THE ROLES OF LAND AND OFF-FARM EMPLOYMENT IN YOUTH AND YOUNG ADULT OUTMIGRATION: EVIDENCE FROM RURAL ZAMBIA

By

Megan Bellinger

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

Agriculture, Food and Resource Economics — Master of Science

2020

ABSTRACT

THE ROLES OF LAND AND OFF-FARM EMPLOYMENT IN YOUTH AND YOUNG ADULT OUTMIGRATION: EVIDENCE FROM RURAL ZAMBIA

By

Megan Bellinger

Migration is a prominent policy issue in many African countries, and youth and young adult (YYA) migration can be particularly important for the future vitality of rural and urban communities. However, there is limited empirical evidence on how agricultural land-related factors and off-farm employment are associated with rural-to-rural and rural-to-urban outmigration by YYA. We use data from nationally representative panel surveys from Zambia to estimate logit and multinomial logit models to investigate these issues. Results show that for young adults (ages 25-35), and to a lesser extent for youth (ages 15-24), employment in the off-farm economy is associated with a reduced likelihood of outmigration to both rural and urban areas – possibly because this method of income diversification reduces the need or desire for the geographic income diversification that can be achieved through migration. Results related to agricultural land factors are substantially more variable than results related to employment in the off-farm economy. We find that indicators of land market activity, perceived land availability in a village, and indicators of land tenure security have nuanced and varied associations with outmigration depending on destination type, migration type, and age group. The land related results suggest that careful policy and programs design is needed to accommodate the differential impacts that land market activity, land access perceptions, and tenure security may have on groups such as YYA who are important for the long term productivity and vitality of their communities.

This work is dedicated to my parents.
I would not be who I am today without your guidance.

ACKNOWLEDGEMENTS

I would like to take this opportunity to extend my sincere thanks to the talented people who have helped me reach this point. First and foremost, I thank Dr. Nicole Mason-Wardell, my major professor, for her constant guidance, willingness to answer any and all of my questions more promptly than I thought possible, and assistance even from seven time zones away. I am so grateful that I had the opportunity to work with her, and could not have asked for a better research experience.

My understanding of the subject matter would be sorely lacking without the opportunity to participate in a RALS survey experience. I am so grateful to the talented team at IAPRI, who spearhead the RALS survey, along with their many government and NGO collaborators, for extending the opportunity to my colleagues and myself to assist in our small way in collecting the data that generates so much insight and policy discussion. I would especially like to thank Dr. Antony Chapoto the "Super Chair," the Regional Supervisor Dr. Chewe Nkonde, the Northwestern Lead QC Mr. Auckland Kuteya, my lovely survey partner Ms. Wendy Akayombokwa, and the entire team of supervisors and enumerators who helped me gain a better understanding of the livelihood situation in Northwestern Zambia.

I would like to thank my research assistantship supervisor, Dr. Milu Muyanga, who has provided helpful insights and guidance while running a survey operation of his own in Malawi. I would also like to thank Dr. Robert Richardson for generously agreeing to join my committee and for providing a fresh perspective and valuable insight to my project.

Finally, I would like to extend my thanks to the communities in Zambia who have been part of the RALS apparatus for the last several years. Without them and their willingness to participate in a lengthy, complicated survey, this research would not be possible.

Funding acknowledgement

This work was made possible by the generous support of the American People provided to the Feed the Future Innovation Lab for Food Security Policy (FSP) through the United States Agency for International Development (USAID) under Cooperative Agreement No. AID-OAA-L-13-00001 (Zambia Buy-In). The contents are the sole responsibility of the author and do not necessarily reflect the views of USAID or the United States Government.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

KEY TO ABBREVIATIONS

ADB	African Development Bank
AIC	Akaike Information Criterion
APE	Average Partial Effect
AU	African Union
CRE	Correlated Random Effects
CSO	Central Statistical Office
IAPRI	Indaba Agricultural Policy Research Institute
FAO	Food and Agriculture Organization
FEWS NET	Famine Early Warning System Network
FLDAS	FEWSNET Land Data Assimilation System
GDP	Gross Domestic Product
HH	Household
ICT	Information and Communication Technology
IGO	Intergovernmental Organization
IIA	Independence of Irrelevant Alternatives
IOM	International Organization for Migration
MNL	Multinomial Logit

RALS	Rural Agricultural Livelihoods Survey
RNFE	Rural Nonfarm Economy
SEA	Standard Enumeration Area
SSA	Sub-Saharan Africa
TAMSAT observations	Tropical Applications of Meteorology using Satellite data and ground-based
TLU	Tropical Livestock Units
UN	United Nations
YYA	Youth and Young Adult
ZMW	Zambian Kwacha

1. Introduction

As populations in sub-Saharan Africa (SSA) expand, youth (ages 15-24) and young adults (ages 25-35) are taking on an important role as those with the most economically active years ahead of them in on- and off-farm activities, representing important avenues for local and national economic growth (Van der Geest 2010; Food and Agriculture Organization (FAO) 2014; Mercandalli and Losch 2017).[1] However, many rural parts of Africa may not have sufficient economic opportunities on or off the farm to employ the growing youth and young adult (YYA) population (Bezu and Holden 2014; Mueller and Thurlow 2019), which may lead some rural YYA to leave their home areas (Bizas and Elie 2014; FAO 2014). While there is a significant narrative and political tension around global South to global North migration,[2] half of all Africans that migrate internationally move from one country to another within the continent (FAO 2017). Further, internal migration (within one's country of origin) is much more common than international migration among Africans, particularly for individuals initially living in rural areas (FAO 2017; Mercandalli and Losch 2017). This is also the case for Zambia, the focus of this study.[3]

[1] The Food and Agriculture Organization, International Labor Organization, and United Nations (UN) have all at various times endorsed the definition of youth as individuals aged 15-24, while the African Union (AU) refers to young people as individuals aged 15-35 for statistical and programming purposes (AU 2006; Elder 2009; FAO 2020; UN 2020). These demarcations are used because 15 is generally when an individual has completed compulsory education and may be entering the workforce, while 25 tends to be around when an individual may establish their own homestead (whether as a part of the parents' household or as their own), and 35 tends to be the age by which an individual has accumulated enough capital to migrate to urban areas should they choose to do so (Yeboah et al. 2019).

[2] Examples include the migration of individuals from North Africa across the Mediterranean Sea to Europe, or from Latin America to the United States.

[3] For example, while international migration into Zambia has dropped from 1.9% to 0.6% of the total population in the last few decades, and even fewer individuals migrate out of the country, 16.8% of the Zambian population in the 2010 census was enumerated in a different district than their district of birth (International Office of Migration 2019).

The factors that play into an individual's migration decision can be quite complex both for the individual who is leaving and their household. The motivating factors surrounding migration are nuanced, and can be related to the relative abundance of opportunities and challenges in one's home community as compared to those in the set of potential receiving communities. In this study, we focus on two critical factors for rural incomes that may play a significant role in a YYA individual's migration decision: (i) land access and related issues of land availability, titling, sale, and rental markets, and how these issues are related to rural migration (Deininger and Jin 2006; Mullan, Grosjean and Kontoleon 2011; de Brauw and Mueller 2012; Holden and Otsuka 2014; Kosec et al. 2018); and (ii) the rural off-farm economy, which includes salaried, wage, and self- employment, and how the availability of off-farm employment can be associated with rural outmigration (Sakho-Jimbira and Bignebat 2006; Dorward et al. 2009; Haggblade, Hazell and Reardon 2010; Wineman and Jayne 2017). Populations in Zambia and many other countries in SSA are young and rapidly urbanizing, with SSA nations comprising 37 of the 50 countries with the highest urban population growth rates (World Bank 2020). However, much of the Zambian workforce still relies on agriculture for their livelihoods, making rural migration dynamics, particularly among YYA, an important topic for policymakers. In this paper, we use descriptive and econometric analysis of data from recent nationally representative panel surveys of smallholder farm households in Zambia to investigate which land and off-farm employment-related factors are associated with YYA rural-to-rural or rural-to-urban outmigration.

Although there is a relatively large literature on how migration affects individuals and households in developing country contexts (e.g., Harris and Todaro 1970; Mabogunje 1970; Foster and Rosenzweig 2001; de Haas 2010; de Weerdt and Hirvonen 2012) as well as on the

drivers of migration (e.g., Deininger and Jin 2006; Sakho-Jimbira and Bignebat 2006; Dorward et al. 2009; de Brauw and Mueller 2012; Holden and Otsuka 2014; Kosec et al. 2018), to our knowledge there have been no previous studies specifically on the land- and off-farm employment-related factors associated with rural-to-urban and rural-to-rural outmigration by rural African YYA. This thesis therefore contributes to the extant literature on migration in three key ways.

First, while much of the migration literature treats migration as an explanatory variable and estimates its effects on outcomes such as consumption or risk mitigation at the destination (e.g., Ritsilä and Ovaskainen 2001; De Weerdt and Hirvonen 2012; Wineman and Jayne 2017), we focus instead on rural YYA's intra-country migration decisions as the outcomes and analyze the factors that are associated with these decisions, addressing one of the literature gaps noted by de Brauw, Mueller and Lee (2014).

Second, in previous studies in which migration is the outcome of interest, explanatory factors are often restricted to socioeconomic and demographic characteristics (Msigwa and Mbongo 2013; de Brauw 2019). Those studies that do consider the impact of non-socioeconomic factors, such as inheritance (Kosec et al. 2018), land scarcity (Holden and Otsuka 2014) and land transferability rights (de Brauw and Mueller 2012), tend to focus on only one dimension of land or are set in countries like Ethiopia where land allotment strategies are shaped by past political systems and differ from the strategies used by many other SSA countries. It is also important to account for current policy issues, such as programs designed to promote conversion of land from customary to titled status, when studying outmigration decisions to inform future policy decisions in Zambia and other SSA countries (Ho and Spoor 2006). Finally, de Brauw, Mueller and Lee (2014) bring out the role of land access, markets, and tenure security in rural-to-urban

migration, but does not consider how land factors are associated with rural-to-rural migration or how youth and young adults may be affected differently from the general population of migrants. In this paper, we examine the association between outmigration of rural YYA (to rural and urban destinations) and multiple measures of household level land factors, including participation in land rental markets, ownership of titled land, reception of inheritance, and perceptions of the possibility of purchasing or selling land or obtaining unallocated land from local authorities.

Third, there is limited empirical evidence on determinants of migration specifically by YYA that extend beyond socioeconomic factors or that considers youth and young adults as potentially separate groups. The few previous studies related to this topic, such as Herrera and Sahn (2013) and Beegle and Poulin (2012), examine the determinants of outmigration among youth and young adults in Senegal and Malawi, but restrict their explanatory variables to those of a demographic and educational nature, and do not address the roles of land factors and off-farm employment as we do here. Chiang, Hannum and Kao (2015) study the migration motivations of young adults but only those in the very limited age range of 18-21. Another relevant study, Dako-Gyeke (2016), focuses on high-earning potential young people such as university graduates. Kosec et al (2018) examine the impact of expected land inheritance on youth migration decisions in Ethiopia, but does not account for other methods of accessing land (e.g., through rental or purchase) or the role of being employed in the off-farm economy prior to migrating. Finally, while Bezu and Holden (2014) study the relationship between current land access and future migration, the outcome that is studied is the planned migration decision among youth as measured by planned employment type (e.g., employment in an urban center, farming, etc.), which does not capture actual migration decisions. We propose that analysis of youth and young adults separately is valuable because their roles within a household are likely different,

and because the opportunity set available to youth is in many cases wider than it is for young adults. We propose that this will lead to different results on the associations between land- and off-farm factors and the outmigration decisions of the two age groups.

This study's focus on the roles of land factors and off-farm employment in rural Zambian YYA's outmigration decisions is highly policy-relevant for several reasons. First, given that in Zambia the majority of YYA live in rural areas (World Bank 2019), that youth unemployment rates have climbed from 16 to 21% in the past five years (International Labor Organization 2020), and that youth unemployment rates are higher than those among older age groups (Central Statistical Office (CSO) 2013), it is critically important to understand what factors are associated with migratory flows of this age group within the country. Second, urban populations in Zambia, as well as across SSA, are growing more rapidly than rural populations, which increases the possibility of population growth outpacing economic/job growth in areas where YYA are hoping to migrate to obtain more remunerative employment (de Brauw, Mueller and Lee 2014; Mercandalli and Losch 2017; Trading Economics 2020; Chamberlin, Sitko and Jayne 2020). Therefore, a better understanding of the factors that are associated with YYA's rural-to-urban migration decisions can help address reasons for rural-to-urban migration at the source, helping to mitigate a potentially overwhelming influx of YYA to urban areas where livelihood opportunities cannot keep pace with the population. Finally, intergovernmental organizations (IGOs) including the United Nations Educational, Scientific and Cultural Organization, the International Organization for Migration (IOM), and the FAO, are calling for increased evidence-based policy around the rural development-migration nexus (Deotti and Estruch 2016, Management of Social Transformations 2017; Chileshe and Nkombo 2019), and this work contributes to that evidence base.

The remainder of this thesis is structured as follows. Section 2 provides definitions for the key terms used in the study, then briefly describes the economic context in Zambia. Section 3 illustrates the conceptual underpinnings for the empirical models that are estimated. Sections 4 and 5 describe the data and methods, respectively. The results are presented and discussed in Section 6, and the paper concludes in Section 7.

2. Background

2.1 Definitions

We follow the definitions used by the IOM (Chileshe and Nkombo 2019) for migration-related terminology. More specifically, internal migration is defined as the movement of individuals within a country but across administrative boundaries such as province or district delineations. Outmigrants are defined as individuals who leave an administrative area with the intent of living elsewhere, while in-migrants are individuals who are entering an administrative area with the intent of living there. Remittances refer to money that is sent from a migrant to their place of origin and can be international or domestic (often from an urban to a rural area). Push factors are factors that incentivize outmigration because of a lack of economic opportunities or external factors like changing weather conditions in the sending community, and pull factors incentivize in-migration because of factors including land availability, social conditions, or employment opportunities in the receiving community (Chileshe and Nkombo 2019). Temporary migration can include individuals who are absent from their prior household for up to three years, as long as they intend to return, while permanent migrants are individuals who leave their household with no intention of returning (Chileshe and Nkombo 2019). The dataset that we use does not comply perfectly with these definitions, which we will discuss more in the Data section, but the definitions remain useful in understanding the policy and IGO discussion around migration.

Finally, we note the distinction between off-farm and nonfarm employment. Off-farm employment encompasses any activity that generates income (either monetary or in-kind) that is not labor and sale directly related to one's own farm, and thus includes salaried or wage labor on others' farms as well as nonfarm employment (i.e., employment that is not on one's own farm or others' farms).

2.2 Country context

Zambia is a primarily agrarian nation, and agriculture accounts for the employment of roughly 54% of the workforce and 32% of gross domestic product (GDP) (FAOSTAT 2020; Trading Economics 2020). However, the country's economy more broadly, related metrics like currency value, and even rural-urban population dynamics are tied closely to the country's copper mining sector, which, for example, contributed 56% to national GDP and 75% to overall exports in 2018 (Mercandalli and Losch 2017; Trading Economics 2020). This economic structure, according to the 2016 Zambia Country Profile, can cause sharp swings in economic growth and measures of well-being (such as household income) based on the world price for copper, which over the last decade saw a peak in 2011 and a trough in 2015 (African Development Bank (ADB) 2016). In response to copper price volatility, the government's Country Strategy 2011-2015 prioritized "diversification through infrastructure development" and "economic and financial governance" (ADB 2016, n.p.). The Country Strategy 2017-2021 builds on these goals by emphasizing the steps the Zambian government has taken to promote economic diversification, in part through promoting exports and facilitating international trade (ADB 2017). This strategy also calls out agriculture, energy, tourism, manufacturing, construction, and mining as key strategic growth areas (ADB 2017).

While Zambia is generally considered to be a preferred investment destination for international investors, it is not without fiscal challenges (ADB 2017). The Zambian Kwacha is not pegged to any currency (unlike some neighboring countries' currencies) and has experienced numerous instances of depreciation in recent years, including in 2015 and the post-harvest season of 2018/2019, both of which are included in our study period (Trading Economics 2020). The most recent depreciation can be attributed in part to the significant negotiating power of the

mining companies, who currently enjoy significant tax advantages in exchange for the revenue and employment they generate for the country (Mordant and Mfula 2019).

The Zambian government has also expressed concerns that urban population growth may outpace job creation, and that the jobs that are created are not stable or lucrative enough to support the urban poor (African Development Bank 2017). A recent synthesis of formal employment among youth in SSA finds that formal employment is much more successful than informal work in providing "decent work" as defined by the Sustainable Development Goals, but is concentrated in urban areas and largely only accessible to youth who have completed secondary school (Sumberg et al. 2019). The lack of urban employment opportunities may be, in part, attributable to the way that many SSA cities grew – i.e., without significant industrialization (Mercandalli and Losch 2017). This leaves the informal sector to take up greater and greater percentages of the urban population as it grows, and strains the government that must provide the informal sector with more services. This can be challenging for government because it is difficult to collect tax revenue from the informal sector (Mercandalli and Losch 2017). The Country Strategy 2017-2021 also notes that there is high urban youth unemployment, lending credence to concerns about the relative pace of population and job growth. It also notes that there are growing pressures on an insufficient water and sanitation infrastructure system in urban and peri-urban areas, presenting additional challenges (African Development Bank 2016).

Hydropower is the source of 85% of Zambia's energy (Boley 2018). Unfortunately, given the last few years of drought conditions, reservoirs are significantly depleted, and power stations cannot generate enough electricity to meet demand (ADB 2016). The result has been "load shedding" during the dry season, during which thousands of homes are without power for 10-14 hours per day. Although the political situation in Zambia is generally fairly peaceful, recent years

of economic uncertainty and drought- and pest-induced[4] below-average maize yields are cause for concern for the government and its citizens (ADB 2016; Assessment Capacities Project 2019).

The economic landscape in Zambia – shaped by factors including increasingly frequent extreme weather, land disputes in rural areas, development projects, population growth, and border conflicts – have all been connected to internal migration, particularly as push factors (Chileshe and Nkombo 2019). The traditional rural outmigration model in Zambia post-independence (after 1964) has been that of a man in the household leaving for up to two years at a time in search of employment while the spouse awaits the man's return and engages in informal labor to supplement the household resources (Chileshe and Nkombo 2019). As of 2010 (when the most recent census was conducted), 16.8% of the country's population was recorded by the census in a district that was not their district of birth (CSO 2012). Urban-to-urban migration was the most common migration type recorded in the 2010 census at 38.7% of the total, followed by 30.0% rural-to-urban, 17.2% rural-to-rural, and 14.1% urban to rural migration.

[4] The fall Armyworm is a pest that primarily feeds on maize crops and is endemic in Africa. It has spread rapidly throughout the continent in recent years, and has damaged the crops of many Zambian farmers in recent years (Rwomushana 2018).

3. Conceptual underpinnings

Migration can be viewed as a tool by which an individual (or household) increases their utility and/or mitigates their vulnerability to adverse shocks or events (de Weerdt and Hirvonen 2012; Deotti and Estruch 2016). In this study, we follow de Brauw, Mueller and Lee (2014) and Wineman and Jayne (2017) and conceptualize outmigration as a strategy or course of action by which a rural YYA individual assumes that by moving (temporarily or permanently), they can enhance the quality or quantity of their economic opportunities relative to those they would have had if they had remained in their current location. A common conceptualization of this calculus of possible returns to labor is the Harris-Todaro framework, in which a rural agricultural laborer can continue to work in what may be underemployment in their rural home area, or they can move to an urban area where there is a greater upper limit, but also larger variance, in returns to labor and resultant utility (Harris and Todaro 1970). Urban areas thus engender an opportunity set for a potential migrant that likely has barriers to entry and uncertainty associated with it, but the potential for overall utility improvement. There is an additional benefit to the geographic diversification that outmigration brings about, for both rural and urban destinations: income sources that are farther away from the originating household will have a lower covariance with other household sources of income, leading to a lower overall household income variance and thus reduced risk (Foster and Rosenzweig 2001; de Brauw, Mueller, and Lee 2014).

Outmigration has the potential to confer benefits not only to individuals who directly partake in the migration process, but to the families of migrants as well as the sending and receiving communities at large. If individuals whose labor does not contribute to productivity are able to leave for areas where their labor is comparatively more valuable, both sending and receiving communities can benefit (Haggblade, Hazell and Reardon 2007; Van der Geest 2010).

This reallocation can provide households in sending communities with assistance in the form of remittances, although it also has the potential to be detrimental to communities should those who leave take a disproportionate amount of social and human capital with them (Wang, Huang, and Zhang 2014; Deotti and Estruch 2016; Chileshe and Nkombo 2019).

Although there may be motivational factors for individuals to leave their home community, including poverty, food insecurity and poor market access (Deotti and Estruch 2016), there are also factors within the community that may encourage individuals to stay, which are discussed below. Such factors have traditionally been discussed in a "push/pull" framework (Parkins 2010; Chileshe and Nkombo 2019), which can limit the nuance that can be applied to the relationship between these factors and an outmigration decision. Given this limitation, the increasing complexity of migration decisions, and the flexibility with which migration can take place, we follow Mercandalli and Losch (2017) in not framing each of the potential migration drivers of interest within a "push/pull" framework. Notably, the destination type and even the age of the migrant in question can lead to different *a priori* expectations regarding the direction of the correlation (positive or negative) between a given explanatory factor and the migration decision. That is, a characteristic of the community may be a "push" factor for one individual, but not for others, depending on other conditions and individual characteristics.

3.1 Why distinguish between rural and urban destinations?

The notion that urban areas offer different opportunities than rural areas to a potential migrant is nothing new – urban areas have long been seen as ideal locations in which to move out of farming and into a higher-income livelihood (Harris and Todaro 1970; Bezu and Holden 2014; FAO 2017). While previous work has suggested that the theoretical underpinnings are similar for

rural-to-rural and rural-to-urban migration, i.e., maximizing returns to labor or maximizing utility (de Brauw, Mueller and Lee 2014), we propose that the opportunity set at the destination that is available to individuals, as well as the resources needed to migrate to achieve these maximization objectives, are different depending on whether one's destination is rural or urban (Van der Geest 2010). Additionally, it is important to acknowledge that heterogeneity in rural areas in terms of land related characteristics, vitality of the rural nonfarm economy (RNFE), and connectedness to urban centers may make outmigration to certain rural areas more attractive than undertaking the less certain and potentially more expensive migration to an urban area (Haggblade, Hazell and Reardon 2010).

We suggest the drivers of migration to rural vs. urban areas to be different based on the arguments above and based on previous work by de Brauw (2019), who finds, for example, that in Indonesia, young adults are more likely to migrate to urban areas, while youth are more likely to migrate to other rural areas. de Brauw (2019) also finds that higher levels of education are positively associated with rural-to-urban migration among YYA in Indonesia, Tanzania, and Nepal, while associations between education and rural-to-rural migration are of much smaller magnitude or do not exist, depending on the country. Similarly, Herrera and Sahn (2013) find heterogeneity in determinants of migration to rural vs. urban areas in their study of young adult migration in Senegal. Proctor and Lucchesi (2012) discuss the differential drivers for rural youth migration depending on their destination type, noting that prestige, higher earning potential, and a desire for nonfarm opportunity may all lead to greater rural-to-urban migration, while factors like the availability of land for rent may encourage rural-to-rural migration.

3.2 Why distinguish between youth and young adults?

While there is broad interest in the movements of younger individuals, particularly in Africa, there is little empirical work that considers separately youth (ages 15-24) and young adults (ages 25-35), despite conceptual distinctions between the primary migration-related motivational factors of each age group. As an individual ages, the opportunity set available to them often shrinks with marriage, children, parental care obligations, and other ties to land or a community, making outmigration potentially less attractive. It is also more likely that a young adult is the head of the household than a youth individual, while youth are more likely to be enrolled in school than are young adults. In our dataset, 30.5% of young adults are the heads of their households relative to just 1.4% of youth. Finally, the assets that youth and young adults have or are able to leverage to undertake a potentially expensive outmigration are likely different, as young adults have had more time to accumulate capital than have youth. Recent work by de Brauw (2019) also motivates the distinction between youth and young adults, in finding that determinants such as age and schooling levels are more strongly associated with outmigration among youth than among young adults.

We now move to a discussion of the ways in which individuals' participation in off-farm employment and the land related characteristics of their households and home communities are likely related to their outmigration decisions.

3.3 The off-farm economy and migration

As shown in the RNFE literature, opportunities for off-farm employment can influence migration decisions (Lanjuow and Lanjuow 2001; de Haas 2010). A robust RNFE has been previously linked to lower rates of outmigration, helping communities retain their young populations

(Beegle, de Weerdt, and Dercon 2011), and a paucity of opportunities off the farm has been linked to higher rates of outmigration, especially among youth in search of more remunerative economic opportunities in urban areas (Lanjouw and Lanjouw 2001; Van der Geest 2010; de Brauw, Mueller, and Lee, 2014; Philips and Pereznieto 2019). Outmigration should not be viewed as a panacea for all economic development challenges, however, as it may also prove to be non-optimal for the migrating individuals if they cannot obtain better employment in their new destinations and sacrifice their home social networks and safety nets in the process (Bezu and Holden 2014, Deotti and Estruch 2016). Policy groups and IGOs emphasize the importance of YYA inclusion in policies aimed at increasing employment; however, recent research shows that YYA often participate in the less stable informal nonfarm economy, if they can break into it at all (Bizas and Elie 2014), and those who leave school early to join the workforce experience depressed earning potential throughout their lives (Yeboah et al. 2019). However, as YYA enter the older age group (25-35), especially for males, off-farm employment comprises a larger portion of labor allocation relative to farming, emphasizing its relevance to an outmigration decision (Wineman and Jayne 2017; Yeboah et al. 2019). In addition, climate change is increasing the inherent riskiness of rainfed crop production in SSA, further decreasing the expected income from agricultural work (Dell, Jones and Olken 2014). Participation in the off-farm economy (particularly the nonfarm portion) can allow individuals to diversify their income so they are generally less vulnerable to climate-related risks and the uncertainty associated with many rural livelihoods (Fjelde and Uexkull 2012).

