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Zambia Buy-in

CORRELATIONS BETWEEN LAND AND OPPORTUNITY ACCESS AND MIGRATION STATUS AMONG YOUTH AND YOUNG ADULTS: EVIDENCE FROM ZAMBIA

By

Megan O. Bellinger, Milu Muyanga, David Mather, Henry Machina, and Nicole M. Mason

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AUTHORS

Megan O. Bellinger is a graduate student at Michigan State University.

Milu Muyanga is an assistant professor at Michigan State University.

David Mather is an assistant professor at Michigan State University.

Henry Machina is a research associate with Indaba Agricultural Policy Research Institute.

N**icole M. Mason** is an associate professor at Michigan State University.

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EXECUTIVE SUMMARY

Great attention is paid on an international scale to the flow of people away from rural areas, with the prevailing opinion suggesting that there is a mass migration from rural villages to increasingly overcrowded cities. However, rural to rural (intra-rural) migration remains an important source of mobility for individuals, especially those who wish to remain connected to their families and places of origin (see FAO 2007). Migration can achieve a multitude of objectives for individuals and their families, as well as the communities who send and receive the migrants. These objectives include income diversification, geographic diversification, risk reduction, social network growth, and income stabilization (Sakho-Jimbira and Bignebat 2006; FAO 2007). The situations and motivations of youth and young adults, which we define as 15-24 and 25-35 year olds, respectively, are of particular interest to us because people in this age group have a lifetime of productivity and income generation ahead of them. They are also entering the workforce as Zambia becomes more integrated into the global market, takes in investment from outside countries, and faces previously unforeseen challenges and opportunities in access to land and non-farm and off-farm employment.

The goal of this paper is to assess the impact of various drivers of migration on the decisions made by youth and young adults to migrate, with a particular emphasis on the impacts of land access, inheritance patterns, and business and wage opportunities in migration decisions. We investigate this research question using descriptive and econometric analysis of data from the Rural Agricultural Livelihood Survey (RALS). In this work, information from 2012 serves as explanatory variables related to an outcome of having migrated by the next survey wave in 2015. Variables of interest and control variables were chosen through a literature review of current work on youth and migration in Africa.

Results indicate that the ability to buy and sell land is correlated with a higher likelihood of migration for those who migrated to rural areas and for those aged 15-24. However, we find that for all age categories, nonfarm employment opportunities have significant correlations with likelihood of migration. Participation in businesses in natural resources (such as charcoal selling or fishing) and businesses in construction (such as brickmaking) are strongly associated with a lower likelihood of migration among youth in the sample. By contrast, employment in a private nonagricultural wage or salaried job (such as working for a bank) is associated with a much higher likelihood of migration among young adults. In the overall sample, participation in value-added food businesses (such as owning a bakery) and private non-agricultural businesses (such as shop owning or tailoring) are associated with lower likelihoods of migration.

Additionally, when broken out by destination type (rural or urban) we find that individuals who are engaged in a relatively profitable business activity are less likely to migrate to rural areas, while young adults who are engaged in salaried or wage employment are more likely to migrate, especially to an urban destination.

Not only is it important to understand driving factors associated with migration to contribute to the international literature on the subject, better understanding of these factors may also be important to communities who hope to retain their young populations or attract others to contribute to agricultural and off-farm community productivity and development.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

AIC	Akaike Information Criterion
APE	Average Partial Effect
AU	African Union
CRE	Correlated Random Effects
CSO	Central Statistical Office
UN DESA	United Nations Department of Economic and Social Affairs
IAPRI	Indaba Agricultural Policy and 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
MoA	Ministry of Agriculture
RALS	Rural Agricultural Livelihoods Survey
SSA	Sub Saharan Africa
TAMSAT	Tropical Applications of Meteorology using Satellite data and ground-based observations
TLU	Tropical Livestock Units
UNICEF	United Nations Children's Fund
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
UN DESA	United Nations Department of Economic and Social Affairs
YA	Young Adult
YYA	Youth and Young Adult

