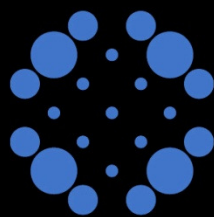# Welfare Effects of Market Friendly Land Reforms in Uganda

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CLTSUMB

Centre for Land Tenure Studies Working Paper 02/11

Welfare Effects of Market Friendly Land Reforms in Uganda

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ABSTRACT. This article estimates the poverty reducing impact of the recent land reforms and land transfers in the different land tenure systems of Uganda. Using balanced panel data for 309 households in 2001, 2003, and 2005, models that control for unobserved household heterogeneity and endogeneity of land acquisition and disposition are employed to measure the poverty-reduction effect of land on household expenditure per adult equivalent. Significant poverty reduction effects of increased land access in form of owned, operated and market-accessed land were found. The poverty reduction effect for land accessed through the market was significantly larger than the poverty reduction effect of land accessed through inheritance. (JEL Q24, Q15, and O12)

Key words: Land transfers, land policy reforms, unobserved heterogeneity, poverty impacts.

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I. INTRODUCTION

Historical circumstances and colonial policies in Uganda are well known to have created land tenure insecurity and other unintended consequences, including establishment of the overlapping land ownership rights, conflicts on land, poor land management, and skewed land distribution (Rugadya 1999; Coldham 2000; Deininger 2003; Deininger 2005; Green 2006; Deininger & Ayalew 2007; Ahene 2009). Customary land is estimated to comprise at least 75 percent of land in Uganda (Busingye 2002) and was for a long time not legally recognized (Bosworth 2003; Hunt 2004). It was administered based on traditional institutional arrangements that discouraged the functioning of land rental and sales markets, while focusing on preserving the cultural identity of different lineage groups.

The search for a solution to challenges in the land sector has lead to several land law reforms in the history of Uganda. For example, the 1995 Uganda constitution emphasizes protection of the land rights of the poor, and the 1998 Land Act redefines and provides full protection of private land rights, including those of the underprivileged groups, women and children, and aims at transforming the traditional land rights into a modern land tenure system that can cope with increasing population pressure and the need to ensure land tenure security, broad based land access through better functioning land markets, more sustainable land management, land use efficiency, and economic growth (Bosworth 2003). While stronger land tenure security can enhance land access, investment on land, and land use productivity (Deininger & Ayalew 2007), it can also reduce poverty among others, by securing land access for the poor who have limited access to other sources of livelihood (Deininger 2003; Deininger 2005; Finan et al. 2005). This paper uses household panel data from 2001, 2003 and 2005 to assess the poverty

impact of the recent Ugandan land reforms that aimed to strengthen land access through markets and to enhance tenure security.

Land reforms play an important role in stimulating labour supply in farm and off-farm activities and land transfers across users at a low cost (Deininger 2005). They can also reduce the power traps created by the minority powerful land-rich elites at the expense of the majority land-poor households, who also tend to be vulnerable to shocks and more likely to lose their land through distress sales (Deininger 2005; Holden 2009). Conversely, better functioning land markets encourage land transfers from less able to more skilled households, and particularly land rental markets provide affordable means through which the land-poor can gain access to more land to promote productivity and welfare (Binswanger & Rosenzweig 1986; Deininger & Feder 1998; de Janvry et al. 2001; Nkonya et al. 2005; Deininger & Mpuga 2008; Holden et al. 2008b). However, this is balanced against the likely negative effects of land sales markets that are often associated with high land prices, which may foster land concentration in the hands of the few rich and inefficient owners (Otsuka 2007; Holden et al. 2008a).

And while land rental and sales markets are reported to be increasing and widespread in all regions of Uganda, evidence showed that the land sales market did not lead to a more unequal land distribution during the 1990s (Deininger & Mpuga 2008), and provided the poor with opportunities to generate starting capital for other investments. Specifically, the paper aims at (i) identifying differences in the distribution of land transfers and ownership across households in different income levels and tenure systems (regions) in Uganda, and (ii) to provide empirical evidence on poverty impacts of land access through the market and non-market avenues in rural Uganda, and (iii) discuss the need for new policy interventions given

the new demand for land by international investors (*see* Deininger et al. 2011) that can potentially threaten the land rights of the poor and therefore long term poverty reduction.

2. A HISTORICAL PERSPECTIVE OF LAND POLICY REFORMS IN UGANDA

This section presents the evolution of land tenure systems and land policy reforms that have been adopted in Uganda since 1900 to resolve historical land tenure problems. In the pre-colonial Uganda, communities and individual households in various kingdoms and tribes possessed larger chunks of land. Kings, local chiefs, and clan heads were the custodians of land on behalf of their subjects and members of the lineage groups.

The Colonial Period (1900-1962)

Land legislation in Uganda started in 1900 with the signing of the "1900 Buganda Agreement" between the British Government and the Kingdom of Buganda, under which *mailo* land tenure was created in Buganda region and parts of Bunyoro. Out of the estimated 19,600 square miles of total land in Buganda, 8,958 square miles of "*mailo*" land were given to the Kabaka (king) of Buganda Kingdom, his top chiefs and notables to own it in perpetuity. The royal family of Buganda was granted 958 square miles of land as private *mailo*[1], while his 1000 top chiefs and notables shared a total of 8000 square miles, with each getting 8 square miles of land on average (West 1972 ; Brett 1973). The rest[2] (9000 square miles) of uncultivated land was allocated to the protectorate as Crown land, to be administered by the colonial government. All the small land occupants that had traditionally occupied these lands were declared tenants, were consequently unable to secure independent land rights, and were required to pay rent "*Busulu*" to their landlords who possessed the certificate of land title.

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[1] The Kabaka (King) of Buganda kingdom was given 350 square miles of private *mailo* land.
[2] This land was later surveyed and found to be less than previously estimated, and the size of Crown land reduced to 8,307 square miles (West 1972; Green 2006).

Although, this helped to stimulate surplus production from small farms and wage labor supply, the position of tenants was vulnerable and land tenure insecurity remained a serious concern of policy makers.

Under the 1900 Buganda Agreement, the colonial government created Freehold Land Tenure in the Western part (Ankole, Toro, and Kigezi), parts of Buganda in the Central region, and Bugisu in the Eastern part of Uganda, following agreements between numerous kingdoms and the British Government. Holders of freehold land included church missionaries and academic institutions, owned this type of land for unlimited time, and would seek land titles from the Crown or the Uganda Land Commission.