The income generated from off-farm employment, as well as the specific type of job that is held, is also important in determining whether simply having a job is sufficient to reduce an individual's desire to migrate out of their home community. We therefore expect that the net

income an individual is making may affect their decision to continue with that activity or seek opportunities elsewhere, because we propose that utility maximizing individuals prefer to work in activities with higher average and/or more stable returns (Haggblade, Hazell and Reardon 2007). Wineman and Jayne (2017) find that migrants tend to draw more upon off-farm and nonfarm income sources than nonmigrants, and additionally find a consumption benefit to outmigration, suggesting that areas with more vibrant nonfarm economies can attract in-migrants from comparatively opportunity-poor areas.

YYA often hold a general opinion that farming is not a viable livelihood, and subsequently may view sources of nonfarm income as more important and attractive in their estimations of how to allocate their scarce time and resources (AU 2006; Proctor and Lucchesi 2012; Deotti and Estruch 2016). However, farming still employs the vast majority of rural YYA across many parts of Africa, and even individuals who are employed in the RNFE often will also rely on farming for part of their income (Deotti and Estruch 2016). Mabiso and Benfica (2019) show through a synthesis of policy programs and government data from Africa that youth and young adults are still primarily entering the agrifood system (which encompasses both farming and off-farm activities up- and downstream of the farm in agricultural value chains), and will continue to do so for the foreseeable future. Research from the FAO finds that rural-to-rural migration in particular is often associated with both greater farming and off-farm economic opportunities (such as in cash crops or mining) in destination areas (Mercandalli and Losch 2017). We therefore also consider the relevance of land factors in a rural YYA individual's outmigration decision.

3.4 Land-related factors and migration

While the RNFE is considered an important pathway for improving rural household incomes, viable agricultural livelihoods are perhaps even more important (Haggblade, Hazell and Reardon 2010; Imai, Gaiha and Garbero 2017; Mercandalli and Losch 2017). Agriculture accounts for an average of 70% of household income in rural Zambia (Chamberlin 2013). Although Zambia is generally perceived to be a land abundant country, median farm size is relatively small (around 1.2 hectares) and declining, suggesting that land scarcity might be a significant problem for some individuals or households (Chamberlin 2013).[5] Peri-urban areas in particular are experiencing a mixture of pressures as land is sought after simultaneously for urbanization and agricultural use by more and more farmers, and land that was previously dedicated to agriculture may be taken over for more lucrative uses such as mining (Mercandalli and Losch 2017). Land scarcity or insecurity can be addressed primarily in two ways: through greater land access or availability and more vibrant land markets, or through stronger land tenure security or formalization. We consider each of these avenues separately.

3.4.1 Land access and land markets

In the context of declining farm sizes, larger extant family landholdings may provide motivation to remain in one's home community, since it may be comparatively more difficult to obtain farmland in a new rural community (Kosec et al. 2018). Without large enough family land endowments, YYA who wish to pursue farming may turn to land markets to access additional land through purchase or rental. We note here that land availability (having land around the

[5] This apparent paradox appears to be explained by the fact that much of the rural population of Zambia is concentrated on a relatively small portion of the country's potentially arable land under customary tenure, in part because poor market infrastructure and access makes settling in very remote areas economically unviable, and in part because access to animal draft or mechanized land preparation is relatively limited (Chamberlin 2013).

village that is either unallocated or is a part of a land rental or purchase market, in addition to the land a household has previously been allocated or has purchased) is a necessary but not sufficient condition for land access, because access may be facilitated or restricted based on one's monetary resources or social connections to those with the power to allocate or sell land. Therefore, while a community may have enough land available to support their population, individuals within the community may not be able to access the amount of land they would prefer to farm. This thesis focuses on land access, rather than availability, because availability without access is not useful to those seeking to increase their farm size. However, in many SSA nations, including Zambia, formal and informal land markets are thin and are often sticky or inflexible (Ho and Spoor 2006; Green and Norburg 2018). Although land rental is currently very uncommon in Zambia, there is evidence that the strength of rental markets may influence outmigration decisions, as families can benefit from the option to rent out land should members outmigrate to pursue their preferred income generating activity (Chamberlin and Ricker-Gilbert 2016; Mabogunje 1970; Kosec et al. 2018). In areas with robust land markets, younger or resource-poor individuals are sometimes crowded out by older or wealthier village residents or outside investors (Holden and Otsuka 2014; Green and Norburg 2018). This crowding out can lead to involuntary or unwanted outmigration (de Brauw and Mueller 2012).

3.4.2 Land tenure security and formalization

Like many former colonies, when Zambia gained independence in 1964 the government implemented a series of decisions to nationalize land, reassign land to private title, redistribute it, and eventually acknowledge to a greater extent the importance of customary land rights (Quan 2000). To date, most land is governed by customary tenure rules, including allocation without

titles by village leaders, indicating the continued importance of acknowledging such rules when developing policies around land dynamics, particularly in rural areas (Munshifwa 2018). However, many African countries (including Zambia) have embarked upon titling programs with the goal of solidifying and privatizing ownership, which is proposed to have benefits for equitable land distribution and is suggested to improve confidence in continued ownership among farmers of titled land (Deininger and Jin 2006; Holden and Otsuka 2014). To address concerns related to tenure security, Zambia's Ministry of Lands established a National Titling Program, with stated goals to "increase tenure security, improve service delivery in informal settlements, rural areas and peri-urban areas, as well as increase tax revenue" (Sommerville et al. 2017, p. 1). The program acknowledges the difficulties associated with national titling efforts, and the resultant need for flexibility in documentation strategies (Sommerville et al. 2017). The revenue generating aspect of the program comes through land taxes, also referred to as "ground rent," which are currently incompletely collected (Sommerville et al. 2017).

There may be benefits to the household of owning titled land or converting customary land to titled: the household may be able to release a migrant without worry that the land that was formerly tended by that individual would be allocated to another household. However, if the individual wishes to obtain their own land in the community, a strong prevalence of titled land may make this goal difficult to achieve, particularly because titled land may be disproportionately accessible to older, wealthier individuals, or medium/large scale farmers (Sitko and Jayne 2014; Jayne et al. 2016). Inheritance also represents an important, and more prevalent, mechanism by which to obtain land from one's family, but given population pressures in Zambia, the size of land that can be obtained in this manner may not be sufficient to support a farming livelihood (USAID 2017).

Characteristics of land access, land markets, and land tenure security and formalization in Zambia may shape outmigration decisions for rural Zambian YYA based on their possession of or perceived ability to obtain enough land to pursue farming as a viable livelihood (Sitko and Chamberlin 2016).

4. Data

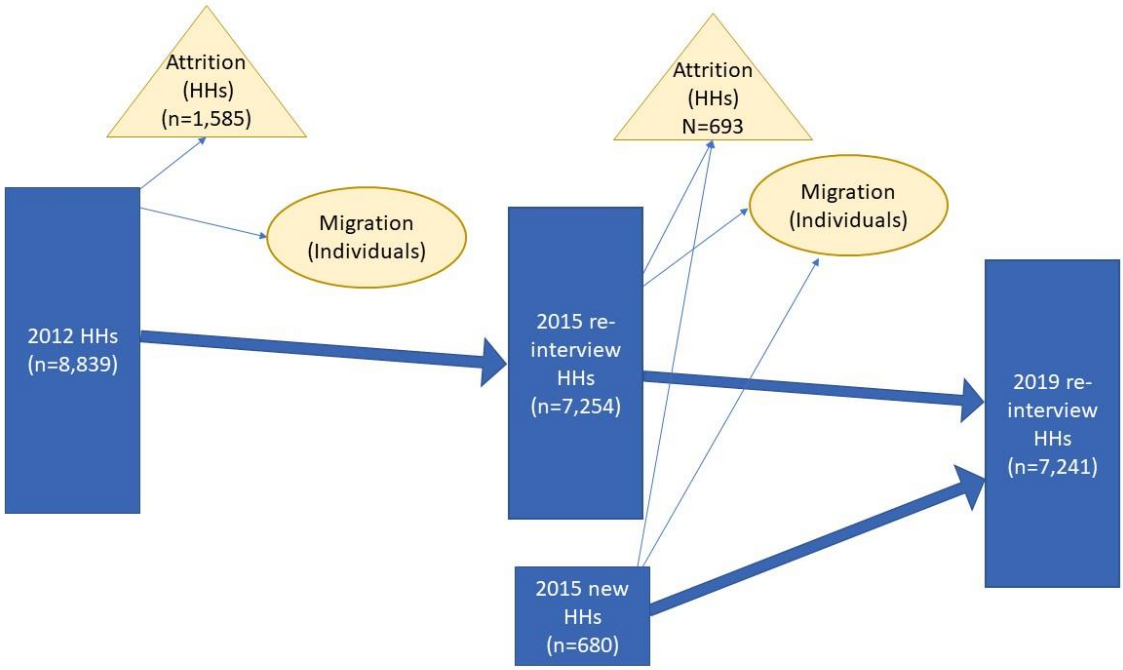
4.1 Household and individual level data

The main source of data used in this study is the Rural Agricultural Livelihoods Survey (RALS), a nationally representative panel survey of smallholder farm households in Zambia conducted in June-July of 2012, 2015, and 2019 by the Indaba Agricultural Policy Research Institute (IAPRI) in collaboration with the Zambia Central Statistical Office (CSO), the Ministries of Agriculture, and Fisheries and Livestock, and other collaborators. The 2012 survey covered the 2010/11 agricultural year (October 2010–September 2011) and the associated crop marketing year (May 2011–April 2012). The 2015 survey covered the 2013/14 agricultural year and the 2014/15 crop marketing year, while the 2019 survey covered the 2017/18 agricultural year and the 2018/19 marketing year. For details on the RALS sample design, see IAPRI (2012, 2015, 2019).

A total of 8,839 households were interviewed during the 2012 RALS, and of these, 7,254 were successfully re-interviewed in 2015. In addition, 680 new households were added to the RALS in 2015. Of the 7,934 total households interviewed during the 2015 RALS, 7,241 were successfully re-interviewed in 2019. See Figure 1 for a visual representation. In our analysis of the RALS data, information on YYA individuals' outmigration decisions (our dependent variables) is drawn from the 2015 and 2019 surveys, and information on these individuals' and their households' pre-migration characteristics (the explanatory variables) is drawn from the 2012 and 2015 surveys, respectively. That is, we pair outmigration decision information from the 2015 RALS with explanatory variables based on the 2012 RALS, and the outmigration decision information from the 2019 RALS with explanatory variables based on the 2015 RALS. To use the data in this way, a household must have been interviewed in both 2012 and 2015 (N=7,254)

or both 2015 and 2019 (N=7,241). (We discuss potential concerns about attrition bias in section 5.5.2.)

Figure 1: Visual representation of RALS datasets



Source: author, with data from IAPRI (2012), IAPRI (2015) and IAPRI (2019)

We now describe in more detail how the 2015 and 2019 RALS data are used to construct the outmigration dependent variables. For each 2012 RALS household that was successfully re-interviewed in 2015, the 2015 data indicate for every individual that was a member of the household in 2012 whether that individual migrated between 2012 and 2015 or not. For migrating individuals, the data also capture the destination type (rural or urban within Zambia, or international), if the move was temporary or permanent, and the purpose of the move. Such information was likewise captured on the 2019 RALS for all individuals that were members of a 2015 RALS household that was successfully re-interviewed in 2019. Migrating individuals were not followed to their destination, and so other than the aforementioned information, no other information is available on migrants after they migrate. Given our focus on internal

outmigration, we exclude international migrants from our sample. There are only 51 and 80 YYA international migrants identified on the 2015 and 2019 RALS, respectively, so excluding these observations does not substantially change our sample size.

Based on the information described above, we construct two sets of outmigration variables based on different definitions of "migrants": (i) a broad definition that considers an individual to be an outmigrant if s/he was reported by the respondent to have permanently left the household since the last survey for any reason (henceforth, "permanent migrants"); and (ii) a narrower definition that focuses on permanent outmigration for employment – i.e., those whose permanent departure from the household was "to find a job" (henceforth, "permanent employment migrants"). The broad definition (i) is consistent with the one used by Kosec et al. (2018), while the narrower definition (ii) is similar to that used by de Brauw and Mueller (2012) and Wineman and Jayne (2017).

An individual's age category (youth or young adult) is based on his/her age as of the survey prior to the outmigration outcome (i.e., the 2012 wave for 2015 RALS-based outmigration information, and the 2015 wave for 2019 RALS-based outmigration information). Our sample includes 21,374 youth (8,793 in 2012 and 12,581 in 2015) and 11,039 young adults (5,077 in 2012 and 5,962 in 2015), for a total of 32,413 YYA (13,870 in 2012 and 18,543 in 2015).

The RALS dataset captures our key variables of interest in a series of questions about land-related topics, as well as about the types of off-farm work that household members are engaged in and the income that such work generates. We describe the specific variables used in the analysis in detail in the Methodology section.

4.2 Village level data

The other data utilized in this study are satellite-based, geo-referenced rainfall and temperature data from Maidment et al. (2014) and McNalley et al. (2016). Total growing season (November to March) precipitation and average growing season temperature in each of the three growing seasons preceding the 2012 and 2015 survey waves (i.e., the 2009/10-2011/12 and 2012/13-2014/15 growing seasons) were calculated and mapped with the computer program ArcGIS as a grid of values. Precipitation is recorded at a resolution of 0.1 decimal degrees, while temperature is recorded at a resolution of 0.25 decimal degrees.

5. Methods

5.1 Empirical Framework

To study the factors associated with YYA migration, we first estimate a logit model for an individual's decision to either migrate or stay in their village (Equation 1). Next, because the factors associated with rural-to-rural migration have been found to differ from those associated with rural-to-urban migration in previous studies as discussed above, we estimate a multinomial logit (MNL) model in which the dependent variable can take on one of three values: zero if the individual does not migrate, 1 if the individual migrates to a rural area, and 2 if the individual migrates to an urban area (equation 2). Both the logit and MNL models are estimated for youth, and young adults separately, and then combined. These models are estimated using the broader (permanent migrants) definition of migration. In addition, for the logit models, we also estimate specifications that use the narrower (permanent employment migrants) definition of migration. MNL models are not estimated for permanent employment migrants due to concerns about very low power when the sample of permanent employment migrants is split by destination type.

(1) $P\left(Migrate_{i,h,t} = 1 \middle| \boldsymbol{X_{t-1}}, \theta_d, \mu_t\right)$

$$= \Lambda\left(\gamma_0 + \boldsymbol{LAND_{h,t-1}\gamma_1} + \boldsymbol{OF_{i,h,t-1}\gamma_2} + \boldsymbol{IND_{i,h,t-1}\gamma_4} + \boldsymbol{HH_{h,t-1}\gamma_3} + \boldsymbol{Z_{v,t-1}\gamma_5} + \theta_d + \mu_t\right)$$

(2) $$P(Destination_{iht} = j|\boldsymbol{X_{t-1}}, \theta_d, \mu_t) = \frac{\exp(\boldsymbol{X_{t-1}\beta_j} + \theta_d + \mu_t)}{\left[1 + \sum_{h=1}^{2} \exp(\boldsymbol{X_{t-1}\beta_h} + \theta_d + \mu_t)\right]}, j = 1, 2$$

$$P(Destination_{iht} = 0|\boldsymbol{X_{t-1}}, \theta_d, \mu_t) = \frac{1}{\left[1 + \sum_{h=1}^{2} \exp(\boldsymbol{X_{t-1}\beta_h} + \theta_d + \mu_t)\right]}$$

In these equations, *i*, *h*, *v*, *d*, and *t* index the YYA individual, his/her household, village, district, and the survey wave, respectively; by *t-1*, we mean as of the previous survey; $\boldsymbol{X}$ refers to all right-hand side variables in equation 1; $\boldsymbol{LAND_{ht}}$ is a vector of land-related variables; $\boldsymbol{OF_{iht}}$ is a

vector of off-farm employment participation variables at the individual YYA level; $\boldsymbol{IND_{iht}}$ are individual YYA demographic controls including age, gender, marital status and education level; $\boldsymbol{HH_{ht}}$ are household-level controls (such as productive assets, demographics, and market access); $\boldsymbol{Z_{vt}}$ are geographic and seasonal weather controls; θ_d is a district fixed effect; μ_t is a year fixed effect; and the γ's and β's are parameters to be estimated. Λ in equation 1 is the logistic function. Standard errors are clustered at the Standard Enumeration Area (SEA) level – roughly the village level – in all regressions.[6] We also note that SEA (village) level fixed effects were tested in the model and were determined to be less useful than district fixed effects because they resulted in complete determination of some datapoints and generated questionable standard errors. All right-hand side variables are values as of the previous survey wave (*t-1*) because values as of the current survey wave (*t*): (a) are observed after the individual made their decision to migrate (or not), and (b) could be influenced by that outmigration decision (i.e., reverse causality). We discuss the explanatory variables in equations 1 and 2 in more detail below.

Equations 1 and 2 are estimated using the RALS data as pooled cross-sections (i.e., with the first cross-section defined by 2015 RALS-based outmigration information paired with explanatory variables from 2012, and the second cross-section defined by the 2019 RALS-based outmigration information paired with explanatory variables from 2015). Using panel data methods such as individual- or household-level fixed effects or correlated random effects models to control for time-invariant household- or individual-level heterogeneity are not good options in this study for three reasons: (i) reverse causality issue highlighted above; (ii) lack of detailed information on migrants after they move; and (iii) utilizing these methods would require, for

[6] SEA demarcations were made by the CSO during the 2010 census to split the country into areas of roughly equal numbers of households. An SEA typically contains 150-200 households. For further explanation, see CSO (2012).

example, that we focus on households that were interviewed in all three RALS waves and that included a YYA individual that did not migrate between the 2012 and 2015 waves. This would mean excluding observations based on the very decision we are interested in modeling.

5.2 Key explanatory variables of interest

We use seven different land-related variables in this analysis ($\boldsymbol{LAND_{h,t-1}}$), six of which are binary variables. The first equals one if the respondent believes his/her household could be allocated additional customary land by the village headperson without having to pay. The second equals one if the respondent believes that customary land can be bought or sold in his/her village without first converting it to titled land. The third variable equals one if the respondent rented any land in or out during the survey period. The fourth equals one if the respondent believes that customary land can be converted to titled land. The fifth equals one if the household owns any titled land. The sixth equals one if the household inherited any land. The seventh land-related variable is continuous and is the household's landholding per capita (total landholding in hectares divided by the number of household members).

We capture a YYA individual's participation in off-farm own business, salaried, or wage work ($\boldsymbol{OF_{i,h,t-1}}$) in two main ways – one for regression purposes, and one for descriptive use. In the regression analysis, we measure participation in the off-farm economy based on the earnings that such participation generates. Due to data limitations (no information is collected in the RALS on the amount of time worked in a given off-farm activity), we cannot calculate returns to labor. We instead rely on the individual's net income from the off-farm activity (separately for own business activities vs. salaried/wage jobs) and designate it as either a "low" or "high" earnings employment activity based on whether their income from the activity is below or above

the median income from all employment activities among YYA individuals. This results in four binary variables: one for participation in "low earnings wage/salaried employment", one for participation in "high earnings wage/salaried employment", and two analogous variables for own business activities. Note that these definitions are based on an individual's earnings and not based on the type of work *per se*; that is, some individuals working in government (for example) are categorized as being in a low earnings wage/salaried job, while others in that industry are categorized as having a high earnings wage/salaried job. We choose this strategy to account for the fact that there may be variability in the earnings from a particular type of job or business, and just because a business is generally remunerative does not mean it is universally so.[7]

In the descriptive analysis, we provide some insights on YYA participation in various types of wage/salaried employment and own business activities, using the categories in Table 1 below. Participation rates for several categories of off-farm employment are very low, so we do not to use category-based off-farm activity variables in the regression analysis.

Table 1: Categories of business and salaried activities

Category	Example
Wage/Salary: Individual works at:	
Another farm	Working on someone else's farm
Agricultural Value Added	Working for a crop or livestock processor
Government	Parastatal employee or civil servant
Private Non-Agricultural	Bank or mine employee
Tourism	Working for a safari or lodge
Individual works in own __ business:	
Agricultural Value Added	Crop or livestock processing or input business
Natural Resources	Charcoal, wild honey, or wild fishing business
Construction	Brickmaking or carpentry
Food Value Added	Beer brewing or bakery
Private Non-Agricultural	Barbershop, repair, landlord businesses

[7] We did, however, also explore a type of work activity-based definition for the high/low earnings variables. Variables generated via this approach are highly positively correlated with our individual earnings-based variables (ρ=0.92 and 0.94 for salaried/wage employment and business activities, respectively), and the regression results are robust to the use of these alternative definitions.

5.3 Other control variables

The additional control variables included in the models are motivated by a review of the literature and our research questions (e.g., Gachasssin 2013; Deotti and Estruch 2016; Wineman and Jayne 2017; Kosec et al. 2018). First, we control for the household's non-land agricultural asset base as reflected in the value of the farm equipment it owns and its livestock (in Tropical Livestock Units (TLUs)).[8] Higher levels of TLUs could be associated with higher returns to farm activities, and thus serve as a deterrent to outmigration, particularly if the livestock owned includes draft animals that can replace some human labor. However, as this is also a measure of one type of assets, it may have the opposite effect as wealthier households may be better able to bear relocation costs of migration as well as the lost labor of a household member who migrates (de Haas 2010; de Brauw and Mueller 2012). We also control separately for characteristics of the respondent's housing structure, such as whether the materials used to build the walls, roof, and floors are made of basic or improved materials[9] and the value of household nonfarm assets excluding the value of the homestead structure (in real 2017 Zambian Kwacha (ZMW)).

Household-level demographic controls include household size and characteristics of the household head: his/her age, education level, the number of years since the head settled in his/her current village, and a binary variable equal to one if the head is considered a local. The last two may be of particular importance for a YYA household member's outmigration decision. For example, YYA individuals who live in households that were established more recently may be more likely to migrate due to weaker social and land-related ties to the household's current

[8] TLU's were calculated with the following FAO formula: cattle = 0.70, sheep and goats = 0.10, pigs = 0.20 and chicken = 0.01 (FAO 2011).

[9] "Improved" floor, wall, and roof materials are defined as materials that are longer lasting and generally more expensive than traditional materials. They include cement or tiles for floors, burned brick or iron sheets for walls, and iron sheets, roofing tiles, or concrete for roofs. "Basic" materials include earth or wood for floors, mud, wood, or grass for walls, and grass or cardboard for roofs.

location. Similarly, an individual in a household whose head is considered "non-local" may be more likely to migrate because the household itself has at some point migrated to be in its current location or because of weaker local ties. Other household-level variables include measures of market access – namely, distances to the nearest feeder road, tarmac road, agricultural market, and agro-dealer. We also account for the relationship of the household to local authorities (i.e., the village head or chief), as well as whether or not the household has received remittances, to gain a clearer picture of the household's social and financial connections. All household-level variables are captured in $\boldsymbol{HH_{ht}}$.[10] We also control for several characteristics of the YYA individual her/himself ($\boldsymbol{IND_{i,h,t-1}}$) that are known to influence an individual's participation in economic activities and propensity to migrate – namely, her/his education level, age, gender, and marital status.

Using geospatial coordinates of each household, we also include two variables that measure weather conditions in the household's vicinity in the years leading up to the time of the survey in which the outmigration decision is captured ($\boldsymbol{Z_{v,t-1}}$). The first is the difference in total precipitation during the growing season (November-March) in each of the three previous years from a 19-year average of precipitation. The second is the difference in average growing season temperature from a 14-year average in each of the three previous years.[11] The 19- and 14-year averages are used because they represent the longest consecutive periods for which sufficient

[10] I check for additional explanatory power in the language family of the household head and spouse by including the more common language family spoken by either the household head or spouse as a categorical variable in the regressions (for example, if one spouse is from a Bemba tribe and the other is from a Kaonde tribe, the language group variable is recorded as Bemba because it is the more prevalent language of the two). This does not add notable explanatory power to the model, does not change the statistical significance or sign of the key variable results, and does not generate a consistent statistically significant result for the language categorical variable. While there is occasionally a statistically significant correlation, it is not consistent across age groups or definitions of migration. I therefore choose not to include language family as an explanatory variable.

[11] I used the Akaike Information Criterion (AIC) to determine how many lags of the weather variables to include. The AIC was optimized (minimized) at three lags.

data are available to calculate the average. To capture other unobserved, time-constant spatial factors, we control for district fixed effects (θ_d) as well as the longitude and latitude of each household. Lastly, we include an indicator variable to account for the survey year and unobserved time-varying factors that are constant across the country (μ_t), which can include factors like broad economic conditions. Summary statistics for all right-hand variables used in the regression analysis are reported in Table A1 in the Appendix.