1. INTRODUCTION

As populations in Sub-Saharan Africa (SSA) expand, countries are experiencing demographic shifts that are common in emerging economies. They are transitioning from a bottom-heavy population distribution towards a more middle-weighted distribution, where many more citizens are surviving into productive years (UNICEF 2017; World Population Review 2019). This brings youth (ages 15-24) and young adults (ages 25-35) into an important role as those with the largest future economic potential in both on and off farm activities, representing an opportunity for growth in local economies and overall Gross Domestic Product (GDP). The continent regards its youth and young adults (YYA) as a precious resource, as indicated by the African Union's Youth Charter, written in 2006. The charter emphasizes the need to encourage youth involvement in agricultural and commercial endeavors, particularly in rural areas, and discusses the importance of securing opportunities for youth to be involved in sustainable livelihoods at sufficient employment levels (AU 2006; Proctor and Lucchesi 2012). Without sufficient economic opportunities, rural YYA may leave their home areas, which (while not always a problem) can be detrimental to communities who lose the associated social and human capital. This can also be a problem for the individuals if they cannot obtain better employment in their new destinations (Bezu and Holden 2014). Zambia currently experiences higher unemployment in urban areas than in the country as a whole, suggesting that out-migration from rural areas to urban destinations may not be beneficial to either the individuals migrating or the urban destinations themselves. Additionally, urban populations are growing more rapidly than rural populations, a common phenomenon around the world that generates the possibility of population growth outpacing economic and job growth in these areas (Trading Economics 2019).[1]

Zambia sits in an important niche of Africa's population and production opportunities, particularly in upcoming years. The United Nations Department of Economic and Social Affairs (UN DESA) predicts that Zambia will be one of the highest contributors to continued population growth in SSA, suggesting that the YYA population in the country will be increasing significantly in the coming years. Given that the majority of YYA were living in rural areas as at 2012, and that youth unemployment rates are estimated to be over 50%, it is critically important to understand what factors are associated with migratory flows of this demographic within the country (World Bank 2019). In this paper, we use descriptive and econometric analysis of data from a recent panel survey of smallholder farm households in Zambia to investigate factors that are associated with migration of youth and young adults to either urban areas or to other rural areas.

One of the most commonly cited reasons why individuals migrate is to mitigate risk and diversify their household's sources of income. As individuals try to maximize their incomes in the face of uncertainty, migration to better farming areas or participating in different types of opportunities can sometimes be their best option. Depending on the opportunities and constraints facing a given individual and household, diversifying their household's income sources, both spatially (through migration) and by income type (through non-farm activities), can improve individual and household incomes while also reducing the household's exposure to farm production risk. In rural contexts, there are broadly two categories of opportunities available to individuals to earn income: farming activities, and non-farm activities (Imai, Gaiha, and Garbero 2017). We take each category and examine how access to these activities are associated with an individual's migration decision.
A robust rural non-farm economy has been previously linked to lower rates of outmigration, and a paucity of opportunity off the farm has been linked to outmigration (de Brauw, Mueller, and Lee

[1] That said, this definition of employment captures *working for family gain* even if the individual earns no income, which counts family farm work as employment even if the individual is not earning money from their labor. .

2014; Lanjouw and Lanjouw 2001). By "increasing opportunities at home [in rural areas]" governments and academics alike see an opportunity to encourage more sustainable economic growth throughout the economy (Deotti and Estruch 2016; Dorward et al. 2009; Imai, Gaiha and Garbero 2017). The prevalence of off-farm income opportunities, in both rural and urban areas, also play a role in helping farmers scale up their operations and increase their productivity (Sitko and Jayne 2014). These factors motivate the need for appropriate population distribution and improved employment opportunities for the growing workforce throughout the country (UN DESA 2015). Additionally, there is reason to believe that access to opportunities to engage in agricultural or non-agricultural income activities may influence an individual's migration decision (Lanjouw and Lanjouw 2001; Kosec, Ghebru, and Holtemeyer 2016; Mabogunje 1970).

While the rural non-farm economy has been lauded as a significant factor in improving rural household incomes, viable agricultural livelihoods are perhaps even more important (Haggblade, Hazell and Reardon 2010; Imai, Gaiha, and Garbero 2017). Inadequate access to arable land is often considered to be one of the most significant constraints to participation in agriculture, and the constraint is often most pronounced among YYA (Green and Norburg 2018; Munshifwa 2018). While average farm sizes in Zambia tend to be higher than its neighbors, we are still interested in whether perceptions of land availability, as well as how land is obtained and transferred and control over different types of land, are associated with YYA individuals' migration decisions (de Brauw and Mueller 2012; Sitko and Chamberlin 2016). Additionally, as climate change begins to negatively affect farming communities more severely, resilience strategies and the potential to migrate to an area with more productive farmland will become increasingly important (Sakho-Jimbira and Bignebat 2006). For example, in recent years the Southern Province in Zambia has experienced adverse weather conditions that have significantly impede crop production, so this once highly productive area may well experience significant out-migration as individuals look for more productive farmland elsewhere (ACAPS 2019; Long and Ort 2010).