Leasehold Land Tenure was established in 1900 to allow holders of *mailo* and freehold land, including the Crown (ULC) to grant land ownership under a contract to another person for a specified period of time and on certain conditions such as the payment of rent. The holders of land under lease were also entitled to a certificate of lease Title.

In 1900, Customary Land Tenure included land that was held and regulated under the traditional systems as defined by customs, the geopolitical location and lineage groups. It still includes: (i) communal customary tenure that is predominant in Northern and Eastern parts of Uganda and (ii) individual/family /clan customary tenure that exist in Central, Western, parts of the North and South Western Uganda (Busingye 2002). Occupants of customary land[3]

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[3] The term "*Kibanja*" represents occupants (*Bibanja* holders) on land under customary tenure. Under the 1998 Land Act, the statutory *Bibanja* holders are guaranteed protection against any eviction without compensation, and can also purchase the stake of the registered land owner to become a *mailo* or freehold land title holder.
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could be on freehold, *mailo,* leasehold or public[4] land. Customary rules imposed different restrictions on the right to sell or mortgage this type of land. Approval of clan chiefs, elders, community, lineage and family membership is mandatory regarding any land transaction, and this keeps land resources within communities.

The Crown Land Ordinance of 1903 declared holders of all the land held under customary system, but outside the *mailo* area, to be tenants at the will of the Crown. The continued land ownership of customary land was regarded as unlawful and at the request of the state, holders of this type of land would easily be evicted. The *Busulu* (annual dues) and *Envujo* (levy per acre) Law of 1928 defined the rights of original occupants of customary land, who were being exploited by their land owners as a result of high economic gains from cotton production. The law put a limit on the rent tenants were to pay their land owners, and provided some protection against evictions without compensation for the land and improvements made on it. This however failed to resolve the challenges of the overlapping land rights. Tenure insecurity on land continued to hamper investments and land market activity on tenanted land (Deininger & Ayalew 2007).

From Independence (1962) to 1986

The 1969 Public Land Act provided the customary tenants with more protection against evictions. Later, the 1975 Land Reform Decree declared all land in Uganda to be public land and to be administered by the Uganda Land Commission. The decree abolished *mailo* and freehold land tenure and converted land held under these two systems into government leases for a period of 99 years. Customary tenancy on *mailo* land was also converted into customary tenure on public land with a limited tenure security. Restrictions were imposed on acquisition

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[4] Public land included land that was not owned both in freehold or mailo tenure and out of which, public leasehold and freeholds would be granted by the ULC.

and disposition of customary land. Holders of customary land were prohibited from engaging in any land transfer, including land transfers into leasehold, without the consent of ULC. They would be compensated, in case their occupation was to be terminated. According to Deininger (2003), the attempt to nationalize land created unintended consequences such as land grabbing, unlawful evictions, and resource dissipation, which reduced the level of investments on land, land transactions, access to credit, and incidence of conflicts on land

Under the Museveni's Government (1986 to Present)

The recent land reforms started with the promulgation of the 1995 Uganda constitution, which repealed the 1975 land reform decree that was seen to be controversial and declared all land in Uganda to belong to the citizens. The constitution reinstated customary, *mailo*, freehold, and leasehold land tenure systems that were in place during the colonial government, and has provisions that aim at strengthening land rights on customary land, especially rights of the underprivileged groups of women and children. The parliament enacted the 1998 Land Act that seeks to define and entrench full land ownership, rights, and tenure security to all Ugandans, including those on customary land, to increase land use efficiency and economic growth (Bosworth 2003). The Land Act sets out procedures under which holders of customary land can apply and acquire certificates of customary land ownership, using the decentralized institutions of land administration that include: Parish Land Committees, office of the Land Recorder at the Sub-county level, District Land Boards, and Land Courts (Tribunals) that also work with the High Court to resolve land disputes.

The 1998 Land Act also enables lawful and *bona fide* occupants[5] of *mailo*, freehold, and public land (land that is mainly in urban areas and owned by the government) to apply and acquire certificates of occupancy on condition that they continue paying the land owner the annual nominal ground rent, but there was limited consensus on this provision, due to the resistance from landholders (Coldham 2000). The Land Act also makes provision on how the holders of customary land certificates, together with land lease-holders can apply and convert their certificates to freehold tenure using the office of Registrar of Titles. Individual freehold land tenure was adopted as a long term system of land ownership, given its aptness in providing land holders with the most complete rights and minimal restrictions on all modes of land transfers and access.

Under the 1998 Land Act, holders of freehold land have the freedom to use their land for any lawful purposes, including lease, sale, mortgage, and bequeath. Holders of leasehold are free to use the land in any lawful way such as sub-leasing, during the lease period of 49 or 99 years. In the customary land system, the rights of land ownership, usufruct, and bequest are considered to be secure, while the transfer of rights is primarily through inheritance. The holders of *mailo* land on the other hand, still face the challenge of utilizing their land resource effectively without evicting and compensating the lawful and *bona fide* occupants that have statutory protection against such evictions, as long as they continue paying rent of Ug.sh1,000 (US$ 0.6) per year. The Act further provides for the establishment of a land fund, to be used in resettling people that become landless as a result of government actions and natural disasters, but its implementation has been slow (Rugadya et al. 2008), probably due to due to

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[5] A lawful occupant refers to customary tenants and any other person that had peacefully entered the land (mail, freehold or public land) with the consent of the owner, while the *bona fide* occupant includes households that had been in unfavorable possession of the land, including those that were resettled on government land, at least, 12 years before the 1995 Uganda Constitution came into force (Coldham 2000).

the lack of resources and other administrative challenges. A comprehensive Land Sector Strategic Plan (LSSP) and new National Land policy were put in place between 2004 and 2010 to further improve land access through the market and the efficiency of the land administration, by modernizing the infrastructure, the processing of land information[6] and permitting system.

These recent land law reforms were expected to increase tenure security, reduce inequality in land holding, increase land access through better functioning land rental and sales markets, and to enhance agricultural productivity and welfare. The implementation of the new law still faces the challenges of limited social legitimacy, opposing cultural interests, and institutional design limitations (Hunt 2004; Rugadya et al. 2004). The land amendment law was passed in 2009 to resolve cultural dissent and ethnic demands, especially in Buganda region (Green 2006), to improve the implementation of the land law, and to stop the evictions of tenants from the registered land, except upon the order of eviction from courts of law.