5.4 MNL model assumptions

As noted above, we estimate both logit and MNL models. To obtain consistent estimates, MNL models require that the independence of irrelevant alternatives (IIA) assumption holds (Hausman and McFadden 1984). In the context of this study, this means that an individual's decision to migrate to, say, an urban area, would not have been different regardless of whether or not the option to migrate to another rural area was available to them. Although tests for the IIA assumption have been developed (e.g., the Hausman-McFadden test and the Small-Hsiao test), these tests are not reliably consistent with each other and have been shown to not be useful in simulation studies (Long and Freese 2014). Following the advice of Long and Freese (2014), we do not perform these tests and instead rely on the previous literature including Cheng and Long (2007), Nchito (2010), Moraga (2013) and de Brauw (2019) that asserts that there are disparate motivations for migrating to urban vs. rural areas, and assume that the IIA assumption holds for this analysis.

5.5 Threats to validity

The analysis we perform is limited to some extent by the nature of the survey data, as minimal information is captured in 2015 (2019) about the exact destinations of individuals who left the household after the 2012 (2015) survey wave, or about distances traveled by the outmigrants. Moreover, we are unable to use the data as a panel and control for time-constant household- or individual-level unobserved heterogeneity for the reasons outlined above. Given these limitations, there may be unobserved individual or household-level characteristics that affect the YYA individual's outmigration decision and are correlated with the observed explanatory variables. If present, such correlation would result in omitted variable bias, discussed further below. In general, because many of the key variables of interest are endogenously determined, we frame all results in this study as associations or correlations and not causal effects.

5.5.1 Addressing endogeneity

It is difficult to separate out the outmigration decision from other individual or household decisions, and given the large number of potentially endogenous explanatory variables of interest (seven related to land factors and four related to off-farm employment) and a lack of instrumental variables (IVs), it is not feasible to use an IV approach to alleviate concerns about endogeneity here. For similar reasons, we choose not to pursue a propensity score matching strategy, as the analysis would quickly become unwieldly with the large number of explanatory variables of interest. Although the analysis presented in this paper is correlational, we believe it is still valuable to perform because the rich set of covariates available in the RALS data and the large sample size lend confidence to the validity of the associations that are found. That said, two factors that are potential sources of omitted variable bias – entrepreneurial ability and

resourcefulness – are not captured in the survey, so after presenting the results below, we consider the likely direction of correlation between each omitted variable and its relevant covariates of interest, and the likely direction of bias that would result from its omission. Similarly, it is also possible that individuals who are inherently more likely to migrate based on these unobservable factors would have left their household prior to the first survey in 2012, which would result in exclusion of this group from the survey sample (Yeboah et al. 2019).

5.5.2 Attrition bias

Given non-negligible attrition between the first and second survey waves (17.9%), and the second and third survey waves (8.7%), we test for attrition bias within the sample. One test for attrition bias, recommended by Wooldridge (2010), entails using the data from all but the last survey wave and including in the main regressions of interest an indicator variable equal to one if the household was re-interviewed in the next wave of the survey, and equal to zero otherwise. A t-test of the coefficient on this variable tests the null hypothesis of no attrition bias versus the alternative hypothesis that there is attrition bias – specifically, that there are unobservables associated with attrition that affect the outcomes of interest. We are unable to use that test here because the information for our dependent variables (outmigration since the previous survey) is only available for households that were re-interviewed in the next survey wave. We rely instead on t-test comparisons of characteristics between households that were and were not re-interviewed, and also use the re-interview status of the household as a dependent variable in a regression to test for statistically significant associations between the explanatory variables included in our main logits and MNLs and the household's re-interview status. The regression used is an MNL with outcomes: (0) the household was re-interviewed, (1) the household was not

re-interviewed because it moved out of the SEA, and (2) the household was not re-interviewed for any other reason.

Although attrition warrants particular thought in the migration context because household migration can be a reason why a household is not re-interviewed, a household's migration decision is unlikely to be driven by entirely the same reasons for which an individual YYA would migrate, although it is possible that there will be some explanatory factors in common between attriting households and outmigrating individuals.[12] Per the t-test results (reported in Table A2 in the Appendix), nearly three quarters of the explanatory variables have statistically significantly different means for attriting vs. re-interviewed households. The MNL results in Table A3 in the Appendix shed light on if similar factors are associated with attrition due to relocation of the household and attrition due to other reasons. Compared to the t-tests, far fewer explanatory variables are statistically significant in the MNL, but more variables are significant in the case of attrition due to household relocation than attrition for other reasons. However, among our key explanatory variables of interest (i.e., the land- and off-farm employment-related variables) and YYA individual characteristics, only one – involvement in a high earnings salaried or wage activity – is significantly associated with attrition; moreover, it is only significant at the 10% level and only in the case of attrition for reasons other than household relocation. The MNL results thus generally increase our confidence that our main findings related to these variables are not strongly affected by attrition bias.

[12] The sample includes 540 households who are not re-interviewed because the household migrates and have a head in the YYA age bracket.

6. Results and discussion

6.1 Descriptive results

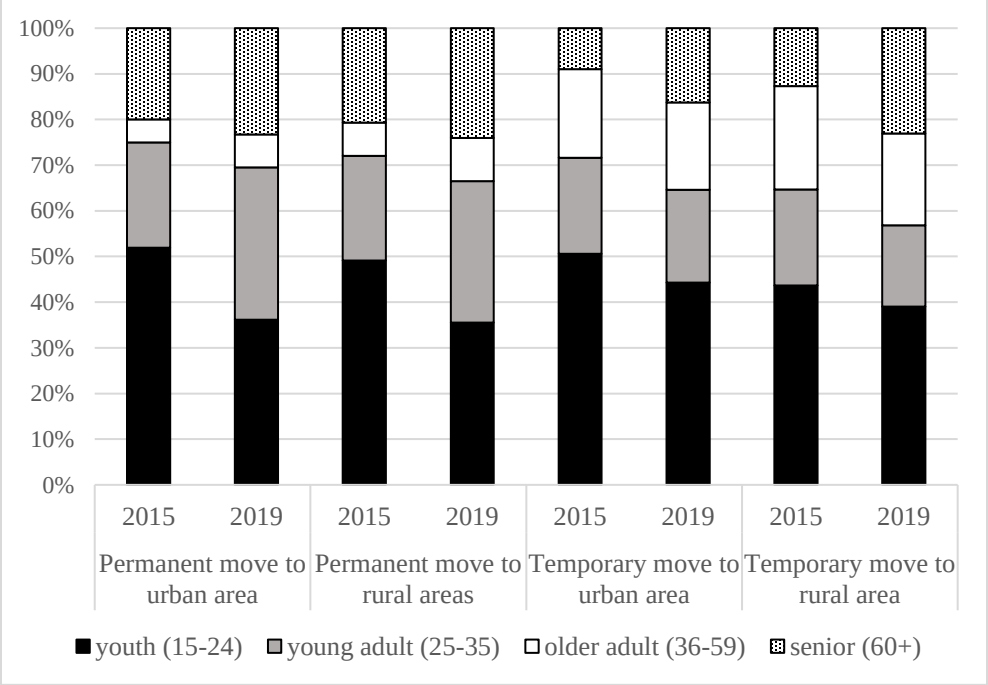
In this section, we describe the pre-migration characteristics of sample YYA that migrated as compared with those that did not. Throughout the results section, we use the term "migration" as shorthand for rural outmigration. As shown in Table A4 in the Appendix, permanent migration is fairly common in our sample at 37.3% of youth and 20.8% of young adults. Migration specifically for employment is far less common: just 2.9% of sample YYA were permanent employment migrants.

As also shown in Table A4 in the Appendix, the prevalence of permanent migration among YYA increased markedly from 21.2% in 2015 to 37.6% in 2019. However, the share of these migrants that left explicitly for employment is fairly stable between waves at 9.0% of total migration in 2015 and 7.9% of total migration in 2019. We suspect that broader economic conditions are contributing to these changing numbers, including worsening weather conditions, outbreaks of pests such as the fall Armyworm (Rwomushana et al. 2018), the instability in the value of the Kwacha, and rising urbanization, as discussed previously. When we consider rural and urban destinations separately, we find that migrants to rural destinations are becoming more prevalent at a faster rate than urban migrants – that is, between 2015 and 2019, the percent of YYA migrants to rural destinations grew by 13.6 percentage points, while the percent of YYA migrants to urban destinations grew by 9.0 percentage points (see Table A5 in the Appendix).

We find that youth make up a larger share of total permanent migrants in 2015, while young adults are a larger percentage of total permanent migrants in 2019 (Figure 2). This change is likely due in part to the natural upward shift in the age distribution that results from a panel

survey. The disparity between age groups is also consistent with analysis by de Brauw (2019), who finds that internal migration tends to peak at age 20 but is quite variable from one country to the next. Temporary migrants are more frequently older prime age adults, which suggests this age group is often only absent from the homestead for brief periods.

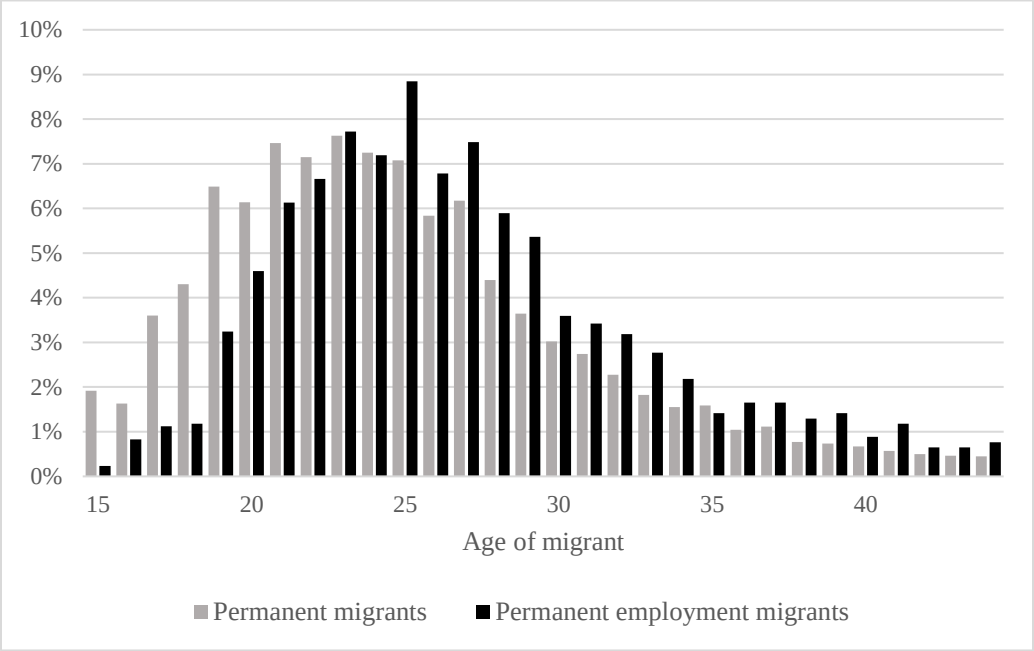
Figure 2: Destination and migration type by age group



Source: author, with data from IAPRI (2015) and IAPRI (2019)

As shown in Figure 3, the age distribution is similarly shaped for permanent migrants and permanent employment migrants, but the peak of the distribution is visibly older for permanent employment migrants. This provides support for the definition of the youth age category as 15-24, because it shows mounding around age 20-21 and a distinct decline for ages older than 30.

Figure 3: Age distribution of permanent and permanent employment migrants



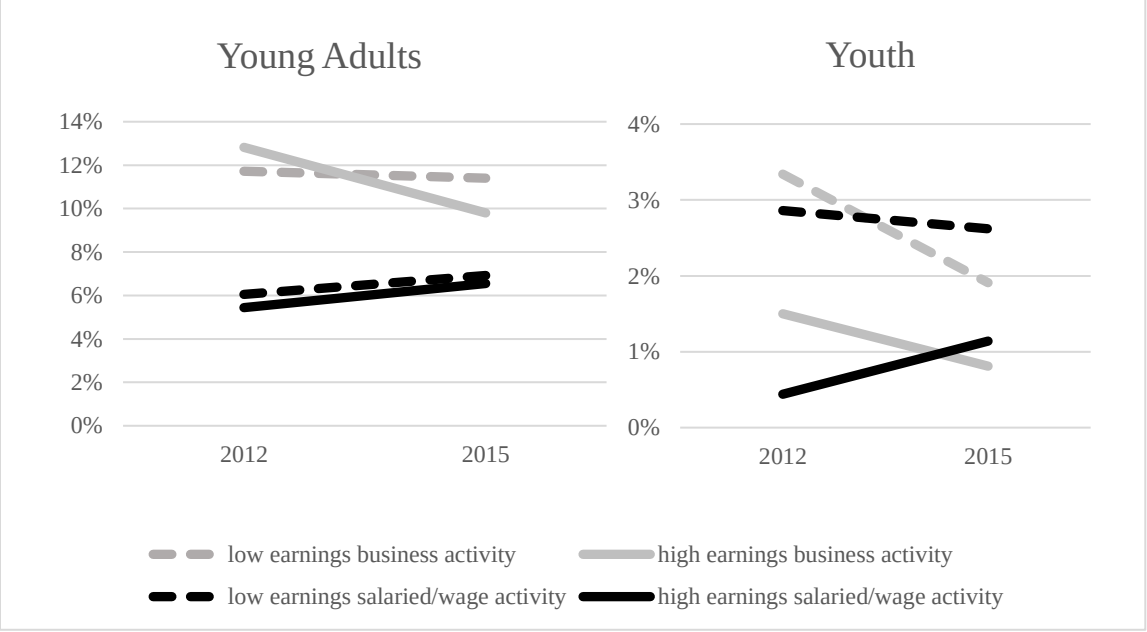
Source: author, with data from IAPRI (2015) and IAPRI (2019)

The proportion of respondents who perceive that there is unallocated land that their household could obtain from local leaders is quite consistent among both age groups, which is unsurprising given that this question captures the perception of the household head, and not that of the YYA household member. However, between 2012 and 2015, we find that the percentage of respondents who believe they could obtain extra land from local authorities drops from around 40% to 35% (see Table A6 in the Appendix). This is consistent with the narrative in Zambia and across much of SSA that land is becoming scarcer and perhaps less accessible, especially to rural households. We also find declines between 2012 and 2015 in the share of respondents replying "yes" to other questions that capture respondent perceptions of dimensions of land access and transferability, including whether the respondent thinks it is possible to buy and sell customary land (24% to 20%), or whether customary land can be converted to titled (32% to 28%). This downward trend may be attributable in part to population growth as previously virgin land is brought into cultivation to support more people, and may also be related to changing perceptions

of government policy around land. It is worth noting that landholding per capita stays fairly stable between survey waves. As of 2012, purchasing and renting land is fairly uncommon, making up just 4.7% and 3.5%, respectively, of acquisition method of all fields captured in the survey. However, we find that purchase occurs nearly evenly between titled (47% of fields purchased) and customary fields (53%). In 2015, purchase and rental comprise 5.6% and 1.9%, respectively, of all surveyed fields, and purchase is split between titled (55%) and customary (45%) fields. Titled land makes up 10.5% of all fields in 2015 in area terms, up from 8.0% in 2012.

The prevalence of off-farm work is quite low among YYA in our sample, although it is comparatively much higher among young adults than among youth (Figure 4). See Table A7 in the Appendix for a full breakdown of participation rates in specific categories of off-farm employment for the different age groups and survey years.

Figure 4: Percentages of participation in the off-farm economy by age group

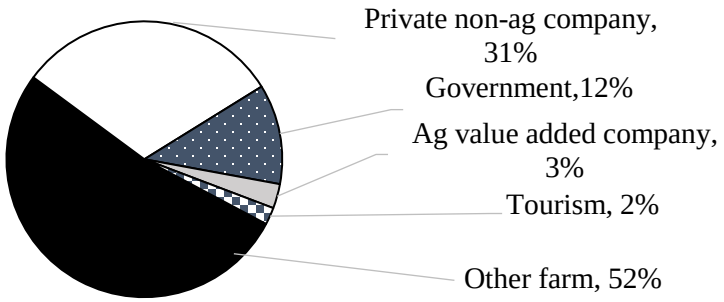


Source: author, with data from IAPRI (2012) and IAPRI (2015)

Participation rates also drop between 2012 and 2015 for both age groups for business activities. Participation in wage or salaried activities increases slightly for young adults, and participation specifically in high earnings wage or salaried activities increases for youth, but because the starting participation rates are so low this result likely does not represent a general trend. While participation rates in wage or salaried activities overall are fairly stagnant, they mask an increase in employment on another's farm that is counterbalanced by a decrease across most other kinds of wage or salaried employment. The generally low participation rate in the RNFE is also seen in work by Mabiso and Benfica (2019), who note residual barriers to participation in the RNFE among YYA, including early pregnancy among women, constraints on capital and skill building, and prohibitively high costs of information technology and cell phones in some parts of Africa. Mueller and Thurlow (2019) also find that YYA are not statistically significantly more successful in the RNFE than older generations, and suggest that the current policy environment is not well suited to address the issue of youth unemployment.

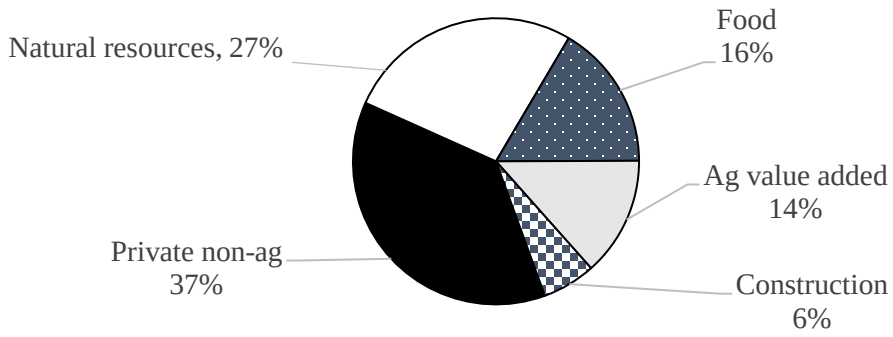
When participation in the off-farm economy is broken up by category of work, we find that wage labor on another's farm is the most common source of wage or salaried employment, at 52% (Figure 5). Private non-agricultural businesses are the most common source of own business employment, at 37% (Figure 6).

Figure 5: Prevalence of categories of off-farm wage/salaried employment among YYA



Source: author, with data from IAPRI (2012) and IAPRI (2015)

Figure 6: Prevalence of categories of off-farm own business activities among YYA

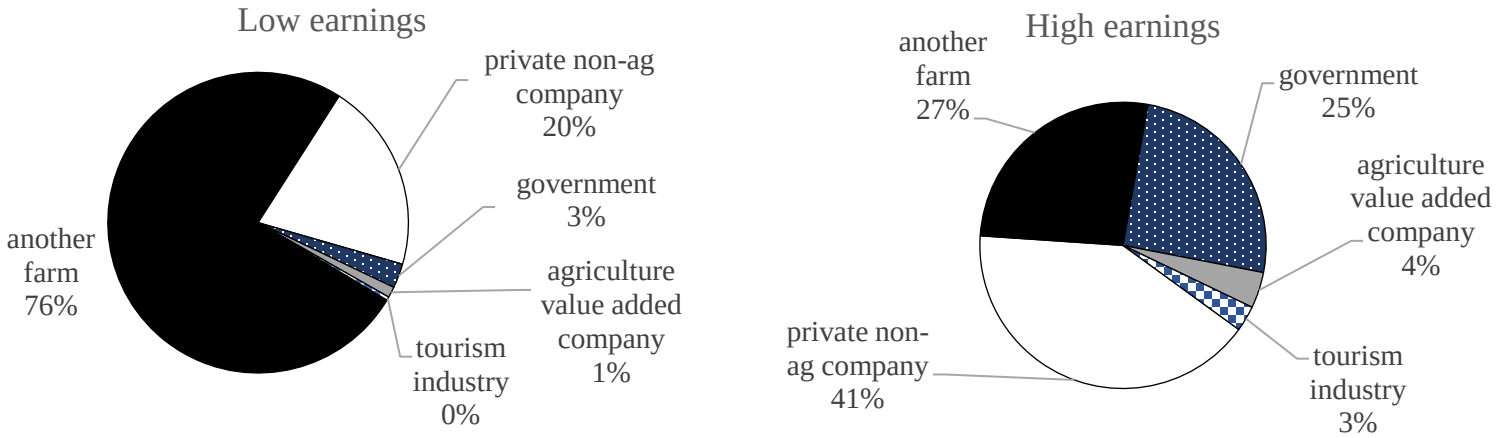


Source: author, with data from IAPRI (2015) and IAPRI (2019)

We further explore the prevalence of the categories of off-farm employment based on their earnings level. It is immediately apparent that work on another's farm dominates low earning wage/salaried work at 76% of the total (Figure 7). Employment in a private non-agricultural job is the most common type of high earning wage/salaried work at 41%, but also constitutes 20% of low earning wage/salaried work, suggesting that there is a fairly significant range in the income generated by this type of employment. We also note that employment in government and tourism are nearly all in the high earning category, but tourism makes up a very small share of YYA wage-salary employment overall (Figures 5 and 7).

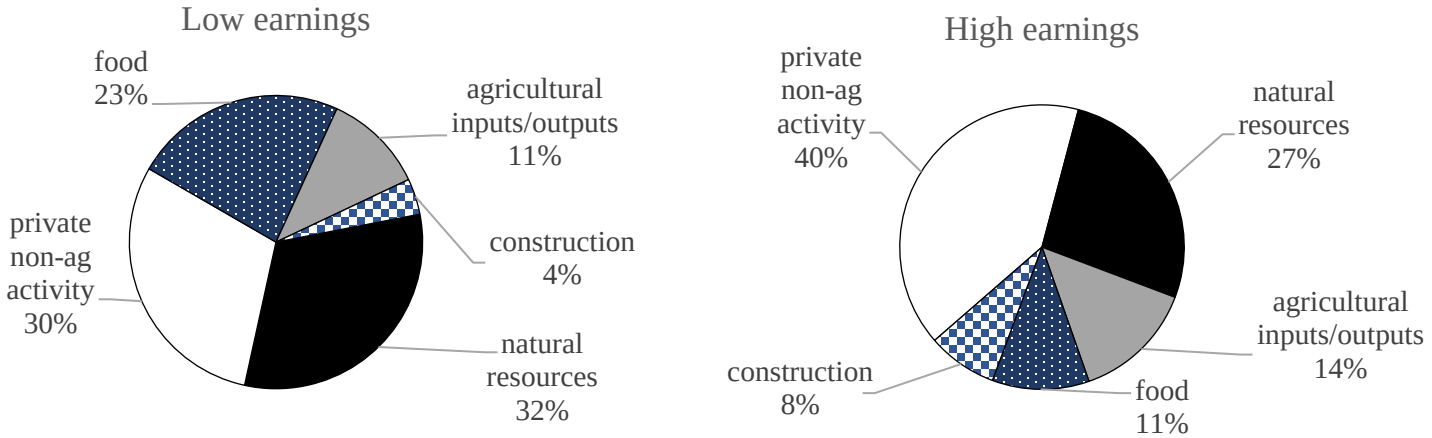
When considering own business activities, we find that private non-agricultural activities make up a sizable share of both low earning business (30%) and high earning businesses (40%) (Figure 8). Fairly high representation in both earnings categories is also evident for several other own business categories. In general, the patterns in Figure 8 suggest that particular types of own businesses are not universally high or low earning relative to other own business activities among YYA.

Figure 7: Breakdown of participation in off-farm wage/salaried work by category and earnings level



Source: author, with data from IAPRI (2012) and IAPRI (2015)

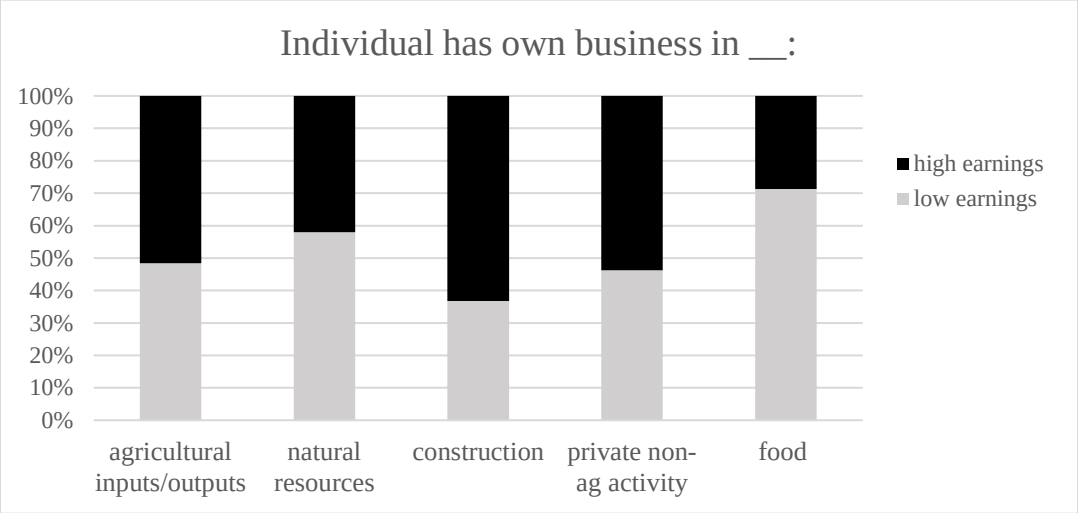
Figure 8: Breakdown of participation in off-farm own business activities by category and earnings level



Source: author, with data from IAPRI (2012) and IAPRI (2015)

We also consider the breakdown of earnings levels within each category of off-farm employment. Among own business activities, the split between high and low earnings is generally not strongly skewed towards one earnings level. The largest disparity is among food value-added businesses, 70% of which are low earning (Figure 9).