This paper contributes to the literature on migration in several ways. While the focus given to migration between rural communities is gaining attention among scholars, much of this literature treats migration as an explanatory variable, which measures the effects of migration on outcomes such as consumption or risk mitigation (Wineman and Jayne 2017; De Weerdt and Hirvonen 2012). By contrast, the survey data we use enables us to focus instead on factors that are associated with the migration decision of youth and young adults in Zambia, which we define as 15-24 and 25-35 year olds, respectively. Our inclusion of recent years' temperature and precipitation information also allows us to account for climate factors that may be confounding the migration decision, and is possible due to geospatial coordinate information collected for each household in our survey data. Finally, information from our survey on participation at the individual level in off and non-farm activities is a further asset that gives us an unusual level of insight into the association that such activities may have on migration decision.

This work also contributes to the literature by its examination of both understudied explanatory factors and factors with disputed direction of impact on migration decisions. We examine multiple measures of household land tenure and access, including renting land, owning titled land, and perceptions of the ability to purchase or sell land. The prevailing literature on migration does not normally take into account the impact having titled land may have on likelihood of migration, or how the impact of titled land is different from inherited land or rented land. However, this is an important distinction to account for because the process of converting land from customary to titled status is a common policy focus area in Zambia and other Sub-Saharan nations (de Brauw and Mueller 2012; Ho and Spoor 2006). In addition, we investigate whether access to crop outgrower schemes are associated with an individual's migration decision from the perspective of a landholder.

By contrast, the bulk of literature on either contract farming or agricultural labor and migration tends to focus on landless migrants (Hall, Scoones, and Tsikata 2017; Smalley 2013). Finally, the special case of Zambia as a relatively land-abundant country whose population is poised to grow significantly in coming decades, makes understanding why young members of its population are moving more important in the coming years.

The paper is organized as follows: Section two provides background on the main drivers of interest for our study. Section three describes the study's research methods and data source. Section four discusses the conceptual framework and section five covers empirical strategy. Section six provides descriptive and econometric results of the study, and section seven covers our discussion of the results. Section eight concludes.

2. BACKGROUND AND SUMMARY OF KEY MIGRATION DRIVERS

2.1 General Overview

Migration is generally recognized as a vehicle by which individuals and their families can improve their livelihoods, whether by increased access to work or income, or by mitigating the negative consequences of a shock to the household (Mabogunje 1970; De Weerdt and Hirvonen 2012; Dorward et al. 2009). However, before concluding that migration is universally good for communities gaining new workers and universally bad for communities losing productive members, there is documentation to suggest that communities who both lose and gain migrants can benefit because of the remittances sent back to the sending community (McLeman 2018; De Haas 2005). Domestic remittances in Zambia accounted for 457.8 billion ZMK out of a total (domestic and international) market of 1.3 trillion ZMK circulating in the country in 2011, and can contribute to the cash in circulation in communities that have lost some of their productive workforce (Gondwe 2012). This suggests that a nuanced and thorough understanding of what factors are associated with the presence or absence of migration is important for all communities with populations in flux. There are several factors that influence an individual's decision making as they choose whether or not to migrate, which we will further explore below. We would also like to note that there are numerous other factors that may influence migration decision that are not covered in this section, but we will discuss those that we account for in the model when we discuss our empirical methods.

2.2 Land Tenure and Land Access in Zambia

Patterns of migration in many African nations are significantly affected by the land transfer and ownership processes, as well as by land tenure systems, as shown by evidence from Kenya and Ghana (Bruce and Migot-Adholla 1994; Sward 2017). Sticky or inflexible land markets can cause numerous challenges for individuals (Holden and Otsuka 2014). Those who cannot access land for farming may be forced to pursue alternative activities or leave their villages in search of land elsewhere. By contrast, individuals who would rather pursue alternative activities may not be able to because they feel obligated to take over farmland from their parents. Lastly, even in areas with functioning land markets, younger or resource poor individuals may be crowded out by older, wealthier, or even foreign investors (Holden and Otsuka 2014, Ho and Spoor 2006). This crowding out can lead to involuntary or unwanted migration.