III. THEORETICAL FRAMEWORK

Land is one of the most important assets of rural households in Uganda and a primary basis for their livelihoods. The high transaction costs of labor supervision tend to reduce productivity on large farms, which rely more on hired labour than is the case on small and owner operated farms that are very productive (Deininger 2003). On the other hand, small farms face significant credit and rationing constraints than is the case on large farms and this explains higher productivity on large farms in areas with developed credit markets. To the

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[6] Inadequate information about the land regulations and inefficient delivery of services provided by the land sector in Uganda may discourage land transactions, and make land transfers risky and prone to opportunistic tendencies that further increase the transaction costs of engaging in land market activity (Ahene 2009).

extent therefore that land reforms become effective in improving tenure security and access to additional land through better functioning land markets, land-poor households can easily move up the agricultural ladder to land ownership, access to credit, and higher productivity.

We assume that households maximize their utility subject to a set of constraints where access to land from different sources is part of this constraint set. Households will attempt to get access to additional land when the benefits of doing so are expected to be higher than the costs. It is mainly through the market that households can adjust their farm size in the short run, while access to land through inheritance can be influenced to a small extent. And while the size of inherited land of individual households changes less frequently, household size and composition changes over time such that the amount of inherited land per adult equivalent also changes over time. Cash and liquidity constraints may prevent households from accessing additional land through the market and their labor endowment limits their ability to utilize the land.

We assume that households that are able to access land through the market have additional non-land resources and are therefore more able to improve their welfare through such land access. Based on this we test the following hypotheses: (i) There is a positive correlation between household welfare and access to land through inheritance and through the market, (ii) After controlling for observable and unobservable factors that may explain land access, additional access to land enhances household welfare, (iii) Access to additional land through the market enhances household welfare more than access to additional land through inheritance.

III. DATA AND WELFARE INDICATORS

This study utilizes a three-period household panel data set collected in 2001, 2003, and 2005 by two research projects. The first survey was conducted in 2001 by the International Food Policy Research Institute (IFPRI), and covered two thirds of Uganda including Southwest, Central, and Eastern and some areas in Northern Uganda. A stratified sampling procedure was employed based on a classification of Uganda's territory according to the agricultural potential, market access and population density. A total of 450 households in 107 communities were interviewed in 2001. The subsequent two surveys were conducted in 2003 and 2005 as part of the Research on Poverty, Environment, and Agricultural Technologies (REPEAT) project, conducted by the Foundation for Advanced Studies on International Development (FASID).

In these surveys, 3 districts that were part of the earlier IFPRI study areas were dropped due to insecurity in the North and Northeastern parts of Uganda. Instead 94 out of 107 communities that were previously covered by the IFPRI survey in 2001 were selected. Only 333 households, out of the 450 households in the baseline survey of 2001 were included in the 2003 REPEAT survey due to the change in the sampling frame in 2003. In addition, out of the 333 sample of households, 20 households dropped out for various reasons in the 2005 survey, while 4 more households with outliers and conflicting values of land access were also dropped from data analysis. This study is therefore based on balanced panel data of 309 households. Data analysis was conducted on 927 observations from 26 districts that include; Mubende, Luwero, Nakasongola, Masaka, Mukono, Kayunga, Rakai, and Mpigi in the central region, Sironko, Tororo, Bugiri, Iganga, Mayuge, Jinja, Kamuli, Pallisa, Mbale, Busia, and Kumi in the Eastern region and Mbarara, Kabale, Kisoro, Kabarole, Kasese, Bushenyi, and

Rukungiri in the western region of Uganda. We expect attrition bias to be too small to affect our results.

We computed income per adult-equivalent and expenditure per adult-equivalent as measures of household poverty levels. Household income in a year was computed from the summation of value of home crop production net of the cost of inputs, value of home produced livestock that were consumed, cash income from sale of livestock and livestock products net of livestock production costs, and cash income from seasonal and monthly off-farm activities. Distinctively, household total consumption expenditure was constructed from cash expenditure for consumption and value of consumption of home produced goods. Both measures of household poverty levels were adjusted to 2005 prices. Problems with the household income data especially in the initial period of 2001 compelled us to use the more reliable consumption expenditure data for the estimation of marginal returns to land access.

Land access includes land endowments in acres that farm households own or operate in their production process. Land owned can be accessed mainly through the modes of inheritance (or in form of gifts) and purchases. Land that farm households operate may include land that is accessed through inheritance and market modes of land access including purchases, renting-in and borrowing. Land acquired through the market is a limited dependent variable (LDV) while land owned and lands operated are continuous variables.

IV. DESCRIPTIVE STATISTICS

Tables 1 and 2 provide descriptive statistics for key variables on land access and poverty indicators across rural households. In particular, Table 1 shows a significant growth in household income between 2001 and 2005. During the same period, a trivial growth in

household consumption expenditure is observed from Ug.shs 345,036 in 2001 to Ug.shs 387,653 in 2005. The real annual income of households on average was found to be lower compared to the corresponding real annual consumption expenditure. This difference is more evident in the initial year of 2001 and can be attributed to various practical challenges related to measuring income of the rural agricultural households.

TABLE 1
HOUSEHOLD POVERTY INDICATORS AND LAND ACCESS, 2001-2005

	2001		2003		2005		Overall	
	N	Mean	N	Mean	N	Mean	N	Mean
Per adult-equivalent								
Household income (Ug.shs)	309	213481.10 (17246.66)	309	340229.30 (28717.71)	309	376035.00 (24578.79)	927	309915.10 (14023.04)
Household expenditure (Ug.shs)	309	345035.70 (15033.22)	309	386107.50 (37832.47)	309	387652.80 (20196.59)	927	372932.00 (15145.67)
Land owned (acres)	309	1.04 (0.07)	309	0.98 (0.08)	309	1.24 (0.10)	927	1.09 (0.05)
Gini coefficient of land-owned by district	309	0.46 (0.01)	309	0.44 (0.01)	309	0.47 (0.01)	927	0.45 (0.00)
Land operated (acres)	309	1.12 (0.07)	309	1.05 (0.08)	309	1.31 (0.10)	927	1.16 (0.05)
Gini coefficient of land - operated by district	309	0.43 (0.01)	309	0.41 (0.00)	309	0.45 (0.01)	927	0.43 (0.00)
Land purchased (acres)	269	0.67 (0.06)	269	0.49 (0.07)	269	0.60 (0.08)	807	0.59 (0.04)
Land inherited (acres)	256	0.54 (0.05)	256	0.51 (0.05)	256	0.45 (0.04)	768	0.50 (0.03)
Land sold (acres)	19	0.11 (0.08)	19	0.00 (0.00)	19	0.11 (0.03)	57	0.07 (0.03)
Land bequeathed (acres)	55	0.61 (0.14)	55	0.00 (0.00)	55	0.04 (0.02)	165	0.22 (0.05)
Land acquired through-renting &borrowing	174	0.16 (0.03)	174	0.15 (0.02)	174	0.21 (0.03)	522	0.17 (0.01)
Land rented-out and-borrowed -out (acres)	55	0.02 (0.02)	55	0.03 (0.02)	55	0.28 (0.07)	165	0.11 (0.03)
Land acquired thru renting, borrowing & purchases	291	0.71 (0.06)	291	0.54 (0.06)	291	0.68 (0.08)	873	0.64 (0.04)