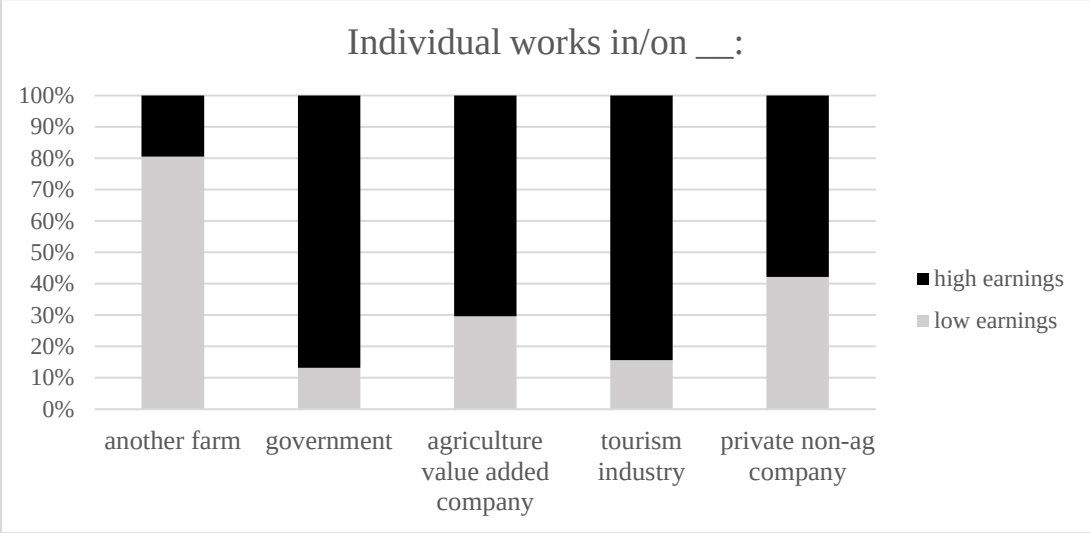
Figure 9: Breakdown of categories of own business off-farm employment by earnings category (low or high earnings)



Source: author, with data from IAPRI (2012) and IAPRI (2015)

The findings for wage or salaried employment are more skewed, as also shown by the results in Figure 7 – work on another's farm is 80% low earning, while work in government and tourism is over 80% high earning (Figure 10).

Figure 10: Breakdown of categories of wage/salaried off-farm employment by earnings category (low or high earnings)



Source: author, with data from IAPRI (2012) and IAPRI (2015)

To better understand the nature of off-farm employment, namely whether it may involve travel and time spent away from the household, we examine the correlation between participation in wage/salaried activities and months reported away from the homestead. For example, if the household head works on a hunting safari that is far from the household and stays there for extended periods of time but still considers themselves to be a household member, they may be less likely to migrate out of the household because they can be employed outside of the community without having to relocate. This is particularly of interest for jobs that have the potential to be in urban areas, as participation in such employment may reduce pressure to migrate to urban areas to find employment. However, we do not find any salaried or wage activities for which the participant spent more than one month away from the homestead on average, with the exception of workers on a hunting safari. To further test the potential relationship between months away from the homestead and participation in wage or salaried activities, we perform an ordinary least squares regression of months spent away from the household regressed on participation status in each category of wage or salaried employment,

while controlling for the distance in kilometers to the nearest district town. This regression is run using the YYA sample and then using all household members age 12 and up, as these are the individuals whose participation in the off-farm economy is asked about in the RALS. The results, shown in Table A8 in the Appendix, suggest that when considering all individuals age 12 and up, participation in each type of wage or salaried activity is strongly associated with fewer months spent away from home. But when considering just YYAs, we find different correlations. First, the statistically significant effects are nearly an order of magnitude smaller. Second, not all types of wage/salaried work are statistically significantly associated with time spent away from the household. Finally, we find that participation in private non-agricultural work is associated with an additional 0.15 months spent away from home. Although the result is positive, it is quite small in magnitude, so we suggest that individuals are likely not primarily accessing their employment by leaving the household for long periods of time while still considering themselves household members. This suggests that in general, the jobs that rural individuals are accessing are likely close enough to the homestead that they do not require the individual to take up temporary residence nearby. Therefore, it may be that individuals who wish to work in jobs that are located far from the homestead must migrate to where those jobs are located.

6.2 Econometric Results

Although we perform analysis for YYA as a single age group in addition to the age sub-categories, for the reasons discussed in the Conceptual Underpinnings section, we discuss and report only the results for the separate age group regressions in the main text. The results for the analysis pooling the age groups and the full results tables for all logit regressions are reported, respectively, in Tables A9 and A10 in the Appendix. We also caution the reader that the

relatively small percentages of certain explanatory or outcome variables – e.g., participation in the off-farm economy among youth, and permanent employment migration among both youth and young adults – leave us with low power, and we thus interpret results associated with these variables with caution. Below, we first summarize the main results related to the land variables (Section 6.2.1), then the main results related to participation in the off-farm economy (Section 6.2.2), and then the results for other covariates (Section 6.2.3).

6.2.1 Land-related variables associations with YYA migration

Variables related to land can generally be split into two categories: land access and land markets, and land tenure security and formalization, as discussed in Section 3.4. We discuss the results for each land-related variable in turn, first based on the logit results (Table 2), and then comment on any differences or new insights gained from the MNL models (Table 3).

6.2.1.1 Land access and land markets

For young adults, the respondent's perceived potential to be allocated additional customary land by local leaders has an average partial effect (APE) on permanent migration for employment of 0.0115, meaning that this variable is associated with a 1.15 percentage point increase in the likelihood of permanent migration for employment among this age group (Table 2). This is equivalent to a 47.9% increase in the likelihood of permanent migration for employment given that, per Table A4 in the Appendix, just 2.4% of the sample's young adults undertook this kind of migration. (See the sample calculation in Box 1 below).[13] When we do not

[13] Throughout the remainder of this paper, we discuss the results in both percentage point and percentage terms to put the magnitudes of the effects into perspective.

consider the migration destination (rural or urban), the potential to be allocated additional customary land is not statistically significant for either type of migration for youth, nor for permanent migration for young adults (Table 2). However, the MNL results (Table 3) suggest weak evidence that this variable is associated with a 1.66 percentage point increase in the likelihood of permanent migration to a rural area among youth. Using the relevant sample percentage in Table A5 in the Appendix, this is equivalent to a 5.7% increase in the likelihood of permanent migration to a rural area.[14] These positive associations between the perception of available land and the likelihood of migration may be driven in part by a perception in the household that their land is not at risk of being reallocated away even if a household member leaves, since there is currently unallocated land available in their area. The result for young adults who migrate in search of a job may be related to a desire by the young adults or the household in general to diversify income sources given lower concern around the possibility of obtaining extra land if necessary. Evidence from Wineman and Jayne (2017) and Yeboah et al. (2019) supports the assertion that young adults allocate more time to off- and nonfarm activities (and allocate less time to farm labor) as they age, and this reallocation may be easier in a household where there is not concern about the possibility of obtaining additional land or of current landholdings being reallocated away from the household.

[14] Note that for the MNL results, the reported APEs represent the percentage point effect of a one unit change in the explanatory variable on the likelihood of being in a given outcome category (non-migrant, migrant to a rural area, or migrant to an urban area). APEs across all three outcome categories therefore sum to zero. We report only the urban and rural APEs in the main tables to conserve space. APEs associated with being a non-migrant as well as the full MNL regression results are available in Tables A11 to A13 in the Appendix.

Box 1: Sample calculation – conversion from APE (percentage point) to percentage terms

Percent of youth who are permanent employment migrants per Appendix Table A4: 2.4%

$$\frac{APE}{Sample\ mean\ for\ outcome\ of\ interest} = percent\ result \qquad EX)\ \frac{0.0115}{0.024} = 0.479 = 47.9\%$$

Table 2: Logit regression land results for youth and young adult by migration type

Age group:	Youth (15-24)		Young adults (25-35)	
Migration type:	Permanent	Permanent employment	Permanent	Permanent employment
Explanatory variables:				
It is possible to be allocated additional customary land = 1	0.0162	0.00267	0.00668	0.0115**
	(0.0112)	(0.00421)	(0.0107)	(0.00554)
It is possible to buy/sell customary land = 1	-0.0127	-0.00728	0.00400	-0.00669
	(0.0121)	(0.00446)	(0.0121)	(0.00562)
HH participates in land rental = 1	-0.00915	-0.0135**	-0.0409**	-0.00332
	(0.0206)	(0.00672)	(0.0198)	(0.00937)
Landholding per capita (ha)	0.000917	-0.00565*	0.00101	0.00380**
	(0.00603)	(0.00293)	(0.00671)	(0.00161)
It is possible to convert customary land to titled = 1	0.0198*	0.00423	-0.0204*	-0.00315
	(0.0112)	(0.00497)	(0.0115)	(0.00518)
HH owns titled land = 1	0.0131	0.00334	0.0122	0.0183**
	(0.0210)	(0.00752)	(0.0158)	(0.00845)
HH has received inheritance = 1	0.00454	0.0114**	-0.0163	0.00782
	(0.0120)	(0.00478)	(0.0111)	(0.00530)
Off-farm economy variables	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Observations	21,374	21,091	11,039	9,819

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered at the SEA level. See Table A10 in the Appendix for full results.
Source: author, with data from IAPRI (2012), IAPRI (2015) and IAPRI (2019)

Table 3: MNL regression land results by age group and destination type for permanent migration

Age group:	Youth (15-24)		Young adults (25-35)	
Destination type:	Rural	Urban	Rural	Urban
Explanatory variables:				
It is possible to be allocated additional customary land = 1	0.0166*	0.00135	0.00150	0.00796
	(0.00967)	(0.00859)	(0.00997)	(0.00625)
It is possible to buy/sell customary land = 1	0.00739	-0.0157*	0.0112	-0.00316
	(0.0113)	(0.00856)	(0.0112)	(0.00827)
HH participates in land rental = 1	-0.00829	-0.00367	-0.0311*	-0.0106
	(0.0201)	(0.0161)	(0.0185)	(0.0117)
Landholding per capita (ha)	0.000962	0.00178	0.00399	-0.00361
	(0.00585)	(0.00443)	(0.00714)	(0.00272)
It is possible to convert customary land to titled = 1	0.00582	0.0103	-0.0119	-0.00232
	(0.00941)	(0.00876)	(0.0111)	(0.00619)
HH owns titled land = 1	-0.0283	0.0353**	-0.00486	0.00910
	(0.0176)	(0.0162)	(0.0184)	(0.00982)
HH has received inheritance = 1	-0.00634	0.0105	-0.0166	0.000160
	(0.0111)	(0.00892)	(0.0106)	(0.00631)
Off-farm economy variables	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Observations	21,374	21,374	11,039	11,039

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered at the SEA level. See Tables A11 and A12 in the Appendix for full results.
Source: author, with data from IAPRI (2012), IAPRI (2015) and IAPRI (2019)

The next land-related variable – the respondent's perception of whether or not it is possible to buy and sell customary land – is not statistically significantly correlated with the yes/no migration decision in any case in Table 2, but it is weakly associated with a 1.57 percentage point (9.6%) lower likelihood of permanent migration to an urban area by youth (Table 3). This may suggest that areas with more flexible land markets (that can accommodate sale of customary land) may facilitate accumulation of land locally, thus reducing the desire to generate income through diversification to urban areas (Mullan, Grosjean, and Kontoleon 2011; Holden and Otsuka 2014). This result may also capture the reality that customary land may be

more attractive than titled land for younger individuals because the ground rents associated with titled land may be prohibitively expensive; customary ownership, although less secure than titled, does not require payment of ground rents (USAID 2017). Finally, the correlation with this "intermediate" step in land reform, where purchase can occur for land that is traditionally not bought and sold, lends support to the conclusions of Toulmin (2008), who suggests that such intermediate steps may be more effective than top-down or centralized government land reform.

We find that participation in the land rental market (i.e., renting land in or out) is associated with a 1.35 percentage point (42.2%) lower likelihood of migration in search of employment among youth (Table 2). This may suggest that youth are confident in the potential to obtain extra land to be able to produce enough agricultural output to make a living. This negative association is also present among young adults: those who live in households participating in land rental are 4.09 percentage points (19.6%) less likely to migrate for any reason. This effect is maintained at a lower level of statistical significance for young adults when considering destination type: land rental is weakly associated with a 3.11 percentage point (19.7%) decreased likelihood in migration to rural destinations (Table 3). This result may be capturing an equilibrating effect that land rental can have on helping individuals who would prefer to farm more to obtain the necessary land. Previous work with land rental and migration has not always found significant associations (Mullan, Grosjean and Kontoleon 2011), and has also found an opposite association (Yeboah et al. 2019). We also note that land rental still comprises a small portion of the total landholding in the survey, and these results may change at significantly higher rates of land rental activity.

We find that a one hectare increase in landholding per capita is weakly associated with a 0.57 percentage point (17.6%) lower likelihood of migration for employment among youth

(Table 2). This result may be capturing the influence of agricultural endowment on livelihood choice for this age group, as a household with more land to farm may be more motivated to keep such resources in the family and continue farming in the younger generation than they would be otherwise. This result may also be due in part to the need for younger household members to help farm larger areas of land. Among young adults, we find an additional hectare of land per capita is associated with a 0.38 percentage point (15.5%) higher likelihood of migration in search of employment. This result may stem from households with larger land endowments choosing to pursue alternative income sources by sending young adult household members to migrate, since the household may already devote the maximum desired amount of time or resources to farming, consistent with evidence from Yeboah et al. (2019). The household may therefore choose to increase total earnings through diversification rather than scaling up farming activities, However, it is worth noting that sample average landholding per capita is 0.58 hectares, so adding an additional hectare of land per household member would more than double the current landholdings. This suggests that the economic significance of this coefficient is somewhat low, because 84% of the YYA sample lives in a household with less than one hectare per capita in landholdings.

6.2.1.2 Land tenure security and formalization

The perception that it is possible to convert customary land to titled is weakly associated with a 1.98 percentage point (5.3%) increased likelihood of permanent migration of any kind by youth (Table 2). This result may indicate that the potential to secure land ownership through titling may release younger family members from working on the family land and striking out elsewhere to establish a new household or leave to pursue continued schooling. This result is consistent with

results from China that show incomplete land rights and restrictions on land rental reduce migration (Mullan, Grosjean and Kontoleon 2011). However, among young adults the opposite effect is found: household perception of the possibility to convert customary land to titled is weakly associated with a 2.04 percentage point (9.8%) lower likelihood of migration. This difference may be attributable in part to the different roles that young adults play in the household relative to youth. For example, a young adult is more commonly the household head or the first-born child who will usually have the first claim to the parents' land. The different effects by age group of this perception may also be attributed in part to the disparate access that individuals have to land outside of family dynamics: older males are more likely to have the resources and inclination to obtain titled land, which may reduce land availability among younger individuals, particularly women (Toulmin 2008; Bezu and Holden 2014; de Brauw and Mueller 2012). Green and Norburg (2018) also find that certification of customary rights can make land less accessible for women and younger individuals in Zambia.

The results suggest that, among youth, household ownership of titled land is associated with a 3.53 percentage point (21.6%) increase in the likelihood of permanent migration to an urban area (Table 3). Among young adults, we find that household ownership of titled land is associated with a 1.83 percentage point (76.3%) increase in likelihood of migration in search of employment (Table 2). Both results may be capturing the effect that greater land tenure security has on a household's comfort level with sending out migrants either to urban areas or in search of employment, both potential strategies of income diversification.

We also find that household receipt of a land inheritance is positively associated with a 1.14 percentage point (35.6%) increase in likelihood of outmigration for youth who leave in search of employment (Table 2). This result is interesting in that one may assume that land

inheritance encourages an individual to remain at the household to take over farming duties later in life, but if the individual is not first in line to receive the inheritance they may be released from farming obligations and thus be able to pursue other livelihoods outside the homestead to diversify household income. This result is in opposition to work from Ethiopia that shows larger expected inheritances are associated with lower likelihoods of migration for individuals, but it should be noted that the metric being assessed here is different than that of the study in Ethiopia – this variable captures inheritance received by the household head, while the study in Ethiopia captures the size of expected land to be inherited by the youth individual (Kosec et al. 2018).

6.2.2 Off-farm economy associations with migration

We find that participation in the off-farm economy at any earnings level and for either wage/salaried work or an own business activity is associated with a 6.17 to 12.1 percentage point (29.7 to 58.2%) lower likelihood of migration for any reason among young adults (Table 4). Additionally, employment in a low earning own business is associated with a 10.1 percentage point (27.1%) lower likelihood of migration among youth. The results are consistent with prior studies that suggest that a robust nonfarm economy in rural areas can provide a disincentive to outmigration (Sakho-Jimbira and Bignebat 2006; Haggblade, Hazell and Reardon 2010). However, it should be noted that the extremely low participation rates in the off-farm economy among youth require cautious interpretation of the results related to the off-farm economy for youth.

Table 4: Logit regression off-farm employment results for youth and young adults by migration type (average partial effects)

Age group:	Youth (15-24)		Young adults (25-35)	
Migration type:	Permanent	Permanent employment	Permanent	Permanent employment
Explanatory variables:				
Individual is employed in a __ = 1:				
Low earnings salaried/wage activity	0.0202	-0.00469	-0.0711***	-0.000854
	(0.0293)	(0.0112)	(0.0208)	(0.0101)
High earnings salaried/wage activity	0.0384	0.0123	-0.121***	-0.00889
	(0.0489)	(0.0155)	(0.0158)	(0.00798)
Individual has own business in a __ = 1:				
Low earnings activity	-0.101***	0.00823	-0.0817***	-0.00332
	(0.0316)	(0.0171)	(0.0148)	(0.0124)
High earnings activity	-0.0572	-0.0152	-0.0617***	-0.00196
	(0.0450)	(0.00947)	(0.0151)	(0.00662)
Off-farm economy variables	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Observations	21,374	21,091	11,039	9,819

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered at the SEA level. See Table A10 in the Appendix for full results.
Source: author, with data from IAPRI (2012), IAPRI (2015) and IAPRI (2019)

For migrants who leave in search of a job, participation in the off-farm economy is an insignificant predictor (Table 4). This is likely due in part to the small overall percentage of employment migrants and individuals who are participating in the off-farm economy, which can leave minimal overlap between the two groups and result in low power and a high minimum detectable effect.

We find that among young adults the decreased likelihood of migration persists for both rural and urban destinations, which is interesting in that it may suggest that the benefits associated with having off-farm employment (e.g., income diversification or potential for higher overall earnings) may make remaining in one's home community more attractive than either migration to other rural areas or to urban areas (Table 5). When we break up analysis of youth

outmigration by destination type, we also find that participation in an own business as well as participation in a low earning wage activity are weakly associated with a 3.12 to 5.26 percentage point (19.1 to 32.1%) decreased likelihood of migration to urban areas. These findings are in agreement with results from Sakho-Jimbira and Bignebat (2006), who find that migration may function as an alternative to local diversification, rather than as a complementary activity.

Table 5: Multinomial logit off-farm activity results by age group

Age group:	Youth (15-24)		Young adults (25-35)	
Destination type:	Rural	Urban	Rural	Urban
Explanatory variables:				
Individual is employed in a __ = 1:				
Low earnings salaried/wage activity	0.0446	-0.0312*	-0.0383**	-0.0336***
	(0.0280)	(0.0185)	(0.0189)	(0.0128)
High earnings salaried/wage activity	0.00656	0.0223	-0.0733***	-0.0370***
	(0.0461)	(0.0340)	(0.0185)	(0.0109)
Individual has own business in a __ = 1:				
Low earnings activity	-0.0672***	-0.0376*	-0.0515***	-0.0376***
	(0.0258)	(0.0226)	(0.0138)	(0.0101)
High earnings activity	0.0152	-0.0526**	-0.0534***	-0.0116
	(0.0458)	(0.0245)	(0.0145)	(0.0113)
Land variables	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Observations	21,374	21,374	11,039	11,039

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered at the SEA level. See Tables A11 and A12 in the Appendix for full results.
Source: author, with data from IAPRI (2012), IAPRI (2015) and IAPRI (2019).

6.2.3 Interpretation of other covariates

Beyond the results for our key explanatory variables, there are several other noteworthy results of interest. First, if the household head is considered local, youth are 3.00 percentage points (18.3%) less likely to migrate to urban areas (Table 6). This result may point to the benefit of

social capital in establishing a livelihood and reducing the desire to outmigrate to a new location, particularly an urban area where the individual and household may not have many (if any) social connections.

Table 6: Multinomial logit results for selected demographic covariates by age group and destination type of permanent migrants

Age group:	Youth (15-24)		Young adults (25-35)	
Destination type:	Rural	Urban	Rural	Urban
Explanatory variables:				
HH head is considered local = 1	-0.0103	-0.0300**	0.0228	-0.000326
	(0.0172)	(0.0127)	(0.0147)	(0.00928)
Individual has completed __ = 1:				
Primary School	-0.0517***	0.00518	-0.0175*	-0.0122**
	(0.00958)	(0.00720)	(0.00994)	(0.00619)
Secondary School	-0.112***	0.0415**	-0.0446***	0.00309
	(0.0188)	(0.0169)	(0.0163)	(0.00977)
Postsecondary School	-0.120***	0.0207	-0.0296	0.0443*
	(0.0426)	(0.0378)	(0.0371)	(0.0269)
Individual is male = 1	-0.122***	-0.00695	0.0249***	0.0185***
	(0.00854)	(0.00653)	(0.00951)	(0.00564)
Age of individual (years)	0.0166***	0.00995***	-0.00590***	-0.00380***
	(0.00167)	(0.00119)	(0.00130)	(0.00103)
Off-farm participation variables	Yes	Yes	Yes	Yes
Land variables	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Observations	21,374	21,374	11,039	11,039

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered at the SEA level. See Tables A11 and A12 for full results.
Source: author, with data from IAPRI (2012), IAPRI (2015), IAPRI (2019)

As predicted by other literature including Ritsila and Ovaskainen (2001) and de Brauw (2019), completion of secondary school (among youth) or postsecondary school (among young adults) has a positive association – up to 4.43 percentage points (58.2%) – with the probability of migration to urban areas. This lends credence to the expectation that education is one of the key factors for success for those who migrate to urban areas, based on the opportunities available.

We find that for both age groups completion of primary or secondary education is associated with a lower likelihood of migration to rural areas, ranging from 1.75 to 4.46 percentage points (23.0 to 58.6%) for young adults, and 5.17 to 11.2 percentage points (17.8 to 38.5%) for youth. We suggest that this result is due in part to the nature of opportunities available in rural areas – lack of education is not typically a barrier to entry for smallholder farming.

We note that among youth, age is positively associated with migration likelihood, while the opposite is true of young adults. This result is consistent with the age distribution of migrants shown previously, with a peak between ages 20 and 24 (Figure 4), as well as with previous findings from de Brauw (2019). A likely explanation for these associations is that older youth are more likely to have completed school or accumulated capital and are thus more prepared to migrate, while older young adults are more likely to have children, land, or other responsibilities that make migration more challenging.

Finally, we find that among youth, women are more likely to migrate for any reason to rural areas (likely including marriage), while young adult men are more likely to migrate to rural or urban destinations, or for employment (see Table A10 in the Appendix for the latter). This may indicate that the opportunities available in terms of types of employment are greater for men than for women in both rural and urban areas, and is consistent with evidence from Mabiso and Benfica (2019), who note the opportunity gap that persists for women working outside the home, and outside their home communities.

6.3 Assessment of endogeneity and potential direction of bias

We consider the potential impact of two unaccounted for individual characteristics – entrepreneurial ability and resourcefulness – and how they may bias the associations found in the results for our key explanatory variables. We first consider the likely direction of correlations between the omitted variables and migration, then the relationship between the variables with potentially biased APEs and the omitted variables, and finally the resultant direction of bias (upward or downward) that the omitted variables likely cause in the APEs of the explanatory variables.[15]

Resourcefulness on the part of the YYA individual is likely to be positively correlated with permanent migration for any reason because the migration process involves obtaining the resources needed to move, traveling to a (likely new) destination, establishing oneself and making social connections in the receiving community, and likely maintaining correspondence with family in the sending community (Table 7). The level of resourcefulness of the household overall may also be a factor. For example, deciding on a migration strategy that would benefit the household, communicating with the outmigrant, and assisting the outmigrant to begin the migration process all require resourcefulness by the members of the household who remain at home. Entrepreneurial ability is likely to be positively correlated with migration specifically in search of employment, particularly if an individual is hoping to start a business in their receiving community. Resourcefulness is also likely to be positively correlated with permanent employment migration.