Similarly to 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). The goal of this series of policy decisions was to promote economic development and equitable land access but is suffering setbacks as populations expand and the amount of inherited land per person becomes smaller from one generation to the next. Therefore, young people in Zambia and across the continent are having an increasingly difficult time establishing or accessing farmland of their own, which encourages migration to areas with more income generating opportunities (Deotti and Estruch 2016).

Upon Zambia's transition to independence, the country designated its land as either State, reserve, or trust, with the latter two categories making up most of the land available to farmers (Amankwah and Mvunga 1986). In general, it is difficult to obtain official ownership or title for reserve and trust land, which are now both referred to as customary. Rather, such land is allocated by the village head and can be passed from one generation to the next (Hall, Scoones, and Tsikata 2017). In an attempt to promote investment in customary land, which historically was unlikely without written records of ownership, the Lands Act of 1995 "recognized rights granted under these customary land governance structures" (Munshifwa 2018). This latest iteration of laws guiding land ownership and inheritance patterns intends to facilitate rental or borrowing of customary land by chiefdom, but has

come under criticism in recent years. Critics dislike the Lands Act's inability to properly include communities in decision making and the Act's predilection for corruption (Munshifwa 2018). Work in Zambia's Eastern Province on the impact of efforts to allocate land rights more equitably has shown that certification of customary land rights, which is similar to the commodification of land via titling, may perpetuate inequities in land distribution and access (Green and Norburg 2018). This suggests that even if land appears accessible it may not be equally accessible for all individuals.

Most land is governed by customary tenure rules, including allocation without titles by village leaders, indicating the continued importance of this legal framework addressing land access, particularly in rural areas. After various drafts that seek to update the land policy, the 2017 policy proposal suggests a goal of guaranteed security of customary tenure. It will attempt to accomplish this by developing guidelines for issuance of customary land titles, encouraging documentation of local land rights, allowing registered customary land interests to be transferred, and protecting customary interest in lands held communally (Munshifwa 2018). However, this latest draft is not to be taken as government policy, so individuals may not count on such policies being in place or protected by government until they accept and approve the draft. Additionally, since the newest draft was not written in 2012 households from this survey are operating under the assumption that land is generally not to be bought, sold or rented. There is evidence that strength of rental markets may also influence migration decision, as the ability to rent land can reallocate it more efficiently based on who is willing to farm it, allowing people to migrate or remain depending on their preferred income generating activity (Chamberlin and Ricker-Gilbert 2016). The prevalence of land rental is particularly important in the case where land ownership transfer is difficult or impossible based on local conditions (Mabogunje 1970; Kosec, Ghebru, and Holtemeyer 2016). It is well established that land tenure systems that provide assurance of an individual's long-term access to a given parcel of land can promote investments to improve the returns to that land (Place and Otsuka 2010; Gebremedhin and Swinton 2005; Barrows and Roth 1990). We thus assume that measures of land access, as well as their perception among rural individuals, to play an important role in the decision of youth and young adults to migrate or remain in their home communities.

2.3 Access to Farm and Non-farm Employment and Own Business Opportunities

2.3.1 Non Farm Income

As shown in the rural nonfarm economy literature, opportunities for off farm employment can influence migration decisions (Lanjuow and Lanjuow 2001). Communities with ample opportunity for alternative employment can enjoy high retention of their young population, while communities where farming is the only viable livelihood may see their young population exiting to seek opportunity elsewhere (Beegle, de Weerdt, and Dercon 2011). Additionally, with the unreliability inherent in climate change affecting farmers' expected harvests, and the general opinion youth hold that farming is not a viable livelihood, sources of off-farm income are becoming more important and attractive in individuals' estimations of how to allocate their scarce time and resources (Deotti and Estruch 2016; AU 2006; Haggblade, Hazell and Reardon 2007).

