crop Income USD	Off farm Income USD	Total House hold Income USD	Probability of Poverty (Probit)	Value of Crop Production USD	Crop Income USD	Off farm Income USD	Total House hold Income USD	Probability of Poverty (Probit)
Net Rented Land(ha)	203.622***	157.573**	-33.394	236.153***	-0.012	121.1***	96.99***	4.31	105.8	-0.038*
	(71.189)	(69.496)	(44.089)	(90.863)	(0.032)	(25.19)	(25.98)	(80.98)	(95.3)	(0.022)
Net borrowed in land (ha)	246.918**	230.599**	70.367	367.479***	-0.029					
	(109.26)	(106.333)	(67.618)	(139.343)	(0.05)					
Log of land owned	124.755**	103.305**	32.035	126.235**	-0.126***	115.6	71.42	342.3	494.7	-0.068
	(49.591)	(48.302)	(31.198)	(63.273)	(0.03)	(83.4)	(71.78)	(278.3)	(318.9)	(0.07)
Household size (adult equivalent scale)	30.995*	26.837*	4.143	44.202**	0.106***	34.09**	34.33**	13.22	64.84	0.033***
	(16.281)	(15.786)	(8.214)	(20.698)	(0.007)	(15.82)	(15.51)	(60.73)	(70.59)	(0.014)
Number of House hold	2,588	2,588	2,588	2,588	2,588	1,257	1,257	1,257	1,257	1,257

Average marginal effect results. The estimation employs the Mundlak Chamberlin device which entails including time averages of all time varying covariates (not shown). Additional controls include house head's age, years of schooling, and gender, Total value of assets, indicator of adult dead within 2 years of survey, indicator of land document ownership, log of distance in km from each community to the nearest market and nearest district town, community level 5 year cumulative average of rainfall. Reference region for Uganda is Central while Rift Valley is the reference for Kenya. Reference year for Uganda is 2015 while it is 2007 for Kenya. Region and year interactions are also included. Clustered robust standard errors shown in parenthesis. *p<0.10.**p<0.05. and ***p<0.01

Appendix Table 3: Land holding and Migration

	Uganda		Kenya	
	1 if migrant household Ols	Number of migrants Tobit(Av marginal effects)	1 if migrant household Ols	Number of migrants Tobit(Av marginal effect
Farming Ability	0.014	0.051*	-0.042***	-0.114*
	(0.012)	(0.08)	(0.016)	(0.062)
Log of land owned	0.004	0.047	0.054	0.161
	(0.021)	(0.05)	(0.057)	(0.114)
Household size (adult equivalent scale)	-0.024***	-0.068***	-0.09***	-0.194***
	(0.006)	(0.013)	(0.012)	(0.021)
Regions				
East	-0.110***	-0.394***	-0.03	
	(0.038)	(0.128)	(0.02)	
West	-0.006	-0.052	0.256***	0.452**
	(0.048)	(0.671)	(0.06)	(0.183)
Central			0.104*	0.210*
			(0.052)	(0.11)
Nyanza			0.125	-0.07
			(0.086)	(0.16)
Survey year				
2009	0.138***	0.386***		
	(0.048)	(0.119)		
2012	0.298***	0.700***	-0.033	-0.125
	(0.053)	(0.121)	(0.038)	(0.105)
2015	0.324***	0.797***		
	(0.056)	(0.106)		
R-square	0.176	0.058	0.108	0.064
Observations	2,588	2,588	1,258	1,258

Note: Estimation employs the Mundlak Chamberlin device which entails including time averages of all time varying covariates (not shown) Additional controls include house head's age, years of schooling, and gender, Total value of assets, indicator of adult dead within 2 years of survey, indicator of land document ownership, log of distance in km from each community to the nearest market and nearest district town, community level 5 year cumulative average of rainfall. Reference region for Uganda is Central while Rift Valley is the reference for Kenya. Reference year for Uganda is 2005 while it is 2007 for Kenya. Region and year interactions are also included. Clustered robust standard errors shown in parenthesis are bootstrapped at 250 replications to account for the generated regressor (farming ability).*p<0.10.**p<0.05. and ***p<0.01. 2003 and 2004 surveys for Uganda and Kenya respectively are not used in the estimation.

Appendix Table 4: Probability model of remaining in the next round of panel survey

	Panel Periods(Uganda)				Panel Period Kenya	
	2003-2005	2005-2009	2009-2012	2012-2015	2004-2007	2007-2012
	OLS				OLS	
1 if Head is male	0.011	0.048	0.068**	0.016	-0.025	-0.038
	(0.022)	(0.045)	(0.033)	(0.024)	(0.034)	(0.030)
Heads years of schooling	-0.001	-0.009*	0.000	0.001	-0.003	-0.001
	(0.002)	(0.005)	(0.003)	(0.002)	(0.004)	(0.002)
Heads age in years	-0.002***	-0.001	-0.002**	-0.001*	-0.003**	-0.000
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Household size	0.001	0.000	-0.004**	-0.004*	-0.011***	-0.008**
(adult equivalent scale)	(0.003)	(0.004)	(0.002)	(0.002)	(0.004)	(0.004)
Log value of total assets	-0.000*	-0.000***	-0.000	-0.000	-0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log of land holding	-0.000	0.001***	0.001	-0.001	0.005	-0.005**
	(0.000)	(0.000)	(0.003)	(0.001)	(0.005)	(0.002)
1 if Rented In land	-0.050***	-0.005**	0.001	0.001	-0.001	0.017
	(0.018)	(0.002)	(0.003)	(0.006)	(0.036)	(0.031)
share of crop income	0.006	-0.120**	-0.053	-0.022	0.004	-0.085**
	(0.024)	(0.049)	(0.035)	(0.035)	(0.045)	(0.042)
Constant	0.281**	0.312**	0.221***	0.212*	0.400***	0.269***
	(0.143)	(0.147)	(0.053)	(0.121)	(0.142)	(0.076)
Observations	940	892	908	896	899	713
R-squared	0.160	0.140	0.023	0.205	0.464	0.018

Note: Village dummies are included but not shown. Robust community clustered SE are reported in parenthesis. P***<0.01. P**<0.05 and P*<0.1