[15] The analysis presented here is based on the simplified case of a simple linear regression system, and because the relationships described are placed in a multivariate and nonlinear system we expect the true nature of the relationships to be somewhat more complicated. Nevertheless, the single variable framing is useful to draw some preliminary inference around the impact that omitted variables may have on the key results

Table 7: Likely correlations between omitted variables and migration type

Omitted variable:	Permanent migration (rural or urban)	Permanent employment migration
Resourcefulness	+	+
Entrepreneurial ability		+

Source: author

Considering now the potential for correlations between the omitted variables (resourcefulness and entrepreneurial ability) and our key explanatory variables of interest, resourcefulness (at the household level) is most likely to be correlated with land rental and with the perceived possibility to purchase or sell customary land, or be allocated additional customary land by local leaders. These correlations are expected to be positive (Table 8). YYA participation in own business activities is likely to be positively correlated with both entrepreneurial ability and resourcefulness.

Table 8: Likely correlations between potentially biased key variables and omitted variables

Explanatory variables:	Omitted variable	
	Entrepreneurial ability	Resourcefulness
It is possible to be allocated additional customary land		+
It is possible to buy/sell customary land		+
HH participates in land rental		+
Individual has own business	+	+

Source: author

Together, the results in Tables 7 and 8 suggest that due to omitted variables bias, the estimated associations between the land-related explanatory variables listed in Table 8 and both permanent migration and permanent employment migration may be biased upward. Similarly,

for YYA participation in own business activities, the estimated associations with permanent employment migration may be biased upward. Note that these are instances in which there is likely to be correlation: (i) between one or both of the omitted variables and the specific type of migration (Table 7), *and* (ii) between one or both of the omitted variables and the key explanatory variable of interest (Table 8). Table 9 shows the signs of the estimated associations between these key explanatory variables and the different types of migration (from Tables 2 through 4) for instances where there may be omitted variables bias. In parentheses, we indicate the effect that upward bias would have on each statistically significant APE. For associations that are estimated to be positive and statistically significant, upward bias would mean that these estimates are larger than they should be. For associations that are estimated to be negative and statistically significant, upward bias would mean that these associations are less negative than they should be (i.e., they are biased toward zero).

Table 9: Estimated signs of potentially biased APEs with expected bias in parentheses

Explanatory variables:	Permanent migration		
	All destinations	Rural destinations	Urban destinations
It is possible to be allocated additional customary land	0	+ (biased upward)	0
It is possible to buy/sell customary land	0	0	– (biased toward zero)
HH participates in land rental	– (biased toward zero)	– (biased toward zero)	0
	Permanent employment migration		
It is possible to be allocated additional customary land	+ (biased upward)	N/A	N/A
It is possible to buy/sell customary land	0	N/A	N/A
HH participates in land rental	– (biased toward zero)	N/A	N/A
Individual has own business	0	N/A	N/A

Source: author, with data from IAPRI (2012), IAPRI (2015), and IAPRI (2019). See Tables 2-4 for magnitudes of APEs.

We note to the reader that although there is no statistically significant result from having an own business on permanent employment migration, the low power in the permanent employment migration regressions (discussed previously) and the likely upward bias from the omitted variables may be masking a true negative effect, by increasing the magnitude of a minimum detectable effect and by biasing what is likely a negative APE towards zero, respectively.

6.4 Robustness checks

To test the validity of the age categories that we use (15-24 and 25-35), we run additional regressions with adjusted age definitions for both permanent migrants overall and for employment migrants specifically. Alternative age ranges are chosen based on the distribution of

migrants shown in Figure 4: age 22 (the cut-off for youth in the first alternate specification) approximately splits the peak of permanent migrants between youth and young adults, and age 30 (the cut-off for youth in the second alternate specification) captures the peak of employment migrants in the youth category. Table 10 shows the age breakdowns for the additional regressions that were run. The results are reported in Tables A14 and A15 in the Appendix.

Table 10: Age category definitions used for sensitivity analysis

Type of migration	Youth definition	Young adult definition
All permanent migration	15-22	23-32
Employment migration	15-22	23-32
All permanent migration	15-30	31-41
Employment migration	15-30	31-41

Source: author

For the off-farm economy participation variables, the results are generally robust to these alternate age categories. While there is some loss or gain of statistical significance when the alternate age categories are used, statistically significant results always agree in sign with the statistically significant results of the 15-24 and 25-35 age categories. There are two notable new results in the adjusted age categories that are worth noting. For individuals in the 15-22 age bracket, participation in a high earning salaried or wage activity is positively associated with migration for any reason or specifically for employment (see Table A14 in the Appendix). However, this result is driven by a very small number of observations given the low percentage of 15-22 year olds that participate in such activities, and thus should be interpreted with caution. A possible explanation is that individuals in this age group likely have fewer family obligations and fewer barriers to migration, and so it may be easier for them to leverage a remunerative job for an even better one elsewhere, thanks to the cash flow and skills associated with high earnings

wage/salaried employment.

A comparison of land access and land market activity results between the different definitions of age categories is quite informative. The sign and statistical significance of results among the slightly smaller youth category (15-22) are consistent with the main regression results. Although the results using other age categories are not as precisely matched with the main results as are those of the 15-22 age group, the alternate age categorizations do not lead to disagreements in sign for statistically significant results. However, when defining youth as individuals age 15-30 we find that some results which were previously significant for young adults are now significant for youth, suggesting that it is the younger half of the young adult cohort that is primarily driving the results (see Table A15 in the Appendix). This is not entirely surprising, as we expect the opportunity sets and motivations for migration to be different between ages 30 and 35 in a similar way that such factors differ between ages 24 and 29.

7. Conclusions and policy implications

While there is a large literature on how migration affects households, as well as on the determinants of migration in developing country contexts, relatively little is known about how land- and off-farm employment-related factors are associated with rural-to-urban and rural-to-rural outmigration of YYA. In this paper, we use descriptive and econometric analysis of data from nationally representative panel surveys from smallholder farm households in Zambia to contribute to this literature. Our key findings are as follows.

First, we find that for young adults (ages 25-35), and to a lesser extent for youth (ages 15-24), participation in the off-farm economy is consistently associated with a reduced likelihood of outmigration to both rural and urban areas. This finding may be less robust for youth because of the low power associated with low youth participation in the off-farm economy; however, such low participation is consistent with Deotti and Estruch (2016) and Yeboah et al. (2019), both of whom note that YYA, and youth in particular, face barriers to employment in the off-farm economy. In general, for YYA that do manage to have employment in the rural off-farm economy, outmigration may be less attractive than staying in their current community given that migration would likely require giving up that off-farm job. There is evidence that formal employment in particular (wage or salaried employment) is more likely than informal employment to provide decent work to youth, but this kind of work is currently concentrated in urban areas (Sumberg et al. 2019). To address the growing youth employment challenge, it may be productive for policymakers to support and implement policies that expand the geographic scope of formal employment to rural areas, which can reduce urban density pressures by providing decent work for youth around the country (Sumberg et al. 2019).

Our results suggest that further facilitation of YYA participation in the off-farm may help link YYA more strongly to their home communities, which can be beneficial for long term demographics and rural vitality. While the goal of this paper is not to establish prescriptive recommendations for the Zambian government, the current Zambian Country Strategy goal of strengthening the RNFE through infrastructure development (of both a physical and information and communication technology (ICT) nature) may have the potential to help rural YYA remain in their home communities by lowering barriers to entry into the RNFE (ADB 2017). With lowered barriers to entry, YYA may be more able to engage with the rural off-farm economy, which may then reduce outmigration from their home communities.

Second, in line with previous studies (e.g., Cheng and Long 2007; Nchito 2010), our results suggest that several land-related factors are statistically significantly associated with outmigration, and that the significance and direction of these associations varies by age category, destination type and migration type. We find that variables that measure the activity of land markets are negatively associated with likelihood of outmigration, suggesting that areas with more active land markets may be able to better retain YYA. We also find that measures of land tenure security, such as household ownership of titled land, are associated with an increased likelihood of outmigration, particularly to urban areas among youth. Ownership of titled land may facilitate outmigration because households do not need to worry about titled land being reallocated away from the household even if a family member migrates. The perceived possibility of obtaining additional customary land from local leaders, which is weakly positively correlated with outmigration, is likely capturing a similar effect. If a household perceives there to be additional customary land available in the village, they may feel more confident in the security of their land even without title because local leaders can bring unallocated land into

cultivation to meet future increased demand rather than reallocating land already under customary ownership by households.

The tension between land access or transferability and tenure security or formalization is at the forefront of land policy debates, because of its implications for productivity, investment, and overall efficiency, with evidence for the benefits of such factors on rural economies and national production (Feder and Onchan 1987; Deininger and Jin 2005; Ho and Spoor 2006; Holden and Otsuka 2014). Our results provide further evidence that land dynamics are complicated, and suggest that blanket policies around land reform should be considered with great caution and accompanied by analysis of the differential impacts they may have for populations with less access to land and resources. Additionally, as urban populations grow and increase demand for potable water, food, electricity, cooking fuel, infrastructure, and government services, *inter alia*, land in periurban or even nearby rural areas may become more valuable, and therefore less accessible to those with fewer resources (Barry and Danso 2014; Zoomers et al. 2017). These demands on resources may further exacerbate the challenges YYA face when starting their own livelihoods.

Rather than establish a blanket policy to encourage or discourage all migration, local and national officials may benefit from simultaneously encouraging migration that contributes to net gains in productivity while working to reduce migration that is caused by a real or perceived lack of opportunity, especially among the young population. Careful policy construction is needed to accommodate the barriers that YYA face when trying to obtain land or off-farm employment to ensure that land distribution and participation in the off-farm economy is equitable and is beneficial to the country overall.

In terms of future research avenues, our results indicate that developing a better understanding of the factors associated with rural outmigration would benefit from migration modules in agricultural household panel surveys that collect information on the distance that individuals migrate (including the name of the district or other administrative zone to which they migrate) to obtain a clearer picture of rural outmigration dynamics. In addition, given the challenges associated with low statistical power, a more nuanced understanding of the relationship between specific types of employment in the off-farm economy and rural outmigration will be difficult to achieve without more YYA participation in the off-farm economy. This field of research may therefore benefit from a better understanding of the supply and/or demand side barriers to entry that YYA experience in participating in the off-farm economy, because without an understanding of these barriers it may be difficult to achieve higher participation rates, and the resultant benefits of such participation, particularly among YYA.

APPENDIX

Table A1: Summary statistics for the explanatory variables included in the regressions

Age group:	YYA (15-35)		Youth (15-24)		Young Adults (25-35)	
Explanatory Variables:	Mean	SD	Mean	SD	Mean	SD
Household level key variables						
It is possible to be allocated additional customary land = 1	0.371	0.483	0.368	0.482	0.376	0.484
It is possible to buy/sell customary land = 1	0.216	0.411	0.214	0.410	0.220	0.414
HH participates in land rental = 1	0.047	0.212	0.048	0.213	0.046	0.209
Landholding (ha) per capita	0.578	1.129	0.583	1.130	0.569	1.128
It is possible to convert customary land to titled=1	0.299	0.458	0.300	0.458	0.298	0.457
HH owns titled land = 1	0.075	0.264	0.077	0.266	0.073	0.259
HH has received land inheritance = 1	0.226	0.418	0.235	0.424	0.209	0.407
Individual level key variables						
Individual is employed in __ = 1:						
Another's farm	0.040	0.197	0.027	0.162	0.063	0.244
Government	0.008	0.091	0.001	0.031	0.021	0.144
Ag input/output company	0.002	0.041	0.000	0.021	0.004	0.063
Tourism	0.001	0.033	0.000	0.019	0.002	0.048
Private non-agricultural company	0.021	0.142	0.008	0.089	0.043	0.202
Individual is employed in __ activity = 1:						
No wage/salaried	0.931	0.253	0.964	0.186	0.874	0.332
Low earnings wage/salaried	0.041	0.198	0.027	0.162	0.066	0.248
High earnings wage/salaried	0.028	0.164	0.009	0.094	0.061	0.239
Individual has own business in __ = 1:						
Agriculture	0.014	0.119	0.004	0.061	0.033	0.179
Natural resources	0.034	0.181	0.012	0.111	0.072	0.258
Construction	0.007	0.082	0.001	0.037	0.016	0.125
Private non- agricultural	0.040	0.196	0.013	0.111	0.088	0.283
Food	0.021	0.142	0.007	0.084	0.044	0.206
Individual has own business in a __ = 1:						
No activity	0.895	0.306	0.965	0.184	0.774	0.418
Low earnings activity	0.058	0.233	0.024	0.154	0.116	0.320
High earnings activity	0.047	0.212	0.011	0.102	0.111	0.314
Household wealth controls						
HH productive asset value, 1000 ZMW (2017 = 100)	3.821	22.792	3.940	23.285	3.613	21.902
HH non-ag asset value excluding homestead, 1000 ZMW (2017 = 100)	1.062	2.686	1.094	2.694	1.006	2.673
Tropical Livestock Units	3.466	11.124	3.831	11.978	2.828	9.413
HH's wall material is improved = 1	0.405	0.491	0.413	0.492	0.389	0.488
HH's floor material is improved = 1	0.386	0.487	0.253	0.435	0.226	0.418
HH's roof material is improved = 1	0.244	0.429	0.399	0.490	0.362	0.481

Table A1 (cont'd)

Age Group:	YYA (15-35)		Youth (15-24)		Young Adults (25-35)	
Explanatory variables:	Mean	SD	Mean	SD	Mean	SD
Household head demographic controls						
HH size (number of members)	7.457	3.162	7.811	3.233	6.838	2.934
HH head has completed __ = 1:						
No primary school	0.479	0.500	0.486	0.500	0.466	0.499
Primary school	0.424	0.494	0.420	0.494	0.432	0.495
Secondary school	0.050	0.217	0.046	0.209	0.056	0.230
Postsecondary school	0.047	0.213	0.048	0.214	0.046	0.210
Age of HH head (years)	46.4	14.328	49.3	13.711	41.5	14.054
HH head is male = 1	0.789	0.408	0.766	0.424	0.829	0.377
Household social connection controls						
HH head is related to village head = 1	0.502	0.500	0.503	0.500	0.500	0.500
HH head is related to chief = 1	0.130	0.337	0.136	0.343	0.119	0.324
HH received remittances = 1	0.172	0.378	0.179	0.383	0.160	0.367
Years since HH head settled in the village	31.564	18.630	33.346	19.165	28.449	17.219
HH head is considered local = 1	0.894	0.308	0.895	0.307	0.893	0.309
Individual demographic controls						
Age of individual (years)	22.844	5.945	18.936	2.818	29.674	3.150
Individual is married = 1	0.328	0.469	0.142	0.349	0.652	0.476
Individual is male = 1	0.490	0.500	0.502	0.500	0.469	0.499
Individual has completed __ = 1:						
No primary school	0.489	0.500	0.468	0.499	0.526	0.499
Primary school	0.442	0.497	0.480	0.500	0.377	0.485
Secondary school	0.054	0.226	0.044	0.204	0.071	0.258
Postsecondary school	0.015	0.121	0.009	0.093	0.026	0.159
Distance, location, and time controls						
Survey year is 2015 = 1	0.617	0.486	0.634	0.482	0.587	0.492
Distance from HH to nearest __ : (km)						
Road	2.019	7.435	2.048	7.732	1.968	6.886
District Town	40.761	33.638	40.790	33.692	40.709	33.545
Market	25.429	30.818	25.477	30.576	25.345	31.238
Tarred road	29.277	35.720	29.244	35.596	29.335	35.938
Agrodealer	31.009	31.752	31.414	32.447	30.301	30.487
Latitude (decimal degrees)	-13.297	2.406	-13.283	2.404	-13.320	2.409
Longitude (decimal degrees)	28.836	2.895	28.841	2.880	28.828	2.921
Weather controls						
Total precipitation difference from 19-year average (mm):						
1-year lag	-87.904	90.634	-89.522	91.130	-85.077	89.696
2-year lag	22.408	97.375	25.714	97.609	16.629	96.698
3-year lag	0.487	81.263	-0.121	81.078	1.549	81.577

Table A1 (cont'd)

Age group:	YYA (15-35)		Youth (15-24)		Young Adults (25-35)	
Explanatory variables:	Mean	SD	Mean	SD	Mean	SD
Mean temperature difference from 14-year average (degrees C):						
1-year lag	1.102	3.278	1.143	3.309	1.030	3.221
2-year lag	1.238	3.264	1.255	3.302	1.210	3.198
3-year lag	1.216	3.289	1.228	3.326	1.195	3.222
Observations	32,413		21,374		11,039	

Source: author, with data from IAPRI 2012, IAPRI 2015, Maidment (2016) and McNally (2014)

Table A2: T-test comparisons of explanatory variables between attriting and re-interviewed HHs

Explanatory variables	Mean re-interviewed	Mean attritors	SD re-interviewed	SD attritors	T-stat. (re-interviewed - attritors)
It is possible to be allocated additional customary land = 1	0.382	0.400	0.486	0.490	-1.607
It is possible to buy/sell customary land = 1	0.216	0.246	0.411	0.431	-3.265***
HH participates in land rental = 1	0.043	0.048	0.204	0.213	-0.903
Landholding (ha) per capita	0.812	0.772	2.338	2.746	0.744
It is possible to convert customary land to titled=1	0.300	0.308	0.458	0.462	-0.708
HH owns titled land = 1	0.086	0.110	0.280	0.313	-3.714***
HH has received land inheritance = 1	0.209	0.166	0.407	0.372	4.809***
Years since HH head settled in current location	31.345	23.884	19.108	19.583	17.207***
HH head is considered local = 1	0.893	0.834	0.309	0.372	8.279***
Tropical Livestock Units	3.799	2.269	10.841	9.060	6.377***
HH productive asset value, 1000 ZMW (2017 = 100)	4.300	4.196	26.436	31.864	0.169
HH non-ag asset value, 1000 ZMW (2017 = 100)	1.078	1.102	3.229	4.356	-0.311
HH's wall material is improved = 1	0.399	0.353	0.490	0.478	4.176***
HH's floor material is improved = 1	0.638	0.775	0.481	0.418	-12.852***
HH's roof material is improved = 1	0.396	0.321	0.489	0.467	6.814***
HH size	6.174	5.174	2.724	2.526	16.420***
Years of education of HH head	6.116	6.724	3.913	4.381	-6.763***
Age of HH head	47.477	43.867	14.733	16.083	10.707***
HH head is male = 1	0.803	0.772	0.398	0.420	3.404***
HH head is related to village head = 1	0.507	0.413	0.500	0.493	8.307***
HH head is related to chief = 1	0.130	0.112	0.336	0.316	2.361**
HH received remittances = 1	0.176	0.195	0.381	0.396	-2.165**
Distance from HH to nearest __ : (km)					
Road	2.186	1.881	7.948	6.772	1.732*
District Town	39.924	41.785	33.248	35.072	-2.458**
Market	25.233	24.509	30.659	29.464	1.050
Tarred road	29.305	32.211	36.738	39.470	-3.466***
Agrodealer	31.314	32.082	31.739	32.125	-1.069

Table A2 (cont'd)

Explanatory variables	Mean re-interviewed	Mean attritors	SD re-interviewed	SD attritors	T-stat. (re-interviewed - attritors)
Latitude (decimal degrees)	-0.005	-5.080	13.431	12.277	16.913***
Longitude (decimal degrees)	29.212	28.947	2.918	2.814	4.039***
Total precipitation __ from 19-year average (mm):					
1-year lag difference	-73.650	-53.671	89.528	90.589	-9.862***
2-year lag difference	1.137	-14.491	95.444	91.315	7.289***
3-year lag difference	3.034	26.867	83.634	84.161	-12.602***
Mean temperature __ from 14-year average (degrees C):					
1-year lag difference	1.080	0.693	3.532	3.334	4.879***
2-year lag difference	1.403	1.261	3.508	3.319	1.810**
3-year lag difference	1.401	1.272	3.538	3.357	1.620

Notes: *** p<0.01, ** p<0.05, * p<0.1
Source: author, with data from IAPRI (2012), IAPRI (2015) IAPRI (2019), Maidment et al. (2014), McNalley et al. (2016)

Table A3: Multinomial logit regression results for households by attrition status (average partial effects)

Reason for attrition:	HH left the SEA	Other reason
Explanatory variables:		
It is possible to be allocated additional customary land = 1	-0.00531	0.00621
	(0.00547)	(0.00462)
It is possible to buy/sell customary land = 1	-0.00279	0.0108
	(0.00658)	(0.00690)
HH participates in land rental = 1	0.00712	0.00978
	(0.0116)	(0.0156)
Landholding per capita (ha)	-0.00447	0.000117
	(0.00311)	(0.00268)
It is possible to convert customary land to titled = 1	0.00739	-0.00737
	(0.00581)	(0.00638)
HH owns titled land = 1	0.0124	0.00781
	(0.0101)	(0.0150)
HH has received inheritance of land = 1	-0.00556	-0.00676
	(0.00696)	(0.00624)
Individual is employed in a __ = 1:		
Low earnings salaried/wage activity	-0.00516	0.00285
	(0.00618)	(0.00686)
High earnings salaried/wage activity	0.00234	0.0154*
	(0.00596)	(0.00891)
Individual has own business in a __ = 1:		
Low earnings activity	0.00923	-0.00459
	(0.00724)	(0.00551)
High earnings activity	0.00261	0.00618
	(0.00405)	(0.00412)
Years since hh head settled in the area	-0.00115***	-0.000143
	(0.000194)	(0.000146)
HH head is considered local = 1	-0.0140*	-0.0105
	(0.00764)	(0.0105)
Tropical Livestock Units	-0.000729	-0.000460
	(0.000939)	(0.000508)
HH productive asset value, 1000 ZMW (2017 = 100)	0.000396	0.000230
	(0.000418)	(0.000208)
HH non-ag asset value, 1000 ZMW (2017 = 100):	-0.000132	-0.00178
	(0.00249)	(0.00177)
Wall material is improved = 1	-0.00244	0.00649
	(0.00672)	(0.00689)
Floor material is improved = 1	0.0190*	-0.0138
	(0.0106)	(0.0145)

Table A3 (cont'd)

Reason for attrition:	HH left the SEA	Other reason
Roof material is improved = 1	-0.00518	0.00266
	(0.00723)	(0.00701)
HH size (number of members)	-0.00499***	-0.00553***
	(0.00110)	(0.00102)
HH head has completed __ = 1:		
Primary school	-0.0354***	0.00382
	(0.00985)	(0.00445)
Secondary School	-0.0573***	0.000721
	(0.0205)	(0.00927)
Postsecondary School	-0.00995	0.00250
	(0.0270)	(0.0101)
Age of HH head	-0.000986***	-9.40e-05
	(0.000235)	(0.000220)
HH head is male = 1	-0.00831	-0.0111
	(0.00777)	(0.00784)
HH is related to village head = 1	-0.00875	-0.00524
	(0.00555)	(0.00564)
HH is related to chief = 1	-0.00867	0.00774
	(0.00896)	(0.00809)
HH has received remittances in past year = 1	0.0143*	0.000981
	(0.00749)	(0.00616)
Age of individual (years)	-5.15e-05	6.84e-05
	(9.85e-05)	(0.000102)
Individual is married = 1	0.00555	-0.00233
	(0.00389)	(0.00478)
Individual is male = 1	-0.000621	0.00160
	(0.00195)	(0.00181)
Individual has completed __ = 1:		
Primary School	-0.00142	-0.00293
	(0.00351)	(0.00282)
Secondary School	0.0104	-0.00293
	(0.00781)	(0.00760)
Postsecondary School	0.00235	-0.000281
	(0.00435)	(0.00343)
Survey year is 2015 = 1	-0.107**	-0.108
	(0.0538)	(0.0804)
Distance to nearest __ (km):		
Feeder road	-0.000424	6.79e-05
	(0.000343)	(0.000308)
Boma (District town)	2.33e-05	-8.70e-06
	(0.000111)	(0.000128)

Table A3 (cont'd)

Reason for attrition:	HH left the SEA	Other reason
Marketplace	0.000100	-5.74e-05
	(9.81e-05)	(9.25e-05)
Tarmac (Paved road)	0.000321**	0.000170**
	(0.000127)	(7.91e-05)
Agrodealer	-9.64e-05	9.89e-06
	(0.000111)	(0.000110)
Latitude of homestead	0.00225*	0.00229*
	(0.00121)	(0.00128)
Longitude of homestead	0.00634	0.00909
	(0.00746)	(0.00671)
Difference from 19-year average (mm):		
1-year lag total precipitation	-0.000163***	0.000132**
	(5.74e-05)	(5.72e-05)
2-year lag total precipitation	-5.84e-07	-7.56e-05
	(5.65e-05)	(6.00e-05)
3-year lag total precipitation	0.000227***	-2.73e-05
	(6.75e-05)	(6.76e-05)
Difference from 14-year average (degrees C):		
1-year lag mean temperature	0.00594	0.00750
	(0.00502)	(0.00506)
2-year lag mean temperature	0.00980	-0.0248
	(0.0192)	(0.0203)
3-year lag mean temperature	-0.0188	0.0220
	(0.0185)	(0.0196)
District fixed effects	Yes	Yes
Observations	81,867	81,867

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered at the SEA level.
Source: author, with data from IAPRI (2012), IAPRI (2015) IAPRI (2019), Maidment et al. (2014), McNalley et al. (2016)