Employment in the non-farm rural economy is estimated to account for nearly a quarter of all rural employment, although this is likely an underestimate due to the informal nature of much non-farm labor. In addition, off-farm income is estimated to comprise at least one third of total rural income across Africa (Lanjouw and Lanjouw 2001; Bezu and Holden 2009; Haggblade, Hazell, and Reardon 2010). Dorward et al. (2009) note how important the availability of multiple income streams is in both breaking the cycle of poverty for individuals and in strengthening communities. As SSA, and Zambia specifically, increase their national GDP and global trade presence, it is becoming

increasingly important and profitable to engage in off-farm income generating activities, particularly those that add value to agricultural or natural resource products. As income across the country rises (as measured by GDP per capita), we also expect to see a growing demand for a larger variety of consumer goods, which will also encourage off-farm activity by making it more profitable due to consumption linkages that drive structural transformation towards a more diversified national economy (TE 2019; Lanjouw and Lanjouw 2001; Hirschman 1992).

We expect that the nature of the off and non-farm employment individuals are engaged in will affect both their decision to migrate and the type of destination they choose to migrate to: urban or rural (Haggblade, Hazell and Reardon 2010). There are arguments for the presence of different types of opportunities having disparate effects on migration decision making. For example, if there are ample remunerative non-farm income opportunities in a certain area, this may encourage youth and young adults to stay because they can foresee a stable financial future for themselves (Haggblade, Hazell, and Reardon 2010). Additionally, if an individual is the sole proprietor in a business, their investment of time and resources may encourage them not to migrate. Such businesses also often require knowledge of local conditions or rely on social connections, both of which are difficult to transplant from one area to another. However, salaried employment for a young person may provide motivation to leave, as the individual may have better resource access, innate ability, and the financial ability to discover and move to more lucrative jobs. This is particularly true for work in urban areas, following the mechanism of structural transformation (Hirschman 1992; De Brauw, Mueller, and Lee 2014). We expect salaried work to encourage migration particularly for the younger cohort because they are less likely to have already established their own family which would make moving more difficult. In both salaried and business employment, the net income an individual is making can impact their decision to continue with that activity or seek opportunities elsewhere.

2.3.2 Crop Outgrowing Opportunities

Participation in a highly remunerative agricultural activity, such as outgrowing of cotton, may also be a pull factor for younger household members because they can be more assured of relatively high farm income, especially in cases where the necessary inputs are difficult to access (Grosh 1994). Nearly all cotton grown in Zambia is produced under an outgrower scheme, which allows us to measure cotton production as a simple proxy for outgrowing opportunities in a community. Research in India posits that the presence of contract farming, or commercial farming more generally, can present as a pull factor to certain areas, especially for young people (Singh 2002). Recent work in Kenya, Zambia, and Ghana show that contract farming and outgrowing schemes produce the most local economic linkages of all kinds of agricultural commercialization (Hall, Scoones, and Tsikata 2017).

2.4 Climate Change

We consider climate factors, and the ways in which they change over time, as potential causes of migration. For example, *environmental migrants* are individuals or households who move because they feel that their current location may not be economically viable in the long term if weather patterns change for the worse (Dell, Jones, and Olken 2014; Fjelde and Uexkull 2012). Recent damage to maize crops in the Southern Province provide an example of one of the avenues by which the changing climate can significantly harm farmers and their families (FEWS NET 2019). In the past few years, farmers from Southern Province have begun gradually shifting north, where land and water are more readily available (Girard and Chapoto 2018). Resilience in the face of climate change is becoming an increasingly urgent topic in the international literature, and migration is one vehicle by which households can improve their resilience (Kelpsaite and Mach 2015). Although climate driven migration is certainly a major component in both international and subnational flows of

individuals, we do not focus on it here. We restrict ourselves to accounting for weather characteristics when building our model but these variables do not have an immediately intuitive interpretation, so we do not address them directly.

3. DATA

3.1 Household and Individual Level Data

The analysis utilizes two types of data. The first is from the Rural Agricultural Livelihood Survey (RALS), a nationally representative panel survey of smallholder farm households in Zambia from 2012 and 2015. 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. The RALS was implemented in June-July of 2012 and 2015 by the Indaba Agricultural Policy and Research Institute (IAPRI), in collaboration with the Zambia Central Statistical Office (CSO) and the Ministry of Agriculture (MoA). For details on the RALS sample design, see IAPRI (2012, 2015).

The 2012 wave of the survey consisted of 55,343 individuals, and from these, there are 14,121 in our age group of interest who are successfully re-interviewed in the 2015 wave of the survey. Within this age group, there are approximately 1,800 migrants.