Note: (i) Standard errors are in parentheses; (ii) Income and expenditure per adult equivalent in real income (2005 value).

There can be limitations of research instruments that depend on recall information over a long period. Besides, enumerators may fail to effectively probe all income sources of the household during data collection. This creates significant data limitations in form of hidden and undisclosed income. It is widely agreed that consumption is a better measure of lifetime welfare compared to current income (Deaton 1997). Thus, the welfare estimates of land

access in this study rely on the more plausible consumption expenditure per adult-equivalent as the measure of household welfare.

In the case of land asset, households gained access to more land through the market, on average 0.64 acres per adult-equivalent, compared to 0.50 acres of land per adult-equivalent that was accessed through inheritance. Inequality in land distribution is illustrated by the gini coefficients for land owned and land operated per adult-equivalent between 2001 and 2005. There is a lower average gini coefficient of 0.43 on land operated per adult-equivalent compared to a gini of 0.45 for land owned in the period 2001-2005. This suggests that land access through the market might be helpful in promoting more equitable land access for agricultural production in rural areas of Uganda. In addition, we see a large increase in land rented-out and borrowed-out per adult-equivalent from 0.03 acres in 2003 to 0.28 acres in 2005. The increase in land rented-out and borrowed-out can be explained by the significant rise in the number of households that participated in the supply side of the land market from 5 in 2001 to 48 in 2005. The average size of land per adult-equivalent acquired through renting and borrowing (acres) is noted to have increased from 0.16 in 2001 to 0.21 in 2005.

Land Ownership and Transfers in the Three Regions of Uganda.

Figure 1 represents a summary of the average land ownership and transfers per adult-equivalent that was computed based on 81 households in Central region, 147 households in Eastern region, and 81 households in Western region of Uganda. The average land owned per adult-equivalent is highest (1.49 acres) in Central region and least (0.86 acres) in the Eastern region. The average levels of land transfers are highest in the central region followed by the western region. Land inherited per adult-equivalent is also noted to be highest at 0.51 acres in Central region, followed by the 0.47 acres in Western region and least at 0.33 acres in the

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Eastern region. Similarly, land per adult-equivalent that is accessed through the market including borrowing is indicated to be 0.67 acres in the central region, 0.66 acres in Western region, and 0.54 acres in the Eastern region. And while more land per adult-equivalent (1.56 acres) is indicated to be operated in the central region than is the case (1.17 and 0.94) in other regions, the average land per adult-equivalent that is accessed through the market appears not to be very much different across all the three regions of the country.
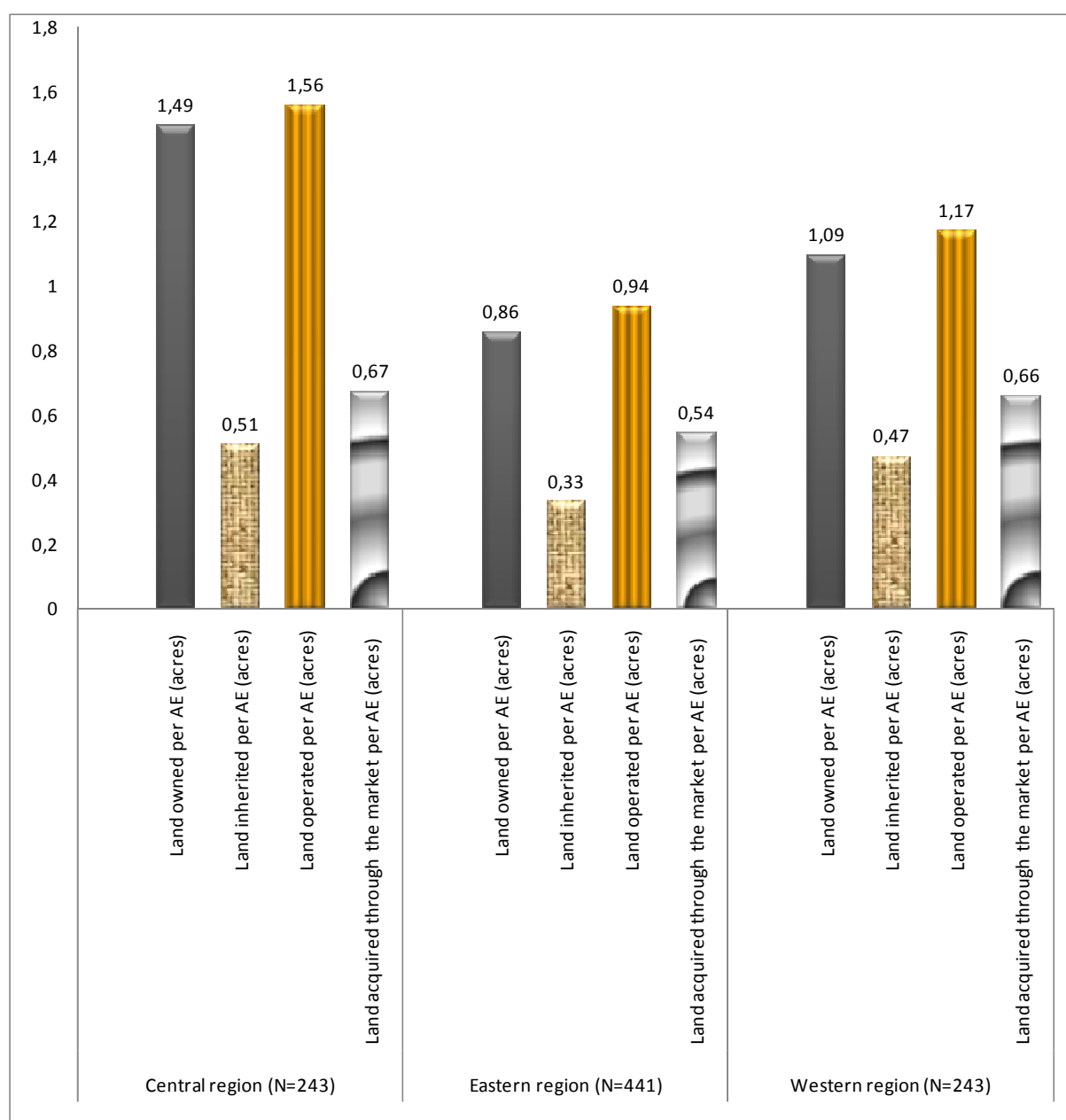