Table A4: Prevalence of YYA migration by survey wave and migration definition

Age group/migration type:	Full sample	2015	2019	2015-2019 change (percentage points)
YYA				
Permanent migrants	31.2%	21.2%	37.6%	+14.4
Permanent employment migrants	2.9%	2.9%	5.5%	+1.4
Youth				
Permanent migrants	37.3%	26.8%	43.3%	+16.5
Permanent employment migrants	3.2%	2.5%	3.6%	+1.1
Young Adult				
Permanent migrants	20.8%	12.4%	26.8%	+14.4
Permanent employment migrants	2.4%	1.6%	3.0%	+1.4

Source: author, with data from IAPRI 2012, IAPRI 2015, IAPRI 2019

Table A5: Prevalence of YYA permanent migration (relative to base category of nonmigrants) by survey wave and destination type

Age group/migration type:	Full sample	2015	2019	2015 to 2019 change (percentage points)
YYA				
Rural migrants	24.2%	16.7%	30.3%	+13.6
Urban migrants	14.1%	9.3%	18.3%	+9.0
Youth				
Rural migrants	29.1%	20.8%	34.2%	+13.4
Urban migrants	16.4%	11.9%	20.8%	+8.9
Young Adult				
Rural migrants	15.8%	9.9%	22.3%	+12.4
Urban migrants	7.6%	5.3%	13.7%	+8.4

Source: author, with data from IAPRI 2012, IAPRI 2015, IAPRI 2019

Table A6: Percentage of YYA whose survey respondents answer "yes" to the following questions, and difference in prevalence of "yes" response between permanent migrants and nonmigrants

Respondent answers "yes" to the following:	Both years	2012	2015	Permanent migrants (both years)	Nonmigrants (both years)
It is possible to be allocated additional customary land = 1	37.1%	40.1%	34.9%	35.1%	38.0%
It is possible to buy/sell customary land = 1	21.6%	24.1%	20.0%	20.1%	22.2%
HH participates in land rental = 1	4.7%	4.2%	5.0%	4.4%	4.8%
It is possible to convert customary land to titled=1	29.9%	32.3%	28.4%	29.4%	30.2%
HH owns titled land = 1	7.5%	9.9%	6.0%	8.2%	7.2%
HH has received land inheritance = 1	22.6%	15.6%	26.9%	24.6%	21.7%

Source: author, with data from IAPRI 2012, IAPRI 2015, IAPRI 2019

Table A7: Percentage of youth and young adults engaged in off-farm activity, and difference in prevalence of activity between permanent migrants and nonmigrants

	Youth					Young adults				
	Both years	2012	2015	Migrants (both years)	Nonmigrants (both years)	Both years	2012	2015	Migrants (both years)	Nonmigrants (both years)
Individual works at/in __ =1:										
Another farm	2.71%	2.56%	2.79%	2.62%	2.75%	6.33%	4.77%	7.43%	2.35%	7.38%
Government	0.10%	0.05%	0.12%	0.16%	0.06%	2.13%	2.55%	1.84%	0.37%	2.60%
Ag value-added company	0.05%	0.04%	0.05%	0.11%	0.01%	0.39%	0.39%	0.39%	0.11%	0.47%
Tourism industry	0.04%	0.01%	0.05%	0.05%	0.03%	0.23%	0.18%	0.26%	0.18%	0.24%
Private non-ag company	0.80%	0.69%	0.86%	0.98%	0.69%	4.26%	3.96%	4.47%	1.82%	4.90%
Low earnings job	2.71%	2.86%	2.62%	2.70%	2.71%	6.56%	6.05%	6.92%	2.74%	7.56%
High earnings job	0.88%	0.44%	1.14%	1.09%	0.76%	6.09%	5.44%	6.55%	1.99%	7.17%
Individual has own business in __ = 1:										
Ag inputs/ outputs	0.37%	0.35%	0.39%	0.29%	0.42%	3.31%	2.67%	3.76%	0.95%	3.93%
Natural resources	1.25%	1.74%	0.96%	0.83%	1.50%	7.18%	8.26%	6.42%	2.94%	8.29%
Construction	0.14%	0.18%	0.11%	0.14%	0.14%	1.60%	2.13%	1.22%	0.44%	1.90%
Private non-ag activity	1.26%	1.85%	0.91%	0.91%	1.46%	8.81%	9.32%	8.44%	2.99%	10.34%
Food	0.71%	1.09%	0.33%	0.94%	0.94%	4.44%	4.01%	1.71%	1.71%	5.15%
Low earnings activity	2.44%	3.34%	1.91%	1.68%	2.89%	11.56%	11.72%	11.4%	3.70%	13.63%
High earnings activity	1.06%	1.50%	0.81%	0.75%	1.24%	11.06%	12.82%	9.8%	4.16%	12.87%

Source: author, with data from IAPRI 2012, IAPRI 2015, IAPRI 2019

Table A8: OLS regression of months away from the household on participation in wage/salaried activities and distance from household to the nearest district town

Ages included:	YYA	All HH members age 12 and up
Explanatory variables	Months away from HH	Months away from HH
Individual is employed in/on __ = 1:		
Another's farm	-0.284***	-1.498***
	(0.0579)	(0.101)
Government	-0.190*	-1.494***
	(0.114)	(0.156)
Agriculture value added company	-0.180	-1.520***
	(0.258)	(0.383)
Tourism	0.165	-1.291***
	(0.287)	(0.387)
Private non-ag company	0.147**	-1.281***
	(0.0735)	(0.119)
Km from HH to the nearest district town	-0.00171***	-0.00432***
	(0.000301)	(0.000548)
Constant	0.669***	1.941***
	(0.0157)	(0.0285)
Observations	38,719	67,055
R-squared	0.002	0.007

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered at the SEA level.
Source: author, with data from IAPRI (2012), IAPRI (2015), IAPRI (2019)

Table A9: Full logit regression results for pooled YYA by migration type (average partial effects)

Explanatory Variables	Permanent migrants	Permanent employment migrants
It is possible to be allocated additional customary land = 1	0.0165*	0.00650*
	(0.00846)	(0.00341)
It is possible to buy/sell customary land = 1	-0.0116	-0.00650*
	(0.00910)	(0.00359)
HH participates in land rental = 1	-0.0229	-0.00976*
	(0.0161)	(0.00591)
Landholding per capita (ha)	0.000676	-0.000430
	(0.00481)	(0.00131)
It is possible to convert customary land to titled = 1	0.00482	0.00133
	(0.00883)	(0.00354)
HH owns titled land = 1	0.0147	0.00715
	(0.0165)	(0.00570)
HH has received inheritance of land = 1	-0.00113	0.00903**
	(0.00887)	(0.00371)
Individual is employed in a __ = 1:		
Low earnings salaried/wage activity	-0.0337*	-0.00257
	(0.0195)	(0.00829)
High earnings salaried/wage activity	-0.101***	-0.00806
	(0.0204)	(0.00651)
Individual has own business in a __ = 1:		
Low earnings activity	-0.127***	0.000740
	(0.0159)	(0.0102)
High earnings activity	-0.115***	-0.00940
	(0.0181)	(0.00593)
Years since hh head settled in the area	0.000133	-8.02e-05
	(0.000249)	(8.17e-05)
HH head is considered local = 1	-0.0249*	0.00337
	(0.0141)	(0.00409)
Tropical Livestock Units	-0.000863	-0.000196
	(0.000646)	(0.000273)
HH productive asset value, 1000 ZMW (2017 = 100)	0.000153	-9.83e-05
	(0.000226)	(7.00e-05)
HH other asset value, 1000 ZMW (2017 = 100):	0.00330	0.00227**
	(0.00227)	(0.00100)
Wall material is improved = 1	0.00412	-0.000486
	(0.00850)	(0.00388)
Floor material is improved = 1	-0.0180	-0.00725*
	(0.0120)	(0.00425)

Table A9 (cont'd)

Explanatory Variables	Permanent migrants	Permanent employment migrants
Roof material is improved = 1	0.00446	-0.000830
	(0.0106)	(0.00437)
HH size (number of members)	0.0117***	0.00209***
	(0.00167)	(0.000441)
HH head has completed __ = 1:		
Primary school	-0.0165*	0.00762***
	(0.00886)	(0.00321)
Secondary School	-0.0177	0.00497
	(0.0179)	(0.00683)
Postsecondary School	0.0254	0.00592
	(0.0275)	(0.00717)
Age of HH head	0.00468***	0.000547***
	(0.000391)	(0.000121)
HH head is male = 1	-0.0386***	0.00212
	(0.0117)	(0.00377)
HH is related to village head = 1	-0.00516	-0.00261
	(0.00818)	(0.00324)
HH is related to chief = 1	0.0128	0.00111
	(0.0126)	(0.00444)
HH has received remittances in past year = 1	-0.00575	0.00604*
	(0.0100)	(0.00352)
Age of individual (years)	0.000947	0.00127***
	(0.000829)	(0.000275)
Individual is married = 1	-0.154***	-0.0259***
	(0.0121)	(0.00333)
Individual is male = 1	-0.0668***	0.0316***
	(0.00751)	(0.00296)
Individual has completed __ = 1:		
Primary School	-0.0241***	0.00410
	(0.00807)	(0.00262)
Secondary School	0.0175	0.0336***
	(0.0176)	(0.00722)
Postsecondary School	0.0517	0.104***
	(0.0383)	(0.0226)
Survey year is 2015 = 1	0.0991***	0.00701
	(0.0206)	(0.00783)
Distance to nearest ___ (km):		
Feeder road	-0.000403	0.000100
	(0.000442)	(0.000167)
Boma (District town)	0.000128	3.43e-05
	(0.000181)	(6.80e-05)

Table A9 (cont'd)

Explanatory Variables	Permanent migrants	Permanent employment migrants
Distance to nearest ___ (km):		
Marketplace	-9.38e-05	-0.000120*
	(0.000169)	(6.50e-05)
Tarmac (Paved road)	0.000323**	-0.000130**
	(0.000148)	(6.61e-05)
Agrodealer	4.31e-05	0.000114*
	(0.000162)	(6.15e-05)
Latitude of homestead	-0.0197	-0.00229
	(0.0159)	(0.00581)
Longitude of homestead	0.00486	0.00319
	(0.00914)	(0.00306)
Difference from 19-year average (mm):		
1-year lag total precipitation	-0.000116	2.11e-06
	(7.22e-05)	(3.06e-05)
2-year lag total precipitation	7.94e-05	-5.34e-06
	(8.45e-05)	(3.38e-05)
3-year lag total precipitation	6.03e-05	-1.49e-05
	(8.35e-05)	(3.37e-05)
Difference from 14-year average (degrees K):		
1-year lag mean temperature	-0.000383	0.00124
	(0.00799)	(0.00324)
2-year lag mean temperature	-0.0277	-0.0164
	(0.0274)	(0.0131)
3-year lag mean temperature	0.0259	0.0163
	(0.0258)	(0.0128)
District fixed effects	Yes	Yes
Observations	32,413	31,931

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered at the SEA level.
Source: author, with data from IAPRI (2012), IAPRI (2015), IAPRI (2019), Maidment et al. (2014), McNalley et al. (2016)

Table A10: Full logit regression results for youth and young adults by migration type (average partial effects)

Age group:	Youth (15-24)		Young adults (25-35)	
Migration type:	Permanent	Permanent employment	Permanent	Permanent employment
Explanatory variables:				
It is possible to be allocated additional customary land = 1	0.0162	0.00267	0.00668	0.0115**
	(0.0112)	(0.00421)	(0.0107)	(0.00554)
It is possible to buy/sell customary land = 1	-0.0127	-0.00728	0.00400	-0.00669
	(0.0121)	(0.00446)	(0.0121)	(0.00562)
HH participates in land rental = 1	-0.00915	-0.0135**	-0.0409**	-0.00332
	(0.0206)	(0.00672)	(0.0198)	(0.00937)
Landholding per capita (ha)	0.000917	-0.00565*	0.00101	0.00380**
	(0.00603)	(0.00293)	(0.00671)	(0.00161)
It is possible to convert customary land to titled = 1	0.0198*	0.00423	-0.0204*	-0.00315
	(0.0112)	(0.00497)	(0.0115)	(0.00518)
HH owns titled land = 1	0.0131	0.00334	0.0122	0.0183**
	(0.0210)	(0.00752)	(0.0158)	(0.00845)
HH has received inheritance of land = 1	0.00454	0.0114**	-0.0163	0.00782
	(0.0120)	(0.00478)	(0.0111)	(0.00530)
Individual is employed in a __ = 1:				
Low earnings salaried/wage activity	0.0202	-0.00469	-0.0711***	-0.000854
	(0.0293)	(0.0112)	(0.0208)	(0.0101)
High earnings salaried/wage activity	0.0384	0.0123	-0.121***	-0.00889
	(0.0489)	(0.0155)	(0.0158)	(0.00798)
Individual has own business in a __ = 1:				
Low earnings activity	-0.101***	0.00823	-0.0817***	-0.00332
	(0.0316)	(0.0171)	(0.0148)	(0.0124)
High earnings activity	-0.0572	-0.0152	-0.0617***	-0.00196
	(0.0450)	(0.00947)	(0.0151)	(0.00662)
Years since hh head settled in the area	7.49e-05	1.78e-05	-0.000132	-0.000312**
	(0.000315)	(0.000100)	(0.000307)	(0.000134)

Table A10 (cont'd)

Age group:	Youth (15-24)		Young adults (25-35)	
Migration type:	Permanent	Permanent employment	Permanent	Permanent employment
Explanatory Variables:				
HH head is considered local = 1	-0.0514***	-0.000555	0.0177	0.0110**
	(0.0177)	(0.00541)	(0.0162)	(0.00522)
Tropical Livestock Units	-0.000981	0.000161	-0.000768	-0.000782**
	(0.000786)	(0.000270)	(0.000626)	(0.000356)
HH productive asset value, 1000 ZMW (2017 = 100)	0.000200	-0.000107	-3.58e-06	-1.11e-05
	(0.000319)	(9.42e-05)	(0.000296)	(9.75e-05)
HH non-ag asset value, 1000 ZMW (2017 = 100):	0.00345	0.00234*	0.00274	0.00169
	(0.00301)	(0.00130)	(0.00273)	(0.00143)
Wall material is improved = 1	0.0140	0.00309	-0.0104	-0.00801*
	(0.0110)	(0.00485)	(0.0109)	(0.00455)
Floor material is improved = 1	-0.0194	-0.00428	-0.00395	-0.0133***
	(0.0149)	(0.00545)	(0.0139)	(0.00505)
Roof material is improved = 1	0.00856	-0.00403	-0.00124	0.00577
	(0.0131)	(0.00431)	(0.0126)	(0.00650)
HH size (number of members)	0.00903***	0.00128**	0.0141***	0.00288***
	(0.00199)	(0.000588)	(0.00172)	(0.000632)
HH head has completed __ = 1:				
Primary school	-0.0319***	0.00688*	0.00941	0.0111**
	(0.0112)	(0.00406)	(0.0107)	(0.00469)
Secondary School	-0.0597**	0.00357	0.0506**	0.0143
	(0.0261)	(0.00916)	(0.0233)	(0.0105)
Postsecondary School	0.0261	0.00280	0.0218	0.0180*
	(0.0340)	(0.00966)	(0.0313)	(0.0095892)
Age of HH head	0.00353***	0.000348**	0.00466***	0.000745***
	(0.000467)	(0.000162)	(0.000416)	(0.000161)

Table A10 (cont'd)

Age group:	Youth (15-24)		Young adults (25-35)	
Migration type:	Permanent	Permanent employment	Permanent	Permanent employment
Explanatory Variables:				
HH head is male = 1	-0.0218	0.00260	-0.0384**	0.00192
	(0.0134)	(0.00470)	(0.0150)	(0.00538)
HH is related to village head = 1	-0.0107	-0.00703	0.00272	0.00459
	(0.0109)	(0.00437)	(0.00925)	(0.00431)
HH is related to chief = 1	0.0131	-0.00348	0.0210	0.0146*
	(0.0155)	(0.00530)	(0.0165)	(0.00802)
HH has received remittances in past year = 1	-0.00412	0.00444	-0.0136	0.00685
	(0.0136)	(0.00475)	(0.0128)	(0.00501)
Age of individual (years)	0.0262***	0.00516***	-0.00962***	-0.00154**
	(0.00177)	(0.000810)	(0.00141)	(0.000731)
Individual is married = 1	-0.106***	-0.0196***	-0.141***	-0.0259***
	(0.0172)	(0.00434)	(0.0155)	(0.00525)
Individual is male = 1	-0.126***	0.0354***	0.0431***	0.0256***
	(0.00944)	(0.00385)	(0.0101)	(0.00410)
Individual has completed __ = 1:				
Primary School	-0.0513***	0.00300	-0.0272***	-0.00295
	(0.0103)	(0.00348)	(0.00990)	(0.00408)
Secondary School	-0.0507**	0.0249***	-0.0355**	0.0182**
	(0.0238)	(0.00823)	(0.0181)	(0.00839)
Postsecondary School	-0.0446	0.0928***	0.0387	0.0794***
	(0.0580)	(0.0255)	(0.0349)	(0.0234)
Survey year is 2015 = 1	0.0848***	0.00937	0.0944***	0.00278
	(0.0269)	(0.0102)	(0.0261)	(0.0124)
Distance to nearest __ (km):				
Feeder road	-0.000504	0.000272	-0.000122	-0.000794
	(0.000550)	(0.000182)	(0.000603)	(0.000733)

Table A10 (cont'd)

Age group:	Youth (15-24)		Young adults (25-35)	
Migration type:	Permanent	Permanent employment	Permanent	Permanent employment
Explanatory Variables:				
Distance to nearest __: (km)				
Boma (District town)	-1.24e-05	2.13e-05	0.000335	-4.21e-05
	(0.000235)	(8.01e-05)	(0.000222)	(0.000103)
Marketplace	-2.11e-05	-0.000156*	-0.000170	-4.14e-05
	(0.000248)	(9.08e-05)	(0.000186)	(7.76e-05)
Tarmac (Paved road)	0.000471**	-6.90e-05	-5.26e-06	
	(0.000188)	(8.41e-05)	(0.000193)	(9.91e-05)
Agrodealer	-5.95e-05	6.55e-05	0.000190	0.000297***
	(0.000225)	(8.08e-05)	(0.000207)	(9.05e-05)
Latitude of homestead	-0.0106	-0.00261	-0.0357*	-0.000455
	(0.0192)	(0.00722)	(0.0196)	(0.00855)
Longitude of homestead	0.00913	0.00149	0.00989	0.00380
	(0.0108)	(0.00440)	(0.0130)	(0.00338)
Difference from 19-year average (mm):				
1-year lag total precipitation	-0.000183**	2.57e-05	-2.08e-05	-1.48e-05
	(9.17e-05)	(4.10e-05)	(9.22e-05)	(4.66e-05)
2-year lag total precipitation	0.000194*	-2.57e-05	-9.34e-05	1.65e-05
	(0.000106)	(4.43e-05)	(0.000102)	(5.03e-05)
3-year lag total precipitation	7.66e-05	5.68e-07	6.11e-05	-4.47e-05
	(0.000104)	(4.35e-05)	(0.000101)	(4.33e-05)
Difference from 14-year average (degrees K):				
1-year lag mean temperature	0.00691	0.00350	-0.00674	-0.00131
	(0.0101)	(0.00412)	(0.00967)	(0.00474)
2-year lag mean temperature	-0.0116	-0.0139	-0.0476	-0.0293
	(0.0347)	(0.0156)	(0.0348)	(0.0187)
3-year lag mean temperature	0.00394	0.0118	0.0453	0.0291*
	(0.0331)	(0.0152)	(0.0326)	(0.0177)

Table A10 (cont'd)

District fixed effects	Yes	Yes	Yes	Yes
Observations	21,374	21,091	11,039	9,819

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered at the SEA level.
Source: author, with data from IAPRI (2012), IAPRI (2015), IAPRI (2019), Maidment et al. (2014), McNalley et al. (2016)

Table A11: MNL results for permanent youth migrants by destination type (average partial effects)

Destination type:	Nonmigrant	Rural	Urban
Explanatory variables:			
It is possible to be allocated additional customary land = 1	-0.0180	0.0166*	0.00135
	(0.0112)	(0.00967)	(0.00859)
It is possible to buy/sell customary land = 1	0.00831	0.00739	-0.0157*
	(0.0123)	(0.0113)	(0.00856)
HH participates in land rental = 1	0.0120	-0.00829	-0.00367
	(0.0205)	(0.0201)	(0.0161)
Landholding per capita (ha)	-0.00275	0.000962	0.00178
	(0.00610)	(0.00585)	(0.00443)
It is possible to convert customary land to titled = 1	-0.0161	0.00582	0.0103
	(0.0111)	(0.00941)	(0.00876)
HH owns titled land = 1	-0.00698	-0.0283	0.0353**
	(0.0214)	(0.0176)	(0.0162)
HH has received inheritance of land = 1	-0.00418	-0.00634	0.0105
	(0.0119)	(0.0111)	(0.00892)
Individual is employed in a __ = 1:			
Low earnings salaried/wage activity	-0.0134	0.0446	-0.0312*
	(0.0291)	(0.0280)	(0.0185)
High earnings salaried/wage activity	-0.0288	0.00656	0.0223
	(0.0489)	(0.0461)	(0.0340)
Individual has own business in a __ = 1:			
Low earnings activity	0.105***	-0.0672***	-0.0376*
	(0.0318)	(0.0258)	(0.0226)
High earnings activity	0.0374	0.0152	-0.0526**
	(0.0460)	(0.0458)	(0.0245)
Years since hh head settled in the area	-0.000130	-0.000128	0.000258
	(0.000312)	(0.000307)	(0.000231)
HH head is considered local = 1	0.0403**	-0.0103	-0.0300**
	(0.0176)	(0.0172)	(0.0127)
Tropical Livestock Units	0.000514	0.000365	-0.000878*
	(0.000778)	(0.000681)	(0.000531)
HH productive asset value, 1000 ZMW (2017 = 100)	-0.000464	0.000741*	-0.000277
	(0.000400)	(0.000428)	(0.000220)
HH non-ag asset value, 1000 ZMW (2017 = 100):	0.00335	-0.00979**	0.00644***
	(0.00375)	(0.00427)	(0.00193)
Wall material is improved = 1	-0.0136	0.0117	0.00198
	(0.0112)	(0.0108)	(0.00919)
Floor material is improved = 1	0.0240	-0.0382***	0.0143
	(0.0150)	(0.0136)	(0.0110)

Table A11 (cont'd)

Destination type:	Nonmigrant	Rural	Urban
Explanatory variables:			
Roof material is improved = 1	-0.00976	-0.00469	0.0145
	(0.0131)	(0.0121)	(0.00882)
HH size (number of members)	-0.00907***	0.00909***	-2.38e-05
	(0.00194)	(0.00165)	(0.00141)
HH head has completed __ = 1:			
Primary school	0.0303***	-0.0457***	0.0153*
	(0.0113)	(0.0106)	(0.00833)
Secondary School	0.0639**	-0.0954***	0.0314*
	(0.0261)	(0.0230)	(0.0189)
Postsecondary School	-0.0120	-0.0549*	0.0669***
	(0.0321)	(0.0287)	(0.0235)
Age of HH head	-0.00344***	0.00207***	0.00137***
	(0.000471)	(0.000427)	(0.000347)
HH head is male = 1	0.0204	-0.0180	-0.00240
	(0.0135)	(0.0119)	(0.00943)
HH is related to village head = 1	0.0117	0.00252	-0.0142*
	(0.0110)	(0.0100)	(0.00828)
HH is related to chief = 1	-0.0162	-0.0101	0.0262**
	(0.0157)	(0.0134)	(0.0119)
HH has received remittances in past year = 1	0.00483	-0.0174	0.0125
	(0.0140)	(0.0124)	(0.0101)
Age of individual (years)	-0.0265***	0.0166***	0.00995***
	(0.00178)	(0.00167)	(0.00119)
Individual is married = 1	0.109***	-0.0467***	-0.0623***
	(0.0172)	(0.0154)	(0.00911)
Individual is male = 1	0.128***	-0.122***	-0.00695
	(0.00935)	(0.00854)	(0.00653)
Individual has completed __ = 1:			
Primary School	0.0465***	-0.0517***	0.00518
	(0.0102)	(0.00958)	(0.00720)
Secondary School	0.0704***	-0.112***	0.0415**
	(0.0231)	(0.0188)	(0.0169)
Postsecondary School	0.0989**	-0.120***	0.0207
	(0.0499)	(0.0426)	(0.0378)
Survey year is 2015 = 1	-0.0956***	0.0693***	0.0263
	(0.0274)	(0.0255)	(0.0183)
Distance to nearest __ (km):			
Feeder road	0.000533	-0.000278	-0.000256
	(0.000539)	(0.000442)	(0.000508)

Table A11 (cont'd)