The 2012 iteration of the survey is our source of explanatory variables, because the RALS survey doesn't follow those who migrate from their original household while the household remains in its original location. The 2015 wave is only the source of our information about who migrated, as well as their type of destination. While it is possible that our results could be affected by attrition bias, testing for such bias is beyond the scope of this paper.

3.2 Village-level Data

The second source of data is from satellite information stored in FLDAS and TAMSAT databases (see Maidment et al. (2014) and McNalley et al. (2016) for documentation). Total growing season (November to March) precipitation and average yearly temperature (October to September) for the five growing seasons preceding 2012 were calculated and mapped with ArcGIS as a grid of values. To combine this data with the survey information, we spatially located the households with their GPS coordinates, and overlaid the grid of weather variables. This allowed us to assign weather data points to each household based on the household location relative to the grid. These variables were included in the regression to control for weather conditions in the years leading up to the survey period and thus improve the accuracy of the measurement of our variables of interest.

4. CONCEPTUAL FRAMEWORK

Our conceptual framework is based on the previous literature on migration, much of which describes migration as a tool by which households increase their utility and/or mitigate their vulnerability to adverse shocks or events (Deotti and Estruch 2016). We conceptualize migration as a strategy or course of action by which individuals assume 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 rural village. Such opportunities may include inheritances, family holdings, or the business and agricultural opportunities available to individuals in their home village. Each of these opportunities are ways in which individuals can increase their wealth and, in the case of business activities, diversify their income so they are generally less vulnerable to risks and the uncertainty associated with many rural livelihoods (Fjelde and Uexkull 2015). Due to the nature of the survey data we use for this study, our analysis is limited to investigating the determinants of voluntary migration by individuals, as opposed to involuntary migration forced upon individuals by violence, persecution, or weather catastrophe. Conversely, poverty, food insecurity, and a lack of access to markets are underlined by the FAO as among the major *push* factors of migration and displacement, in particular in rural areas (Deotti and Estruch 2016).

A common conceptualization of the key factors that contribute to an individual's migration decision is that some push individuals to leave their village – such as poverty and food insecurity -- while others *pull* them to an urban or other rural area (Bezu and Holden 2014; Mabogunje 1970; Parkins 2010; Schoorl et al. 2000; Deotti and Estruch 2016). Because we do not have information on the destinations that migrants end up in, we cannot speak to pull factors in those areas, but we expect that a lack of opportunities both within agriculture and in the non-farm economy will act as a push factor, and will be positively associated with migration. By contrast, we expect factors that would act as pull factors to individuals from other areas (like having readily accessible land or a favorable business environment), will be negatively associated with likelihood of migration.

We limit our study to migrants who meet the African Union definition of *youth* because we propose that when choosing to migrate or stay in their current location, youth and young adults are uniquely influenced by factors such as land and resource access as well as the opportunity to engage in remunerative off-farm rural activities. Additionally, youth and young adults can represent the largest source of a community's future income and potential economic gains as they have many productive years ahead of them (Deotti and Estruch 2016; AU 2006).

We assume that individuals maximize their utility by assessing the economic opportunities they expect to have in their current location relative to opportunities in locations to which they have the chance to move (Ritsilä and Ovaskainen 2001; Li and Huffman 2000). These economic opportunities include participation in agricultural and/or non-farm activities, where the former includes both own crop and/or livestock production as well as wage employment on other farms. Non-farm activities include non-agricultural wage or salaried employment as well as own business activities.

We characterize an individual's migration decision as follows: the probability that a youth or young adult migrates is a function of our variables of interest (land and employment or opportunity access), expected climatic conditions, and household demographic and other characteristics. We assume that each individual has three options related to migration: (a) to migrate to another rural area (rural-rural migration; (b) to migrate to an urban area (rural-urban migration); or (c) to stay where they are. Each

option is associated with a utility, and the individual within the household will choose the decision that maximizes their individual utility.