Figure 1. Per Adult-equivalent (AE) Land Ownership and Transfers (in acres) in the Three Regions of Uganda

First-Order Stochastic Dominance Analysis

The first-order stochastic dominance analysis (FOSDA) that is density functions (CDFs) was

conducted to assess the statistical differences in the distribution of land endowment across

households with varying levels of welfare. Graphically, the curve for the CDF of a dominated

quartile will be to the left of the CDF for the dominating alternative quartile. This implies that

a dominating quartile has a lower cumulative density than a dominated alternative. Figures 2

and 3 show results of the FOSDA for land owned and land operated per adult-equivalent.

Notice that households in the poorest two quartiles (quartile 1 and 2) are dominated by

households in quartiles 3 and 4. The land distribution of households in quartile 4 clearly

dominates all other land endowment (owned and operated) distributions in quartiles 1 to 3.

Thus, land owned and land operated are statistically highest for households in quartile 4,

followed by households in quartile 3, lower for households in quartiles 2 and lowest for
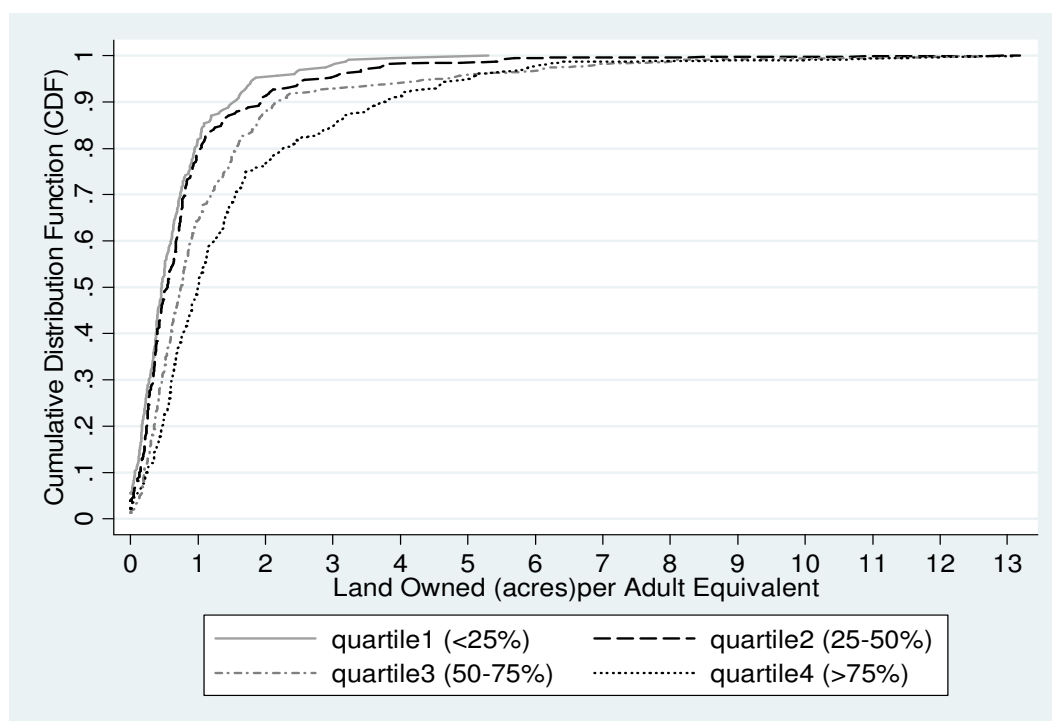
households in quartile 1.

Figure2. First-order stochastic dominance graph comparing land owned and welfare levels
(quartiles) in terms of household expenditure per adult-equivalent, 2001-2005
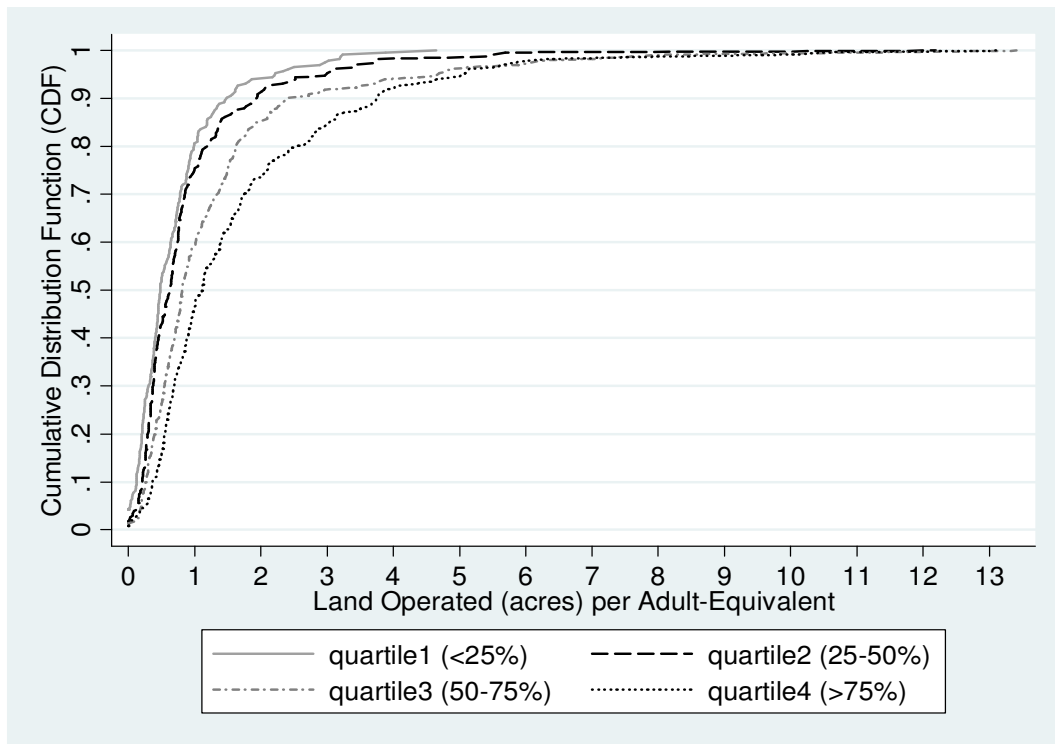
Figure 3. First-order stochastic dominance graph comparing land operated and welfare levels (quartiles) in terms of household expenditure per adult-equivalent, 2001-2005