Destination type:	Nonmigrant	Rural	Urban
Explanatory variables:			
Distance to nearest __ (km):			
Boma (District town)	-6.90e-05	0.000132	-6.29e-05
	(0.000230)	(0.000219)	(0.000180)
Marketplace	0.000158	0.000216	-0.000375**
	(0.000244)	(0.000225)	(0.000176)
Tarmac (Paved road)	-0.000380**	0.000475**	-9.49e-05
	(0.000188)	(0.000185)	(0.000159)
Agrodealer	-3.89e-05	-8.68e-05	0.000126
	(0.000242)	(0.000219)	(0.000148)
Latitude of homestead	0.00593	0.000815	-0.00675
	(0.0192)	(0.0169)	(0.0155)
Longitude of homestead	-0.00663	0.00979	-0.00316
	(0.0110)	(0.0115)	(0.00750)
Difference from 19-year average (mm):			
1-year lag total precipitation	0.000172*	-0.000120	-5.27e-05
	(9.14e-05)	(9.52e-05)	(7.36e-05)
2-year lag total precipitation	-0.000188*	0.000136	5.14e-05
	(0.000107)	(9.88e-05)	(7.27e-05)
3-year lag total precipitation	-6.02e-05	0.000140	-7.99e-05
	(0.000104)	(0.000107)	(8.03e-05)
Difference from 14-year average (degrees K):			
1-year lag mean temperature	-0.00644	-0.00135	0.00778
	(0.00986)	(0.0108)	(0.00707)
2-year lag mean temperature	0.0285	0.0319	-0.0604**
	(0.0353)	(0.0370)	(0.0263)
3-year lag mean temperature	-0.0197	-0.0293	0.0490*
	(0.0337)	(0.0346)	(0.0254)
District fixed effects	Yes	Yes	Yes
Observations	21,374	21,374	21,374

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered at the SEA level.
Source: author, with data from IAPRI (2012), IAPRI (2015), IAPRI (2019), Maidment et al. (2014), McNalley et al. (2016)

Table A12: MNL results for permanent young adult migrants by destination type (average partial effects)

Destination type:	Nonmigrant	Rural	Urban
Explanatory variables:			
It is possible to be allocated additional customary land = 1	-0.00946	0.00150	0.00796
	(0.0108)	(0.00997)	(0.00625)
It is possible to buy/sell customary land = 1	-0.00807	0.0112	-0.00316
	(0.0122)	(0.0112)	(0.00827)
HH participates in land rental = 1	0.0416**	-0.0311*	-0.0106
	(0.0198)	(0.0185)	(0.0117)
Landholding per capita (ha)	-0.000377	0.00399	-0.00361
	(0.00707)	(0.00714)	(0.00272)
It is possible to convert customary land to titled = 1	0.0142	-0.0119	-0.00232
	(0.0116)	(0.0111)	(0.00619)
HH owns titled land = 1	-0.00424	-0.00486	0.00910
	(0.0170)	(0.0184)	(0.00982)
HH has received inheritance of land = 1	0.0164	-0.0166	0.000160
	(0.0111)	(0.0106)	(0.00631)
Individual is employed in a __ = 1:			
Low earnings salaried/wage activity	0.0719***	-0.0383**	-0.0336***
	(0.0210)	(0.0189)	(0.0128)
High earnings salaried/wage activity	0.110***	-0.0733***	-0.0370***
	(0.0182)	(0.0185)	(0.0109)
Individual has own business in a __ = 1:			
Low earnings activity	0.0891***	-0.0515***	-0.0376***
	(0.0144)	(0.0138)	(0.0101)
High earnings activity	0.0650***	-0.0534***	-0.0116
	(0.0152)	(0.0145)	(0.0113)
Years since hh head settled in the area	0.000108	8.81e-05	-0.000197
	(0.000309)	(0.000293)	(0.000157)
HH head is considered local = 1	-0.0225	0.0228	-0.000326
	(0.0163)	(0.0147)	(0.00928)
Tropical Livestock Units	0.000836	4.01e-05	-0.000876***
	(0.000667)	(0.000616)	(0.000323)
HH productive asset value, 1000 ZMW (2017 = 100)	-0.000172	0.000306	-0.000134
	(0.000343)	(0.000324)	(0.000129)
HH non-ag asset value, 1000 ZMW (2017 = 100):	-0.00226	-0.00130	0.00356**
	(0.00358)	(0.00361)	(0.00164)
Wall material is improved = 1	0.0143	-0.00631	-0.00795
	(0.0111)	(0.0108)	(0.00733)
Floor material is improved = 1	0.00135	0.00414	-0.00549
	(0.0140)	(0.0135)	(0.00698)

Table A12 (cont'd)

Destination type:	Nonmigrant	Rural	Urban
Explanatory variables:			
Roof material is improved = 1	-0.00151	-0.00312	0.00463
	(0.0129)	(0.0118)	(0.00700)
HH size (number of members)	-0.0140***	0.00987***	0.00414***
	(0.00171)	(0.00157)	(0.000888)
HH head has completed __ = 1:			
Primary school	-0.0162	-0.0104	0.0266***
	(0.0108)	(0.0102)	(0.00631)
Secondary School	-0.0482**	-0.00898	0.0571***
	(0.0237)	(0.0240)	(0.0164)
Postsecondary School	-0.0154	-0.0534**	0.0688***
	(0.0300)	(0.0238)	(0.0187)
Age of HH head	-0.00467***	0.00313***	0.00154***
	(0.000425)	(0.000411)	(0.000248)
HH head is male = 1	0.0397***	-0.0282**	-0.0115
	(0.0153)	(0.0135)	(0.00843)
HH is related to village head = 1	-0.00261	0.0103	-0.00772
	(0.00937)	(0.00923)	(0.00644)
HH is related to chief = 1	-0.0263*	0.00903	0.0172*
	(0.0157)	(0.0137)	(0.00898)
HH has received remittances in past year = 1	0.0165	-0.0208*	0.00428
	(0.0125)	(0.0107)	(0.00715)
Age of individual (years)	0.00970***	-0.00590***	-0.00380***
	(0.00141)	(0.00130)	(0.00103)
Individual is married = 1	0.150***	-0.0852***	-0.0644***
	(0.0155)	(0.0141)	(0.00830)
Individual is male = 1	-0.0434***	0.0249***	0.0185***
	(0.0101)	(0.00951)	(0.00564)
Individual has completed __ = 1:			
Primary School	0.0296***	-0.0175*	-0.0122**
	(0.0104)	(0.00994)	(0.00619)
Secondary School	0.0415**	-0.0446***	0.00309
	(0.0174)	(0.0163)	(0.00977)
Postsecondary School	-0.0148	-0.0296	0.0443*
	(0.0359)	(0.0371)	(0.0269)
Survey year is 2015 = 1	-0.102***	0.0744***	0.0276**
	(0.0255)	(0.0232)	(0.0128)
Distance to nearest __ (km):			
Feeder road	5.72e-05	-0.000425	0.000367
	(0.000611)	(0.000574)	(0.000526)

Table A12 (cont'd)

Destination type:	Nonmigrant	Rural	Urban
Explanatory variables:			
Distance to nearest __ (km):			
Boma (District town)	-0.000325	0.000299	2.63e-05
	(0.000222)	(0.000224)	(0.000135)
Marketplace	0.000200	-5.94e-05	-0.000140
	(0.000186)	(0.000176)	(0.000126)
Tarmac (Paved road)	1.77e-05	0.000150	-0.000167
	(0.000193)	(0.000195)	(0.000144)
Agrodealer	-0.000170	2.35e-05	0.000147
	(0.000202)	(0.000204)	(0.000134)
Latitude of homestead	0.0378*	-0.0421**	0.00423
	(0.0198)	(0.0176)	(0.0121)
Longitude of homestead	-0.0107	0.0253**	-0.0147**
	(0.0130)	(0.0126)	(0.00721)
Difference from 19-year average (mm):			
1-year lag total precipitation	2.30e-05	6.13e-05	-8.43e-05
	(9.18e-05)	(8.98e-05)	(5.86e-05)
2-year lag total precipitation	8.76e-05	-7.45e-05	-1.31e-05
	(9.80e-05)	(8.95e-05)	(5.40e-05)
3-year lag total precipitation	-6.00e-05	4.48e-05	1.53e-05
	(0.000101)	(9.72e-05)	(5.73e-05)
Difference from 14-year average (degrees K):			
1-year lag mean temperature	0.00615	0.00519	-0.0113*
	(0.00942)	(0.00998)	(0.00665)
2-year lag mean temperature	0.0569	-0.0806**	0.0238
	(0.0348)	(0.0330)	(0.0255)
3-year lag mean temperature	-0.0524	0.0747**	-0.0223
	(0.0330)	(0.0310)	(0.0237)
District fixed effects	Yes	Yes	Yes
Observations	11,039	11,039	11,039

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered at the SEA level.
Source: author, with data from IAPRI (2012), IAPRI (2015), IAPRI (2019), Maidment et al. (2014), McNalley et al. (2016)

Table A13: MNL results for permanent pooled YYA migrants by destination type (average partial effects)

Destination type:	Nonmigrant	Rural	Urban
Explanatory variables:			
It is possible to be allocated additional customary land = 1	-0.0186**	0.0131*	0.00551
	(0.00843)	(0.00758)	(0.00627)
It is possible to buy/sell customary land = 1	0.00763	0.00431	-0.0119*
	(0.00913)	(0.00824)	(0.00634)
HH participates in land rental = 1	0.0249	-0.0179	-0.00706
	(0.0161)	(0.0156)	(0.0116)
Landholding per capita (ha)	-0.00158	0.00200	-0.000419
	(0.00508)	(0.00507)	(0.00321)
It is possible to convert customary land to titled = 1	-0.00504	-0.00151	0.00655
	(0.00887)	(0.00752)	(0.00627)
HH owns titled land = 1	-0.00874	-0.0188	0.0275**
	(0.0169)	(0.0146)	(0.0118)
HH has received inheritance of land = 1	0.000989	-0.00907	0.00809
	(0.00891)	(0.00860)	(0.00646)
Individual is employed in a __ = 1:			
Low earnings salaried/wage activity	0.0388**	-0.00324	-0.0355***
	(0.0194)	(0.0180)	(0.0121)
High earnings salaried/wage activity	0.0914***	-0.0551***	-0.0363**
	(0.0222)	(0.0212)	(0.0142)
Individual has own business in a __ = 1:			
Low earnings activity	0.133***	-0.0846***	-0.0484***
	(0.0160)	(0.0137)	(0.0123)
High earnings activity	0.112***	-0.0665***	-0.0453***
	(0.0186)	(0.0178)	(0.0116)
Years since hh head settled in the area	-0.000170	2.44e-05	0.000145
	(0.000247)	(0.000239)	(0.000170)
HH head is considered local = 1	0.0171	0.00117	-0.0183*
	(0.0138)	(0.0133)	(0.00962)
Tropical Livestock Units	0.000656	0.000190	-0.000845**
	(0.000637)	(0.000551)	(0.000373)
HH productive asset value, 1000 ZMW (2017 = 100)	-0.000346	0.000597**	-0.000250*
	(0.000263)	(0.000275)	(0.000145)
HH non-ag asset value, 1000 ZMW (2017 = 100):	0.00126	-0.00658**	0.00531***
	(0.00261)	(0.00285)	(0.00145)
Wall material is improved = 1	-0.00250	0.00452	-0.00202
	(0.00877)	(0.00844)	(0.00697)
Floor material is improved = 1	0.0199*	-0.0268**	0.00690
	(0.0119)	(0.0110)	(0.00788)

Table A13 (cont'd)

Destination type:	Nonmigrant	Rural	Urban
Explanatory variables:			
Roof material is improved = 1	-0.00685	-0.00299	0.00984
	(0.0107)	(0.00987)	(0.00650)
HH size (number of members)	-0.0117***	0.00965***	0.00207**
	(0.00163)	(0.00140)	(0.00101)
HH head has completed __ = 1:			
Primary school	0.0134	-0.0318***	0.0184***
	(0.00884)	(0.00833)	(0.00610)
Secondary School	0.0206	-0.0616***	0.0410***
	(0.0181)	(0.0184)	(0.0129)
Postsecondary School	-0.0108	-0.0542**	0.0650***
	(0.0252)	(0.0218)	(0.0179)
Age of HH head	-0.00465***	0.00293***	0.00171***
	(0.000396)	(0.000338)	(0.000256)
HH head is male = 1	0.0384***	-0.0330***	-0.00540
	(0.0116)	(0.0103)	(0.00743)
HH is related to village head = 1	0.00540	0.00558	-0.0110*
	(0.00841)	(0.00774)	(0.00603)
HH is related to chief = 1	-0.0169	-0.00123	0.0181**
	(0.0127)	(0.0110)	(0.00907)
HH has received remittances in past year = 1	0.00731	-0.0170*	0.00965
	(0.0103)	(0.00941)	(0.00747)
Age of individual (years)	-0.00113	-8.15e-05	0.00121**
	(0.000827)	(0.000772)	(0.000563)
Individual is married = 1	0.159***	-0.0810***	-0.0778***
	(0.0119)	(0.0105)	(0.00646)
Individual is male = 1	0.0681***	-0.0712***	0.00313
	(0.00743)	(0.00681)	(0.00499)
Individual has completed __ = 1:			
Primary School	0.0213***	-0.0254***	0.00411
	(0.00809)	(0.00744)	(0.00530)
Secondary School	-0.00632	-0.0421***	0.0484***
	(0.0177)	(0.0158)	(0.0125)
Postsecondary School	-0.0112	-0.0426	0.0538*
	(0.0372)	(0.0361)	(0.0294)
Survey year is 2015 = 1	-0.111***	0.0821***	0.0286**
	(0.0208)	(0.0190)	(0.0130)
Distance to nearest __ (km):			
Feeder road	0.000455	-0.000307	-0.000148
	(0.000436)	(0.000385)	(0.000417)

Table A13 (cont'd)

Destination type:	Nonmigrant	Rural	Urban
Explanatory variables:			
Distance to nearest __ (km):			
Boma (District town)	-0.000175	0.000182	-6.90e-06
	(0.000180)	(0.000172)	(0.000130)
Marketplace	0.000188	8.35e-05	-0.000271**
	(0.000166)	(0.000150)	(0.000127)
Tarmac (Paved road)	-0.000260*	0.000385***	-0.000126
	(0.000150)	(0.000146)	(0.000125)
Agrodealer	-9.87e-05	1.23e-05	8.63e-05
	(0.000171)	(0.000165)	(0.000117)
Latitude of homestead	0.0163	-0.0136	-0.00275
	(0.0160)	(0.0143)	(0.0111)
Longitude of homestead	-0.00246	0.00966	-0.00719
	(0.00903)	(0.00963)	(0.00632)
Difference from 19-year average (mm):			
1-year lag total precipitation	0.000102	-3.10e-05	-7.14e-05
	(7.18e-05)	(7.28e-05)	(5.56e-05)
2-year lag total precipitation	-7.66e-05	4.35e-05	3.31e-05
	(8.40e-05)	(7.77e-05)	(5.13e-05)
3-year lag total precipitation	-4.34e-05	9.11e-05	-4.77e-05
	(8.28e-05)	(9.12e-05)	(6.04e-05)
Difference from 14-year average (degrees K):			
1-year lag mean temperature	0.00125	-0.00112	-0.000134
	(0.00780)	(0.00811)	(0.00556)
2-year lag mean temperature	0.0420	-0.0146	-0.0274
	(0.0277)	(0.0268)	(0.0202)
3-year lag mean temperature	-0.0398	0.0177	0.0221
	(0.0262)	(0.0255)	(0.0198)
District fixed effects	Yes	Yes	Yes
Observations	32,413	32,413	32,413

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered at the SEA level.
Source: author, with data from IAPRI (2012), IAPRI (2015), IAPRI (2019), Maidment et al. (2014), McNalley et al. (2016)

Table A14: Logit regression results for adjusted age categories by migration type: sensitivity analysis (average partial effects)

Age group:	Youth (15-22)		Young adult (23-33)	
Migration type:	Permanent	Permanent employment	Permanent	Permanent employment
Explanatory variables:				
It is possible to be allocated additional customary land = 1	0.0122	-0.00564	0.00895	0.00390
	(0.0121)	(0.00487)	(0.0107)	(0.00775)
It is possible to buy/sell customary land = 1	-0.0183	-0.0107*	-0.00183	-0.0113
	(0.0133)	(0.00562)	(0.0138)	(0.00856)
HH participates in land rental = 1	-0.00600	-0.0183**	-0.0477**	0.00601
	(0.0228)	(0.00910)	(0.0212)	(0.0143)
Landholding per capita (ha)	0.00997	-0.0103***	0.00343	-0.000873
	(0.00673)	(0.00258)	(0.00580)	(0.00316)
It is possible to convert customary land to titled = 1	0.0250**	0.00317	-0.0130	0.000850
	(0.0119)	(0.00604)	(0.0122)	(0.00759)
HH owns titled land = 1	0.0128	0.00563	-0.0131	-0.00197
	(0.0228)	(0.0103)	(0.0163)	(0.0105)
HH has received inheritance of land = 1	-0.00130	0.0103*	-0.0139	0.00849
	(0.0135)	(0.00534)	(0.0114)	(0.00801)
Individual is employed in a __ = 1:				
Low earnings salaried/wage activity	0.0401	-0.0151	-0.0545***	0.00664
	(0.0308)	(0.0101)	(0.0171)	(0.0122)
High earnings salaried/wage activity	0.199***	0.0770**	-0.114***	0.0135
	(0.0689)	(0.0386)	(0.0203)	(0.0168)
Individual has own business in a __ = 1:				
Low earnings activity	-0.0648	-0.0106	-0.0683***	0.0318
	(0.0568)	(0.0233)	(0.0232)	(0.0234)
High earnings activity	-0.0268	0.0172	-0.0635***	0.00392
	(0.0380)	(0.0220)	(0.0152)	(0.00898)
Years since hh head settled in the area	-6.25e-05	1.60e-05	0.000353	-0.000387*
	(0.000327)	(0.000145)	(0.000302)	(0.000205)

Table A14 (cont'd)

Age group:	Youth (15-22)		Young adult (23-33)	
Migration type:	Permanent	Permanent employment	Permanent	Permanent employment
Explanatory variables:				
HH head is considered local = 1	-0.0465**	0.000487	0.00394	0.0128*
	(0.0189)	(0.00748)	(0.0177)	(0.00778)
Tropical Livestock Units	-0.000788	0.000287	-0.00107	0.00123
	(0.000819)	(0.000403)	(0.000661)	(0.00102)
HH productive asset value, 1000 ZMW (2017 = 100)	0.000435	-0.000125	-0.000209	-0.000114
	(0.000373)	(0.000179)	(0.000369)	(0.000181)
HH non-ag asset value, 1000 ZMW (2017 = 100):	-0.00264	0.00189	0.00454	0.00300
	(0.00358)	(0.00162)	(0.00332)	(0.00276)
Wall material is improved = 1	0.00970	-0.00898*	-0.0187	-0.00387
	(0.0117)	(0.00501)	(0.0123)	(0.00851)
Floor material is improved = 1	-0.0316*	-0.00501	-0.00260	-0.00200
	(0.0170)	(0.00615)	(0.0158)	(0.0112)
Roof material is improved = 1	-0.00236	-0.00439	-0.00300	-0.00511
	(0.0136)	(0.00534)	(0.0137)	(0.00960)
HH size (number of members)	0.00761***	0.00169**	0.0167***	0.00419***
	(0.00220)	(0.000829)	(0.00194)	(0.00102)
HH head has completed __ = 1:				
Primary school	-0.0462***	0.00954**	-0.00257	-0.00309
	(0.0114)	(0.00480)	(0.0122)	(0.00709)
Secondary School	-0.0746***	0.0169	0.00497	-0.00586
	(0.0264)	(0.0135)	(0.0247)	(0.0120)
Postsecondary School	-0.00749	0.00823	0.0161	-0.00981
	(0.0334)	(0.0125)	(0.0315)	(0.0146)
Age of HH head	0.00251***	0.000373*	0.00484***	9.44e-05
	(0.000492)	(0.000194)	(0.000426)	(0.000244)
HH head is male = 1	-0.00937	0.00105	-0.0452***	0.00971
	(0.0134)	(0.00665)	(0.0154)	(0.00816)

Table A14 (cont'd)

Age group	Youth (15-22)		Young adult (23-33)	
Migration type:	Permanent	Permanent employment	Permanent	Permanent employment
Explanatory variables:				
HH is related to village head = 1	-0.00208	0.00129	0.00418	-0.00475
	(0.0117)	(0.00479)	(0.0106)	(0.00702)
HH is related to chief = 1	0.00648	-0.00543	0.00849	0.0254**
	(0.0165)	(0.00653)	(0.0163)	(0.0121)
HH has received remittances in past year = 1	-0.0132	0.00981	-0.0113	0.00147
	(0.0138)	(0.00599)	(0.0131)	(0.00781)
Age of individual (years)	0.0232***	0.00706***	-0.0118***	-0.00255**
	(0.00243)	(0.00112)	(0.00147)	(0.00102)
Individual is married = 1	-0.0341*	-0.0224***	-0.0989***	-0.0332***
	(0.0199)	(0.00701)	(0.0145)	(0.00980)
Individual is male = 1	-0.130***	0.0416***	0.0354***	0.0569***
	(0.0103)	(0.00439)	(0.00954)	(0.00617)
Individual has completed __ = 1:				
Primary School	0.0147	0.00945*	0.0257**	0.0168***
	(0.0120)	(0.00515)	(0.0123)	(0.00528)
Secondary School	0.0191	0.0383***	0.0286	0.0521***
	(0.0288)	(0.0131)	(0.0188)	(0.0109)
Postsecondary School	0.224***	0.0429***	0.202***	0.0902***
	(0.0316)	(0.0131)	(0.0250)	(0.0156)
Survey year is 2015 = 1	0.142*	0.0285	-0.00232	-0.0264
	(0.0743)	(0.0373)	(0.0790)	(0.0600)
Distance to nearest __ (km):				
Feeder road	-0.000642	0.000309	-0.000553	0.000604
	(0.000595)	(0.000202)	(0.000548)	(0.000401)
Boma (District town)	0.000105	3.22e-05	0.000311	-0.000284*
	(0.000243)	(0.000111)	(0.000253)	(0.000154)

Table A14 (cont'd)

Age group:	Youth (15-22)		Young Adult (23-33)	
Migration type:	Permanent	Permanent employment	Permanent	Permanent employment
Explanatory variables:				
Distance to nearest __ (km):				
Marketplace	-0.000131	-5.15e-05	-0.000154	-0.000141
	(0.000273)	(0.000111)	(0.000229)	(0.000137)
Tarmac (Paved road)	0.000489**	-0.000146	-3.89e-05	-6.48e-05
	(0.000191)	(0.000109)	(0.000198)	(0.000148)
Distance to nearest __ (km): Agrodealer	-0.000130	2.70e-05	0.000231	4.93e-05
	(0.000241)	(0.000111)	(0.000231)	(0.000150)
Latitude of homestead	-0.00306	0.000123	0.00197	0.00192
	(0.00256)	(0.00126)	(0.00253)	(0.00158)
Longitude of homestead	0.00357	-0.00277	0.0260	0.00910
	(0.0131)	(0.00520)	(0.0162)	(0.0100)
Difference from 19-year average (mm):				
1-year lag total precipitation	-6.25e-05	9.65e-05*	-0.000109	-2.59e-05
	(0.000117)	(5.23e-05)	(0.000110)	(6.94e-05)
2-year lag total precipitation	0.000112	-8.59e-05*	-1.29e-06	-6.89e-05
	(0.000113)	(4.90e-05)	(0.000106)	(5.99e-05)
3-year lag total precipitation	0.000115	-2.33e-05	-2.45e-05	0.000129**
	(0.000121)	(5.18e-05)	(0.000127)	(5.85e-05)
Difference from 14-year average (degrees K):				
1-year lag mean temperature	0.00544	0.00450	-0.00135	0.00259
	(0.0108)	(0.00586)	(0.0109)	(0.00665)
2-year lag mean temperature	-0.0303	-0.0384*	-0.0268	-0.0214
	(0.0395)	(0.0211)	(0.0385)	(0.0244)
3-year lag mean temperature	0.0261	0.0315	0.0244	0.0261
	(0.0380)	(0.0206)	(0.0367)	(0.0239)

Table A14 (cont'd)

District fixed effects	Yes	Yes	Yes	Yes
Observations	17,723	17,518	11,595	11,239

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered at the SEA level
Source: author, with data from IAPRI (2012), IAPRI (2015), IAPRI (2019), Maidment et al. (2014), McNalley et al. (2016)

Table A15: Logit regression results for adjusted age categories by migration type: sensitivity analysis (average partial effects)

Age group:	Youth (15-30)		Young adult (31-41)	
Migration type:	Permanent	Permanent employment	Permanent	Permanent employment
Explanatory variables:				
It is possible to be allocated additional customary land = 1	0.0154*	-0.000968	-0.000868	0.00311
	(0.00904)	(0.00437)	(0.00846)	(0.00594)
It is possible to buy/sell customary land = 1	-0.0176*	-0.0114**	-0.00702	-0.00871
	(0.0101)	(0.00518)	(0.00959)	(0.00582)
HH participates in land rental = 1	0.0139	0.00338	0.00563	0.00480
	(0.00910)	(0.00492)	(0.00927)	(0.00649)
Landholding per capita (ha)	0.00642	0.00557	0.00510	-0.0150**
	(0.0173)	(0.00864)	(0.0150)	(0.00695)
It is possible to convert customary land to titled = 1	-0.0279	-0.0105	-0.0207	0.0143
	(0.0179)	(0.00853)	(0.0162)	(0.0156)
HH owns titled land = 1	0.00477	-0.00713***	0.00129	-0.00366
	(0.00512)	(0.00256)	(0.00429)	(0.00364)
HH has received inheritance of land = 1	0.000102	0.0125**	-0.0184**	-0.00544
	(0.00987)	(0.00514)	(0.00796)	(0.00576)
Individual is employed in a __ = 1:				
Low earnings salaried/wage activity	-0.00179	-0.00903	-0.0384***	0.00291
	(0.0189)	(0.00891)	(0.0122)	(0.00795)
High earnings salaried/wage activity	-0.0606*	0.0200	-0.0621***	0.0237*
	(0.0331)	(0.0181)	(0.0140)	(0.0136)
Individual has own business in a __ = 1:				
Low earnings activity	-0.109***	0.00186	-0.0272*	0.00664
	(0.0270)	(0.0172)	(0.0144)	(0.0110)
High earnings activity	-0.0821***	0.00185	-0.0421***	0.00311
	(0.0172)	(0.0103)	(0.00893)	(0.00594)