We assume that an individual's decision to migrate is a function of a number of individual, household, and community-level factors, as follows:

$$P(migration) = P(land\ access, access\ to\ employment\ own\ business\ opportunities, market\ access, expected\ weather\ conditions, individual\ and\ household\ characteristics$$

5. EMPIRICAL MODELS AND ESTIMATION STRATEGY

5.1 Empirical Models

We adapt this general approach to our study of the determinants of youth and young adult migration by first modelling an individual's decision to either migrate or stay in their village. Second, we study the same determinants of migration with a dependent variable that takes the value of zero if the individual stays in the village, =1 if the individual migrates to another rural area, and =2 if the individual migrates to an urban area.

$$P(Migration)_{ih,2015} = \gamma_0 + x_{1h}\gamma_{land} + z_{2,ih}\gamma_{opportunity} + x_{3h}\gamma_3 + x_{4h}\gamma_4 + z_{3,ih}\gamma_5 + \theta_p + u_h \quad (1)$$

$$P(Destination)_{ih,2015} = \gamma_0 + x_{1h}\gamma_{land} + z_{2,ih}\gamma_{opportunity} + x_{3h}\gamma_3 + x_{4h}\gamma_4 + z_{3,ih}\gamma_5 + \theta_p + u_h \quad (2)$$

Here *Migration* refers to the sample of the dependent variables in question: we conduct analysis on the entire group of youth and young adults, as well as separately for the two age groups. We estimate these models with logit regressions. *Destination* is a factor variable with three possible outcomes: 0 if individual decides to stay in their home village; 1 if they migrate to a different rural area, and 2 if they migrate to an urban area. We estimate this model with a multinomial logit regression. In all model specifications, $x_{1,h}$ is the vector of land access variables, $z_{2,ih}$ is the vector of economic opportunity access variables at the individual level, $x_{3,h}$ are household controls (such as productive assets, demographics, and market access) $x_{4,h}$ are geographic and weather controls, $z_{3,ih}$ are individual demographic controls including age, gender, marital status and education level, and θ_p are provincial fixed effects. All explanatory and control variables are measured at their 2012 states, relative to the outcome variable which is measured by migration status as of 2015.

5.2 Estimation Strategy

Regressions of binary outcomes often use either probit or logit estimators, in which the main difference is a distributional assumption. We first use a logit regression to assess the strength and statistical significance of associations between a binary outcome that equals one if a youth or young adult decided to migrate after 2012 and equals zero otherwise. We then choose to run separate logit regressions for those in the youth and young adult categories in addition to the pooled logit because we find significant differences in some of our key explanatory variables between the age groups (see Tables A1-A4). This may be due to the fact that we have relatively fewer young adult migrants in our sample than youth migrants, and also because in households with young adults, those with a greater propensity to migrate have already left by the time of the first survey wave.

Given that the 2015 RALS survey collected the destination type of individual migrants from the 2012 survey (i.e., to another rural area or to an urban area), we next supplement our logit outcome analysis with a multinomial regression. Usage of a multinomial logit model, which is computationally more straightforward than a multinomial probit, requires an independent irrelevant alternative (IIA) assumption to hold (Hausman and McFadden 1984). For our context, this means that the final choice of destination when an individual migrates shouldn't be affected by the option that is not chosen. For example, if the individual is deciding between migrating to a rural area, migrating to an urban area, or staying in the same place, and they choose to migrate to a rural area, IIA assumes that they would make the same choice if they had presented with the options of migrating to a rural area or not migrating. Because the drivers of migrating to rural and urban areas are quite different (Cheng and Long 2007; Nchito 2010), we assume that the IIA assumption holds for our analysis.

5.3 Key Explanatory Variables

Unallocated land available to household: This binary variable captures the respondent's response to two questions. Question 1 asks "Do village authorities still have unallocated arable land that could be given to households in this area?" and question 2 (if response to 1 is yes) asks "If your household wanted more land, could some of this unallocated land be allocated to this household for cropping purposes?" The response for this question is recorded as *no* if the response to either question is no. It is recorded as *yes* if the respondent both thinks there is unallocated land available in the area and that they can have it allocated to them. This variable measures household perceptions regarding the potential that they could gain access to currently unused arable land (under customary tenure) to which they could obtain use rights for which the household does not have to pay.

Land Liquidity: This binary variable also captures the respondent's answer to two questions. It is recorded as *yes* if the respondent's answer to either of two questions is yes. Question 1 asks "is it possible to convert customary land to titled land in this village?" which would make the land officially transferrable between parties based on land laws. Question 2 asks "is it possible to sell or buy customary land without first converting it to titled?" This variable essentially measures whether or not land that is already in use by someone can change hands via a purchase transaction.