VI. ECONOMETRIC MODEL ESTIMATION

Land access that includes a) land owned, b) land operated, and c) land acquired through the market, all are expected to be endogenous. This was confirmed by the findings of the post-estimation tests for endogeneity that is based on the Durbin (score) and the Wu-Hausman tests summarized in Table 3. Linear functional forms for the estimated poverty impact model were adopted following the test results of various diagnostic fits in the form of scatter plots and nonparametric 'lowess' and 'local linear' regressions. The plots (not included in the text) found the relationship between household expenditure and each of the land access variables to be largely linear.

There can be methodological challenges related to generating unbiased estimates of welfare effects of land and other endowments due to their endogeneity and the fact that they may be correlated with unobservable household, farm and community characteristics. A standard

instrumental variable (IV) method that employs a linear combination of five instruments was used as the preferred estimation method, while a residual component (RC) approach based on Holden *et al* (2009) was estimated as a robustness check of the key results. The standard IV two-stage least squares (2SLS) method employed a linear combination of five instruments for each of the endogenous land access variables. They include: (i) the proportion of households in the smallest village (LC1) that can afford at least 2 meals a day, (ii) land in acres that both head and spouse brought in at the start of the household, (iii) the value (Ug.shs) of other in-kind (non-land and non-cash) assets that the head and spouse brought in at the start of the household, (iv) a dummy variable for the high agricultural potential (high rainfall) of the village, (v) age of household head, and age of household head squared.

There can be a positive correlation between food security and access to land, especially among the rural households. Farm households can increase their agricultural food production and welfare overtime, if the land-poor (or near landless) but efficient households are able to access land from the land-rich households. The proportion of households in the smallest local government (LC1) that can afford at least 2 meals a day can therefore, be a reliable instrument for land access at the village level.

We also contend that households with more access to land in the current period may have also enjoyed relatively more land endowments at the start of their households. Current land endowments and the possibility of the increased land accumulation over time may largely be correlated with initial land and non-land assets that the head and the spouse brought in at the start of the household. Still, land scarcity is likely to be more pronounced in areas with a reliable rainfall pattern, due to high population pressure. The agricultural potential of an area can be an effective signal of the level and the underlying dynamics of land access across rural farm households in any given agricultural period. Undoubtedly, the age of the head tends to

correspond highly with different stages of the life-cycle that are specific to different levels of food requirements and demand for different productive assets in the household. We expect age of the household head to be a suitable instrument for land access over time.

VII. RESULTS AND DISCUSSION

Results of the first-stage IV (2SLS) model estimation of different modes of land access are presented in Table 3, while results of the second-stage IV estimation are summarized in Table 4. Land owned that also includes a mixture of land that is inherited and purchased is specified in model 1, operated land in model 2, market acquired land including borrowing in models 3, while land that is accessed through the market without borrowing is specified in model 4. First-stage results of all the model specifications in Table 2 indicate adjusted R-squared values that are between 13% and 29%. This implies a reasonable overall fit and considerable variation in land access that is explained by the exogenous and instrumental variables.

Different tests of the instrumentation are summarized in the lower section of Table 3. The first test is based on the null hypothesis that instruments are weak. The F-statistics for the joint significance of instruments in each of the models (Table 3) are found to range between 15.9 and 18.8, with a p-value of 0.0000. These F-values are higher than 10 and satisfies the widely agreed rule of thumb for instruments that are considered not to be weak. This is further confirmed by the minimum eigenvalue statistics that are also greater than 10. However, these two statistics are seen to be considerably lower than the critical value of 29.18 of the 2SLS estimator (when a distortion of a 5% is tolerated in the Wald test) that includes a 10 percent at most of the true size of estimates. In this case, we do not reject the null hypothesis that the joint effect of the instruments is weak.

The test of endogeneity of land access variables based on these instruments (Table 3) show relatively high values (3.99-8.45) of the Durbin (score) chi2 statistic and (3.97-8.46) of the Wu-Hausman F statistic that are all significant at 1-5 % level. These results imply a strong rejection that all the land access variables are exogenous. We therefore, conclude that land owned, land operated, and market accessed land are all endogenous.

The test of over-identification restrictions is based on the post estimation Sargan chi2 statistic that ranges from 6.66-8.39 and the Basmann chi2 statistics of 6.62-8.35. These two statistics have p-values that are clearly insignificant, which implies that the validity of the 5 overidentifying restrictions in each model specification could not be rejected. These five instruments are therefore found to be strong and relevant to predict the endogenous land access variables. They are correlated with the endogenous land access variables but uncorrelated with the independent variables and the error term in the outcome equation. Perhaps, the basic objection to this IV approach is that the instruments could potentially be correlated with the outcome (household welfare) variable in the second-stage.

Results in Table 2 indicate that the effect of a 1 acre increase in land inherited on different modes of land access is statistically significant at 1 percent level. The economic importance of an increase in land inherited is however larger and positive on each of the land owned and land operated (models 1 and 2), but also negative and smaller in magnitude on each of market accessed land in model 3 and 4. Regional effects are also noted to have an important effect on land access. Households in each of the Eastern and Western regions of Uganda appear to own and operate less land per adult-equivalent compared to their counterparts in the Central region. When it comes to market accessed land in models 3 and 4, the effect of regional differences is found to be trivial and statistically insignificant. The effect of dummy year

periods in relation to the year 2005 has coefficients that are negative and statistically significant in models for land owned and land operated. This is however, not the case for market accessed land. Change in prices, weather and population density may have created significant and substantial limitation on land that households owned and operated in each of 2001 and 2003 compared to 2005.