Table A15 (cont'd)

Age categories:	Youth (15-30)		Young Adult (31-41)	
Migration type:	Permanent	Permanent employment	Permanent	Permanent employment
Explanatory variables:				
Years since hh head settled in the area	9.18e-05	-0.000126	-0.000245	1.60e-05
	(0.000265)	(0.000129)	(0.000233)	(0.000192)
HH head is considered local = 1	-0.0297*	0.00315	0.0223**	0.0183***
	(0.0153)	(0.00611)	(0.0110)	(0.00562)
Tropical Livestock Units	-0.000709	0.000350	-0.00102	0.000921
	(0.000657)	(0.000635)	(0.000647)	(0.000807)
HH productive asset value, 1000 ZMW (2017 = 100)	0.000279	-0.000134	-4.17e-05	-0.000531
	(0.000261)	(0.000161)	(0.000206)	(0.000398)
HH non-ag asset value, 1000 ZMW (2017 = 100):	-0.000157	0.00254	0.00188	0.00272
	(0.00282)	(0.00161)	(0.00257)	(0.00210)
Wall material is improved = 1	-0.000281	-0.00781	-0.00692	-0.00768
	(0.00911)	(0.00508)	(0.00943)	(0.00657)
Floor material is improved = 1	-0.0163	-0.00420	-0.00661	-0.00870
	(0.0130)	(0.00636)	(0.0124)	(0.00956)
Roof material is improved = 1	-0.00354	-0.00454	-0.00671	-0.00308
	(0.0111)	(0.00542)	(0.0101)	(0.00630)
HH size (number of members)	0.0129***	0.00283***	0.00836***	0.000114
	(0.00192)	(0.000761)	(0.00146)	(0.000966)
HH head has completed __ = 1:				
Primary school	-0.0354***	0.00382	0.0123	-0.00348
	(0.00985)	(0.00445)	(0.00948)	(0.00796)
Secondary School	-0.0573***	0.000721	0.0309	-0.00527
	(0.0205)	(0.00927)	(0.0295)	(0.0177)
Postsecondary School	-0.00995	0.00250	-0.0271	-0.00511
	(0.0270)	(0.0101)	(0.0182)	(0.0225)
Age of HH head	0.00438***	0.000384**	0.00343***	-8.52e-06
	(0.000405)	(0.000178)	(0.000355)	(0.000300)

Table A15 (cont'd)

Age categories:	Youth (15-30)		Young Adults (31-41)	
Migration type:	Permanent	Permanent employment	Permanent	Permanent employment
Explanatory variables:				
HH head is male = 1	-0.0314***	0.00533	-0.0420***	0.000382
	(0.0119)	(0.00590)	(0.0138)	(0.00809)
HH is related to village head = 1	0.00274	-0.00105	-0.00602	0.00120
	(0.00915)	(0.00433)	(0.00776)	(0.00530)
HH is related to chief = 1	0.00720	0.00169	-0.00172	0.0245***
	(0.0133)	(0.00663)	(0.0116)	(0.00912)
HH has received remittances in past year = 1	-0.0133	0.00742	-0.0119	-0.00496
	(0.0113)	(0.00514)	(0.00854)	(0.00722)
Age of individual (years)	0.00240**	0.00268***	-0.00860***	-0.000699
	(0.00108)	(0.000516)	(0.00113)	(0.000854)
Individual is married = 1	-0.0902***	-0.0270***	-0.0638***	-0.0329**
	(0.0137)	(0.00592)	(0.0154)	(0.0128)
Individual is male = 1	-0.0724***	0.0483***	0.0293***	0.0401***
	(0.00802)	(0.00428)	(0.00834)	(0.00559)
Individual has completed __ = 1:				
Primary School	0.0515***	0.0159***	-0.000558	0.0147*
	(0.00926)	(0.00369)	(0.00993)	(0.00763)
Secondary School	0.106***	0.0585***	0.0217	0.0317
	(0.0202)	(0.00991)	(0.0244)	(0.0259)
Postsecondary School	0.266***	0.0747***	0.182***	0.0227
	(0.0222)	(0.0123)	(0.0353)	(0.0158)
Survey year is 2015 = 1	0.108*	0.0205	-0.0313	-0.0606
	(0.0598)	(0.0302)	(0.0650)	(0.0753)
Distance to nearest __ (km):				
Feeder road	-0.000612	0.000401**	0.000464	-0.000195
	(0.000525)	(0.000195)	(0.000370)	(0.000391)

Table A15 (cont'd)

Age categories:	Youth (15-30)		Young Adults (31-41)	
Migration type:	Permanent	Employment	Permanent	Employment
Explanatory variables:				
Distance to nearest __ (km):				
Boma (District town)	0.000184	-4.13e-05	3.30e-05	-0.000308**
	(0.000196)	(0.000108)	(0.000179)	(0.000127)
Marketplace	-0.000126	-0.000130	2.20e-05	0.000234
	(0.000191)	(9.68e-05)	(0.000152)	(0.000145)
Tarmac (Paved road)	0.000369**	-0.000168*	-0.000239*	3.81e-05
	(0.000149)	(0.000101)	(0.000144)	(8.90e-05)
Agrodealer	1.85e-05	2.74e-05	9.81e-05	-9.14e-05
	(0.000185)	(9.65e-05)	(0.000166)	(0.000131)
Latitude of homestead	-0.00178	0.000370	0.00335*	0.00199
	(0.00203)	(0.00102)	(0.00196)	(0.00139)
Longitude of homestead	0.00373	0.00302	0.00946	0.000174
	(0.0107)	(0.00568)	(0.0110)	(0.00564)
Difference from 19-year average (mm):				
1-year lag total precipitation	-6.03e-05	6.80e-05	-0.000115	-3.01e-05
	(9.28e-05)	(4.44e-05)	(8.22e-05)	(5.65e-05)
2-year lag total precipitation	7.95e-05	-8.60e-05*	-0.000160*	-5.51e-05
	(9.27e-05)	(4.40e-05)	(8.78e-05)	(5.17e-05)
3-year lag total precipitation	3.19e-05	3.35e-05	0.000191**	9.11e-06
	(0.000104)	(4.50e-05)	(9.10e-05)	(5.84e-05)
Difference from 14-year average (degrees K):				
1-year lag mean temperature	0.00468	0.00434	-0.00625	0.00318
	(0.00854)	(0.00499)	(0.00868)	(0.00624)
2-year lag mean temperature	-0.0319	-0.0209	-0.0217	-0.0442**
	(0.0312)	(0.0188)	(0.0296)	(0.0201)
3-year lag mean temperature	0.0267	0.0183	0.0300	0.0439**
	(0.0298)	(0.0181)	(0.0291)	(0.0182)

Table A15 (cont'd)

District fixed effects	Yes	Yes	Yes	Yes
Observations	26,604	26,516	9,309	9,156

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses are clustered at the SEA level.
Source: author, with data from IAPRI (2012), IAPRI (2015), IAPRI (2019), Maidment et al. (2014), McNalley et al. (2016)

REFERENCES

REFERENCES

Assessment Capacities Project. (2019). Zambia Drought- Southern Province. *Assessment Capacities Project Briefing Note No.11*. Geneva, CH. Accessed 10/28/19 at https://www.acaps.org/sites/acaps/files/products/files/20190711_acaps_start_briefing_note_drought_zambia_final.pdf

African Union (AU). (2006). African Youth Charter. Adopted 2 July 2006, Addis Ababa ET. Accessed on 4/28/2020 at https://au.int/en/treaties/african-youth-charter

African Development Bank. (2016). Country profile: republic of Zambia. *African Development Bank*. Lusaka, Zambia. Accessed on 03/20/2020 at https://www.afdb.org/en/countries/southern-africa/zambia

Barry, M., & Danso, E. K. (2014). Tenure security, land registration and customary tenure in a peri-urban Accra community. *Land use policy*, *39*, 358-365.

Beegle, K., de Weerdt, J., & Dercon, S. 2011. Migration and Economic Mobility in Tanzania: Evidence from a Tracking Survey. *The Review of Economics and Statistics*, *93*(3), 1010-1033.

Beegle, K., & Poulin, M. (2012). Migration and the Transition to Adulthood in Contemporary Malawi. *World Bank Research Papers.* Washington, DC.

Bezu, S., & Holden, S. (2014). Are Rural Youth in Ethiopia Abandoning Agriculture? *World Development*, *64*, 259-272.

Bizaz, E., & Elie, J. (UNICEF). (2014). Migration, Employment and Youth Perspective from West Africa. *Cortina, J., Taran, P and Raphael, A. Migration and youth: challenges and opportunities series.* New York.

Boley, J. (2018). Zambia: Energy sector overview. *United States Agency for International Development*. Accessed on 03/20/2020 at https://www.usaid.gov/powerafrica/zambia.

Brambilla, I., & Proto, G. (2011). Market structure, outgrower contracts, and farm output. Evidence from cotton reforms in Zambia. *Oxford Economic Papers*, *63*(4), 740-766.

Central Statistical Office (2012). 2010 Census of Population and Housing National Analytical Report. *Central Statistical Office*, Lusaka.

Central Statistical Office (2013). 2012 Zambia Labour Force Survey Report. *Central Statistical Office*, Lusaka.

Chamberlin, J. (2013). Unpublished Ph.D. dissertation essay "Population density, remoteness and farm size: Exploring the paradox of small farms amidst land abundance in Zambia."

Department of Agricultural, Food and Resource Economics, Michigan State University. East Lansing, MI.

Chamberlin, J., & Ricker-Gilbert, J. (2016). Participation in Rural Land Rental Markets in Sub-Saharan Africa: Who Benefits and by How Much? Evidence from Malawi and Zambia, *American Journal of Agricultural Economics*, *98*(5), 1507–1528.

Chamberlin, J., Sitko, N., & Jayne, T. (2020). Rural in-migration and agricultural development: Evidence from Zambia. *Agricultural Economics*. **https://doi.org/10.1111/agec.12567**

Cheng, S., & Long, J. S. (2007). Testing for IIA in the Multinomial Logit Model. *Sociological Methods & Research*, *35*(4), 583–600.

Chiang, Y. L., Hannum, E., & Kao, G. (2015). It's not just about the money: Gender and youth migration from rural China. *Chinese sociological review*, *47*(2), 177-201.

Chileshe, M., & Nkombo, N. (2019). Migration in Zambia: A country profile. *International Organization for Migration*. Lusaka.

Dako-Gyeke, M. (2016). Exploring the migration intentions of Ghanaian youth: A qualitative study. *International Migration and Integration*, *17*(3), 723-744.

de Brauw, A., & Mueller, V. (2012). Do Limitations in Land Rights Transferability Influence Mobility Rates in Ethiopia? *African Economies*, *21*(4), 548-579.

de Brauw, A., Mueller, V., and Lee, H. (2014). The Role of Rural–Urban Migration in the Structural Transformation of Sub-Saharan Africa. *World Development*, *63*, 33-42.

de Brauw, A. (2019). Rural youth: determinants of migration throughout the world. *IFAD Research Series* (55). Rome.

De Haas, H. (2010) The Internal Dynamics of Migration Processes: A Theoretical Inquiry. *Ethnic and Migration Studies*, *36*(10), 1587-1617, DOI: 10.1080/1369183X.2010.489361

Deininger, K., & Jin, S. (2005). Tenure security and land-related investment: Evidence from Ethiopia. *European Economic Review 50*, 1245-1277.

Dell, M., Jones, B., & Olken, B. (2014). What Do We Learn from the Weather? The New Climate-Economy Literature. *Economic Literature*, *52*(3), 740-798.

Deotti, L., & Estruch, E. (2016). Addressing rural youth migration at its root causes: A conceptual framework. Food and Agriculture Organization Report. Rome.

Dorward, A., Anderson, S., Bernal, Y., Vera, E., Rushton, J., Pattionson, J., & Paz, R. (2009). Hanging in, Stepping up, and Stepping Out: Livelihood Aspirations and Strategies of the Poor. *Development in Practice*, *19*(2), 240-247.

Elder, S. (2009). Key indicators of youth labour markets: Concepts, definitions and tabulations. *International Labour Organization.* Accessed on 04/28/20 at https://www.ilo.org/employment/Whatwedo/Instructionmaterials/WCMS_140860/lang--en/index.htm

FAOSTAT (2020). Food and Agriculture Organization database. Accessed on 03/27/20 at http://www.fao.org/faostat/en/#data.

Feder, G., & Onchan, T. (1987). Land ownership security and farm investment in Thailand. *American Journal of Agricultural Economics*, *69*(2), 311-320.

Fjelde, H., & Uexkull, N. (2012). Climate triggers: Rainfall anomalies, vulnerability and communal conflict in Sub-Saharan Africa. *Political Geography*, *45*, 98-99

Food and Agriculture Organization (FAO). (2011). Guidelines for the preparation of livestock sector reviews. Animal Production and Health Guidelines. No. 5. Rome. Accessed on 04/28/20 at http://www.fao.org/3/i2294e/i2294e00.htm

IFAD, F. (2014). Youth and agriculture: Key challenges and concrete solutions. *Published by the Food and Agriculture Organization of the United Nations (FAO) in collaboration with the Technical Centre for Agricultural and Rural Cooperation (CTA) and the International Fund for Agricultural Development (IFAD). Rome*.

Food and Agriculture Organization (2017). Evidence on internal and international migration patterns in selected African countries. *Rural Employment Series.* Rome. Accessed on 04/28/20 at http://www.fao.org/reduce-rural-poverty/resources/resources-detail/en/c/1062085/

Food and Agriculture Organization (2020). Rural youth- FAQs. Accessed on 04/01/20 at http://www.fao.org/ruralyouth/faqs.html

Foster, A. & Rosenzweig, M. (2001). Imperfect commitment, altruism, and the family: Evidence from transfer behavior in low-income rural areas. *Review of Economics and Statistics*, *83*(3), 389-407.

Gachassin, M. (2013). Should I Stay or Should I Go? The Role of Roads in Migration Decisions. *African Economics*, *22*(5), 796-826.

Green, E. & M. Norberg. 2018. Traditional Landholding Certificates in Zambia: Preventing or Reinforcing Commodification and Inequality? *Southern African Studies*, *44*(4), 613-628.

Haggblade, S., Hazell, P. B., & Reardon, T. (Eds.). (2007). Transforming the rural nonfarm economy: Opportunities and threats in the developing world. *Intl Food Policy Res Inst*.

Haggblade, S., Hazell, P., & Reardon, T. (2010). The rural non-farm economy: Prospects for growth and poverty reduction. *World development 38*(10), 1429-1441.

Hall, R., Scoones, I., & Tsikata, D. (2017). Plantations, outgrowers and commercial farming in Africa: agricultural commercialisation and implications for agrarian change. *Peasant Studies 44*(3), 515-537. DOI: 10.1080/03066150.2016.1263187

Harris, J. & Todaro, M. (1970). Migration, unemployment and development: a two-sector analysis. *The American economic review, 60* (1), 126-142.

Hausman, J. & McFadden, D. (1984). Specification Tests for the Multinomial Logit Model. *Econometrica 52*(5), 1219-1240.

Herrera, C., & Sahn, D. (2013). Determinants of internal migration among Senegalese youth. *Cornell Food and Nutrition Policy Program Working Paper 245*.

Ho, P., & Spoor, M. (2006). Whose land? The political economy of land titling in transitional economies. *Land use policy*, *23*(4), 580-587.

Holden, S., & Otsuka, K. (2014). The roles of land tenure reforms and land markets in the context of population growth and land use intensification in Africa. *Food Policy 48*, 88-97.

IAPRI. (2012). The 2012 Rural Agricultural Livelihoods Survey (for Small and Medium Scale Holdings) Interviewer's Instruction Manual. Lusaka, Zambia.

IAPRI. (2015). The 2015 Rural Agricultural Livelihoods Survey (for Small and Medium Scale Holdings) Interviewer's Instruction Manual. Lusaka, Zambia.

IAPRI. (2019). The 2019 Rural Agricultural Livelihoods Survey (for Small and Medium Scale Holdings) Interviewer's Instruction Manual. Lusaka, Zambia.

International Labour Organization (2020). Country profiles- ILOSTAT. Accessed on 04/22/2020 at https://ilostat.ilo.org/data/country-profiles/.

Imai, K. S., Gaiha, R., & Garbero, A. (2017). Poverty reduction during the rural–urban transformation: Rural development is still more important than urbanisation. *Policy Modeling*, *39*(6), 963-982.

Imbert, C., & Papp, J. (2020). Costs and benefits of rural-urban migration: Evidence from India. *Development Economics.* doi: https://doi.org/10.1016/j.jdeveco.2020.102473.

Jayne, T. S., Chamberlin, J., Traub, L., Sitko, N., Muyanga, M., Yeboah, F. K., ... & Kachule, R. (2016). Africa's changing farm size distribution patterns: the rise of medium-scale farms. *Agricultural Economics*, *47*(S1), 197-214.

Kalumbi, C. (2013). 2012 Zambia labour force survey report. Central Statistical Office. Government Printing Department. Lusaka, Zambia.

Kosec, K., Ghebru, H., Holtemeyer, B., Mueller, V., & Schmidt, E. (2018). The effect of land access on youth employment and migration decisions: Evidence from rural Ethiopia. *American Journal of Agricultural Economics*, *100*(3), 931-954.

Lanjouw, J. & Lanjouw, P. (2001). The rural non-farm sector: issues and evidence from developing countries. *Agricultural Economics, 26*(1), 1-23.

Long, J. S., & Freese, J. (2014). Regression models for categorical dependent variables using Stata 3rd edn. Stata press.

Mabiso, A., & Benfica, R. (2019). The narrative on rural youth and economic opportunities in Africa: facts, myths and gaps. *IFAD RESEARCH SERIES 61* (No. 2165-2020-361).

Mabogunje, A. (1970). Systems approach to a theory of rural-urban migration. *Geographical analysis, 2*(1) 1-18.

Maidment, R., D. Grimes, R.P.Allan, E. Tarnavsky, M. Stringer, T. Hewison, R. Roebeling & E. Black (2014). The 30 year TAMSAT African Rainfall Climatology And Time series (TARCAT) data set. *Geophysical Research* DOI: 10.1002/2014JD021927.

Management of Social Transformations (2017). Migration as a development challenge: analysis of root causes and policy implications. *UNESCO Report.* Accessed on 04/24/20 at https://unesdoc.unesco.org/ark:/48223/pf0000247089

McNally, A., et al. (NASA/GSFC/HSL). (2016). FLDAS VIC Land Surface Model L4 Monthly 0.25 x 0.25 Degree for Southern Africa (GDAS and RFE2) V001. Greenbelt, Maryland: Goddard Earth Sciences Data and Information Services Center (GES DISC). Accessed: 03/18/2019 at 10.5067/RS9NFRACQ33N.

Mercandalli, S., and Losch, B. (2017). *Rural Africa in motion. Dynamics and drivers of migration South of the Sahara*. FAO.

Moraga, J. (2013). Understanding different migrant selection patterns in rural and urban Mexico. *Development Economics, 103*, 182-201.

Mordant, N. & Mfula, C (2019/03/20). Zambia slaps miner First Quantum with $8 billion tax bill. Reuters. Accessed on 04/27/2020 at https://www.reuters.com/article/us-zambia-tax/zambia-slaps-miner-first-quantum-with-8-billion-tax-bill-idUSKBN1GW2FD

Msigwa, R., & Mbongo, J. (2013). Determinants of Internal Migration in Tanzania. *Economics and Sustainable Development, 4*(9), 28-35.

Mueller, V., & Thurlow, J. (Eds.). (2019). Youth and jobs in rural Africa: Beyond stylized facts. *Oxford University Press*.

Mullan, K., Grosjean, P. & Kontoleon, A. (2011). Land Tenure Arrangements and Rural-Urban Migration in China. *World Development, 39*(1), 123-133.

Munshifwa, E. 2018. Customary Land Governance in Zambia: Inertia, Confusion, and Corruption. Prepared for presentation at the 2018 World Bank Conference on Land and Poverty, March 19-23, 2018. Washington, DC: The World Bank.

Nchito, W. (2010). Migratory patterns in small towns: the cases of Mazabuka and Kalomo in Zambia. *Environment and Urbanization, 22*(1), 91-105.

Philips, L., & Pereznieto, P. (2019). Unlocking the potential of rural youth: the role of policies and institutions. IFAD Research Series 57. *Available at SSRN 3532476*

Proctor, F., & Lucchesi, V. (2012). Small-scale farming and youth in an era of rapid rural change. IIED/HIVOS, London/The Hague.

Quan, J. (2000). Land tenure, economic growth and poverty in sub-Saharan Africa. In Toulmin, C., and Quan, J., eds. Evolving Land Rights, Policy, and Tenure in Africa. London.

Ritsilä, J., & Ovaskainen, M. (2001). Migration and regional centralization of human capital. *Applied Economics, 33*(3), 317-325.

Rwomushana, I., M. Bateman, T. Beale, P. Beseh, K. Cameron, M. Chiluba, V. Clottey et al. (2018). "Fall armyworm: impacts and implications for Africa Evidence Note Update, October 2018." *Report to DFID. Wallingford, UK: CAB International*.

Sakho-Jimbira, S. and Bignebat, C. (2006). Local diversification of income sources versus migration: Complements or Substitutes? Evidence from rural families of the Senegalese Groundnut Basin. Presented at the 106th seminar of the EAAE, Pro Poor Development in low income countries: Food, agriculture, trade and environment. Montpellier, France. Presented 25-27 October 2007.

Sitko, N. J., & Chamberlin, J. (2016). The geography of Zambia's customary land: assessing the prospects for smallholder development. *Land Use Policy, 55*, 49-60.

Sitko, N. J., & Jayne, T. S. (2014). Structural transformation or elite land capture? The growth of "emergent" farmers in Zambia. *Food Policy, 48*, 194-202.

Smalley, R. (2013). Plantations, Contract Farming and Commercial Farming Areas in Africa: A Comparative Review. Land and Agricultural Commercialisation in Africa (LACA). Future Agricultures Consortium Working Paper no 55.

Sommerville, M., Bouvier, I., Chuba, B., & Minango, J. (2017). Land Documentation in Zambia: A Comparison of Approaches and Relevance for the National Land Titling Program. *Proceedings of the Responsible Land Governance: Towards an Evidence Based Approach*, Washington, DC.

Sumberg, J., Flynn, J., Mader, P., Mwaura, G., Oosterom, M., Sam-Kpakra, R., & Shittu, A. I. (2019). Formal-sector employment and Africa's youth employment crisis: Irrelevance or policy priority?. *Development Policy Review,* 38, 428– 440. https://doi.org/10.1111/dpr.12436

Trading Economics. (2020). Zambia Statistics on Trade and Employment. Accessed on 11/13/2019 at https://tradingeconomics.com/zambia/indicators

Toulmin, C. (2008). Securing land and property rights in sub-Saharan Africa: the role of local institutions. *Land use policy, 26*(1), 10-19.

United States Agency for International Development (USAID) (2017). Zambia country profile. Accessed on 04/14/20 at https://www.land-links.org/country-profile/zambia/#land

United Nations (2020). Department of Economic and Social Affairs Youth division FAQs. Accessed on 04/23/20 at https://www.un.org/development/desa/youth/what-we-do/faq.html

Van der Geest, K. (FAO). (2010). Rural youth employment in developing countries: A global view. *Rural Employment Series,* Rome.

Wang, X., Huang, J., & Zhang, L. (2014). Creating the entrepreneur farmers needed yesterday, today and tomorrow. In proceedings of IFAD Conference on New Directions for Smallholder Agriculture, 24–25 January, 2011. Forthcoming in IFAD/OUP publication: New Directions for Smallholder Agriculture, edited by P. Hazel et al., 2012.

World Bank. (2019). World Bank Development Indicators. World Bank. Accessed on 11/22 at https://datacatalog.worldbank.org/dataset/world-development-indicators.

Wineman, A., & Jayne, T. (2017). Intra-rural migration and pathways to greater well-being: Evidence from Tanzania. Food Security Policy Research Paper 60.

Yeboah, F., Jayne, T., Muyanga, M. & Chamberlin, J. (2019). Youth Access to Land, Migration and Employment Opportunities: Evidence from Sub-Saharan Africa Papers of the 2019 Rural Development Report. IFAD Research Series 53. Available at SSRN: https://ssrn.com/abstract=3523765 or http://dx.doi.org/10.2139/ssrn.3523765

Zoomers, A., Van Noorloos, F., Otsuki, K., Steel, G., & Van Westen, G. (2017). The rush for land in an urbanizing world: From land grabbing toward developing safe, resilient, and sustainable cities and landscapes. *World Development*, *92*, 242-252.