TABLE 2
RESULTS OF THE FIRST-STAGE IV (2SLS) REGRESSION OF LAND ACCESS

	Per adult-equivalent			
	Land Owned	Land Operated	Land Access through Market	Land Rented & Purchased
Independent variables	1	2	3	4
Land inherited per adult-equivalent (acres)	0.886***	0.880***	-0.215***	-0.225***
	(0.06)	(0.06)	(0.05)	(0.05)
Eastern region of Uganda	-0.323***	-0.287***	-0.032	-0.023
	(0.10)	(0.10)	(0.09)	(0.08)
Western region of Uganda	-0.239**	-0.234**	0.091	0.096
	(0.11)	(0.11)	(0.09)	(0.09)
Dummy variable for year 2001	-0.322***	-0.365***	0.018	0.072
	(0.12)	(0.12)	(0.10)	(0.10)
Dummy variable for year 2003	-0.285***	-0.281***	-0.101	-0.072
	(0.10)	(0.10)	(0.08)	(0.08)
Instrumental Variables				
Proportion of households in the LC1 that can afford at least 2 meals a day	-0.373**	-0.408***	-0.238*	-0.156
	(0.16)	(0.16)	(0.13)	(0.13)
Land (acres) brought in by head and spouse at the start of the household	0.023***	0.023***	0.013***	0.013***
	(0.00)	(0.00)	(0.00)	(0.00)
Value (shs) of other in-kind assets brought in by head and spouse at the start of household/1000	0.000***	0.000***	0.000***	0.000***
	(0.00)	(0.00)	(0.00)	(0.00)
Dummy for agricultural potential/high rainfall in a community (1= bi and uni high, 0= otherwise)	-0.080	-0.157*	-0.059	-0.039
	(0.09)	(0.09)	(0.07)	(0.07)
Age of household head (yrs)	0.017	0.009	0.015	0.017
	(0.02)	(0.02)	(0.02)	(0.02)
Age of household head squared (yrs)	-0.000	-0.000	-0.000	-0.000
	(0.00)	(0.00)	(0.00)	(0.00)
Constant	0.684	1.063**	0.327	0.147
	(0.44)	(0.44)	(0.37)	(0.37)
Number of observations	927	927	927	927
Wald chi2	34.577	34.121	12.974	13.460
Prob > F	0.000	0.000	0.000	0.000
R-squared	0.294	0.291	0.135	0.139
Adjusted R-squared	0.285	0.282	0.125	0.129
Root MSE	1.232	1.224	1.032	1.021

Note: (i) standard errors are in parentheses; (ii) * Significant at 10%; ** significant at 5%; *** significant at 1%.

Results of the 2SLS standard IV estimation of welfare effects of access to land are presented in Table 3. Land access variable in each of the models 1-4 has a positive coefficient that is statistically significant at 1-5 percent level. With one unit of the dependent variable being equal to Ug.shs 10,000, results in model 1 shows that holding the effect of other variables constant, a 1 acre increase in land owned per adult-equivalent increases household welfare (consumption expenditure per adult-equivalent) by Ug.shs 77,400 that is significant at 5 percent. Similarly, model 2 indicates that households that access 1 additional acre of land operated per adult-equivalent enjoy Ug.shs 78,090 increase in their consumption expenditure per adult-equivalent that is statistically significant at 5 percent level.

The coefficients on land per adult-equivalent accessed through the market are positive and significant at 1 percent level in models 3 and 4 and are also noted to be higher (10.246 and 10.265) in value terms than is the case with the corresponding coefficients on land inherited per adult-equivalent (6.441 and 6.554). The coefficients on land accessed through the market are also higher than 7.740 for owned land in model 1 and 7.809 for operated land in models 2. And while this implies that a 1 acre increase in land per adult-equivalent acquired through the market (including through borrowing) increases household expenditure per adult-equivalent by Ug.shs 102,460, a similar increase of land acquired through only renting and purchases is indicated to be Ug.shs 102, 650. In terms of the economic significance, the welfare effect of additional unit of land access through the market adds up to 39.2 percent of the poverty line income level (Ug.shs 261,717.1). This is strong evidence that land plays an important role in influencing household welfare in rural Uganda. Land acquired through the market as well as through other means has strong positive welfare effects.

TABLE 3
IMPACT OF LAND ACCESS ON HOUSEHOLD CONSUMPTION EXPENDITURE PER ADULT-EQUIVALENT, (2SLS) IV APPROACH

	Per adult-equivalent (AE) land access (acres), and expenditure/10,000 (Ug.shs)			
	Land Owned	Land Operated	Land Access through Market	Land Rented-in & Purchased
Independent Variables	1	2	3	4
Land access per adult-equivalent (acres)	7.740**	7.809**	10.246***	10.265***
	(3.47)	(3.60)	(3.88)	(3.86)
Land inherited per adult-equivalent (acres)	-2.642	-2.707	6.441***	6.554***
	(3.56)	(3.65)	(2.13)	(2.15)
Eastern region of Uganda	5.294	5.191	3.269	3.105
	(3.85)	(3.84)	(3.42)	(3.42)
Western region of Uganda	7.803*	7.758*	5.171	5.128
	(4.11)	(4.11)	(3.80)	(3.81)
Dummy variable for year 2001	-2.529	-2.621	-5.124	-5.312
	(3.59)	(3.57)	(3.38)	(3.39)
Dummy variable for year 2003	1.986	1.930	0.806	0.518
	(3.62)	(3.61)	(3.40)	(3.39)
Constant	25.603***	25.079***	26.935***	27.603***
	(5.60)	(5.87)	(4.66)	(4.49)
Number of observations	927	927	927	927
F statistic	2.128	2.093	2.543	2.551
Prob > F	0.048	0.052	0.019	0.019
R-squared	0.132	0.138	0.182	0.178
Adjusted R-squared	0.127	0.132	0.177	0.173
Root MSE	43.093	42.964	41.846	41.935
Test for weak instruments based on the 2SLS; Ho: Instruments are weak				
First-stage adjusted R-sq	0.2851	0.2824	0.1245	0.1289
F-statistic for joint significance of instruments	16.8982	15.8536	18.201	18.8358
Prob > F	0.0000	0.0000	0.0000	0.0000
Minimum eigenvalue statistic	16.8982	15.8536	18.201	18.8358
2SLS Size of nominal 5% Wald test (at 10%)	29.18	29.18	29.18	29.18
Tests of endogeneity:Ho: variables are exogenous				
Durbin (score) chi2(1)	3.997	4.33159	8.45535	8.41554
p-value	0.0456	0.0374	0.0036	0.0037
Wu-Hausman F(1,919)	3.97966	4.31437	8.45954	8.41935
p-value	0.0463	0.0381	0.0037	0.0038
Tests of overidentifying restrictions:				
Sargan (score) chi2(5)	8.0459	8.38527	6.80339	6.65956
p-value	0.1537	0.1362	0.2357	0.2472
Basmann chi2(5)	8.01128	8.35227	6.76496	6.62092
p-value	0.1556	0.1379	0.2387	0.2504

Note: (i) Unadjusted (nonrobust) standard errors are in parentheses;

(ii) * Significant at 10%; ** significant at 5%; *** significant at 1%;

(iii) An option "small" was used to enhance the efficiency of the IV estimates. It allows for the total sample (N) adjustment "$(N/N-K)$" to the degrees of freedom in the variance-covariance matrix of parameters (K), and also reports small sample F and t statistics instead of Wald chi2 and z statistics.

Noteworthy is the size of the coefficient (7.740) on land owned variable in model 1 that is much higher compared to the corresponding coefficients on inherited land in models 3 and 4. This is attributed to land owned in model 1 that is a combination of land sales, purchases, and inheritance. This finding makes sense therefore, that the coefficient in model 1 lies somewhere in between the two coefficients on inherited land and market accessed land. The study finding that the magnitude of the estimated welfare effects were larger on market-accessed land than on inherited land is a further indication that access to additional land through the market, including borrowing, may be associated with stronger poverty reducing effects compared to additional land that is accessed through non-market modes. This is a logical consequence of land markets transferring land to more efficient producers. We cannot therefore reject the three hypotheses formulated in the theoretical framework. It is clear that welfare of households' increases with access to land and this is more than a correlation between wealth and land access, given that the results are robust to alternative controls for endogeneity of land access.

Results in Table 3 further indicate positive welfare effects of regions that are only significant at 10 percent in models 1 and 2. A shift from Central region to Western region of Uganda appear to be associated with Ug.shs 78,030 (or 30% of poverty line income) more for every 1 acre of land that is owned, and Ug.shs 77,580 (or 29.6% of poverty line income) more for every 1 acre of land that is operated. And while regional differences in the welfare effects of market accessed land appear to be positive and statistically insignificant, the welfare effects of change in time periods from 2001 to 2005 are shown to be trivial in magnitude and statistically insignificant. The explanatory variables in the four estimated model specifications are also indicated to explain only 12.7 to 17.7 percent variation in the welfare level of rural households. Results of the standard IV approach did not change significantly, even when we

employed the G2SLS panel random-effects[7] and limited-information maximum likelihood (LIML) estimation to estimate the poverty impact equation of land access.

Further robustness checks

Further sensitivity analysis of the major findings of the standard IV approach was implemented using the residual component (RC) model based on Holden et al (2009; 2011). Each of the endogenous land access variables is first regressed on exogenous variables using panel models that are able to clean out the unobservable and observable time-invariant household, farm and village characteristics that may cause endogeneity bias. Specifically, a linear panel fixed-effects model is fitted for the land owned; land operated, and market accessed land in the first-stage. Alternatively, the dynamic panel random-effects (RE) Tobit model (Wooldridge 2005) is also estimated for market accessed land, in order to control for its embedded limited dependent (LDV) characteristics. Unlike household fixed-effects, the Tobit model is able to produce conditional expectation functions (CEFs) that respect LDV boundaries of the key variable of interest, and fitted values that are positive (Angrist & Pischke 2009).

The RC approach is easy to compute and can generate robust estimates of the poverty impact equation of the endogenous land access variables under the assumption of strict exogeneity of the residuals. It utilizes the residual component asset variable (=Productive Asset - Predicted Asset) to test the impact of the variation in asset endowment on household consumption expenditure, after the fixed household specific confounders have been cleaned out using a fixed-effects type of data transformation. The RC method is therefore able to control for

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[7] Results of the G2SLS panel random-effects estimation and that of limited-information maximum likelihood (LIML) estimation of the poverty impact equation of land access are available and can be obtained from the authors upon request.

biases due the spurious correlations with omitted time-invariant variables. It is particularly useful when there are no strong and valid instruments to predict the endogenous variable of interest, and also when the data set constitutes short panels that can further limit the effects of omitted time-varying heterogeneity. The RC approach does not rely on the strength and validity of the instruments, which is the Achilles heel of the IV approach. It instead requires relevant regressors that are strictly exogenous and limited presence of the time-varying unobserved heterogeneity that is correlated with the residual component and the outcome variable.

Results of the first-stage and second-stage estimation of the RC method are not reported in the text due to limited space, but can be accessed from the authors upon request. However, they indicate consistent parameters and are line with the key findings of the IV (2SLS) approach in Table 3. They however, show relatively larger marginal effects of each of the land access variables (13.084 for land owned, 14.200 for land operated, 20.838 - 21.013 for market accessed land) compared to the corresponding estimates of IV model estimation. The significantly larger RC coefficients (20.838 - 21.013) on market acquired land in relation to corresponding coefficients (2.924 - 5.652) on inherited land is a further confirmation of our earlier IV findings that land access through the market including borrowing, generates stronger poverty reduction effects compared to additional land through inheritances.

VIII. CONCLUSION

This paper has estimated the welfare impacts of land access through inheritance, a combination of inheritance and other methods of acquisition, and through the market and borrowing in rural Uganda. The uncovered evidence indicates that land scarcity is increasing, and this has made land access an important poverty and welfare indicator in Uganda where

more than 90% of the poor live in rural areas. Our analysis shows that land, whether accessed through the market or non-market ways plays an important role in enhancing household welfare. Households with more of either owned land, operated land, or market-accessed land were shown to gain a significant welfare-improving effect of this better land access after we have controlled for endogeneity in land access.

The other significant finding was that better land access through the market has a stronger welfare-improving effect than better land access through inheritance. This is likely to be the case because land markets to a larger extent transfer land to more efficient producers. However, it is not clear whether the existing land law and policies in Uganda will continue to suffice in ensuring pro-poor land transfers. The increase in the new demand for land by foreign investors can potentially threaten the land rights of the poor and long-term poverty reduction, and new reforms may be needed to effectively protect the national interests and livelihoods. While our analysis demonstrated that land markets enhanced efficiency as well as poverty reduction in the mid 2000s the land markets may have different impacts in the new situation with more actors on the demand side.

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