Titled and Rented Land: These are household-level binary variables that capture ownership of titled land and use of rented or borrowed land, respectively. If a household has one or more titled fields, this implies that individuals in that household have (in theory) more secure access to land, relative to land under customary tenure. If a household has rented in any fields, this implies that individuals in that household have an additional mode of accessing land that is not available to the vast majority of households.

Landholding per capita and land inherited (hectares): These two variables account for the land the household currently controls as well as the land it acquired via inheritance. It represents both the household's current land endowment and a path of land transfer through family lineage.
Participation in wage/salaried employment or own business activities: These indicator variables capture participation by the individual in any of five business and five wage generating activities in the 2011-2012 marketing season (1 May 2011-30 April 2012), For this paper we group wage and salaried employment together and refer to them more generally as wage activities. The categories are shown in Table 1 below.

Participation in low- and high-return wage employment or own business activities: In a separate specification of each of our regressions, instead of using the ten binary indicators of off-farm employment or own business activities noted just above, we use four. These four variables group the more disaggregated information on the individual's participation in off-farm activities into those that are wage or salaried employment separately from those that are own business activities. These two categories are further differentiated as either low- or high-return activities, where we define the return to each activity as gross income for employment or as gross income net of input costs for own business activities.

Table 1. Business and Wage Activities

Category	Example
Wage	
Farm work	Working on someone else's farm
Agricultural Value Added	Working for a crop or livestock processor
Government	Parastatal employees and Civil Servants
Private Non-Agricultural	Bank or mine employee
Tourism	Working for a safari or lodge
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

Source: all tables are produced by author with data from IAPRI 2012 and IAPRI 2015.

Cotton outgrowing in community: Cotton is a relatively high-return crop, which could potentially serve as a disincentive to migration for youth and young adults with access to both land and an outgrower scheme. We therefore include an indicator variable that is equal to one if cotton is produced in the village by any survey respondents. This variable controls for the opportunity to participate in this kind of high-return agricultural activity.

Other important control variables include household's ownership of livestock, which we convert to Tropical Livestock Units (TLUs[2]) as well as the value of farm equipment. These variables serve as a measure of both potential agricultural productivity as well as asset wealth. Higher levels of TLU could be associated with higher returns to farm activities, and thus serve as a deterrent to migration. However, as this is also a measure of one type of assets, it may have the opposite effect as wealthier households are 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 walls, roofs, and floors are made of basic or improved materials, and the value of household non-farm assets.

5.3.1 Other Control Variables

In addition to the variables previously discussed, the econometric models control for specific explanatory variables using values from the 2012 survey and our weather data (i.e., prior to the migration decision). These variables are motivated by a review of the literature and our research questions (e.g., Gachasssin 2013; Deotti and Estruch 2016; Kosec, Ghebru, and Holtemeyer 2016; Wineman and Jayne 2017). Those at the household-level include size of household and characteristics of the head (age of household head; years of education of head; year in which head settled in this area; and whether or not the head is considered a local). Other household-level variables include measures of market access such as the distance to the nearest: feeder road, agricultural market, tarmac road, and agro-dealer.

Using geospatial coordinates of each household, we also include two variables that measure weather conditions in the agricultural year of 2011/12. The first is the difference in precipitation in 2011/12

[2] 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)

relative to a 16-year moving average of precipitation, and the second is the average growing season temperature. We also include four additional lags of each of these two variables, for a total of five lags relative to the first year the individual may have migrated, 2012/13. To determine how many years of lagged weather variables should be included, we checked the impact of adding successive years of lags on the AIC, and we found that the value was optimized at five years of lags.

We also include the longitude and latitude of each household to capture other unobserved spatial factors, as well as provincial fixed effects (i.e., indicator variables). Finally, we include measures of several individual characteristics (for each youth or young adult) that are known to potentially affect an individual's migration decision, such as: education level of the individual, marital status, age, and gender.

5.4 Unobserved Time-constant Individual and Household Level Heterogeneity

The analysis we carry out is limited to some extent by the nature of the survey. For example, minimal information is captured for the individuals who leave after they have migrated and left the household. In addition, we are unable to take full advantage of the panel structure of our data because we cannot assume that household conditions in the second wave of the survey (2015) had an impact on decisions to migrate or remain before that point. This prevents us notably from employing correlated random effects (CRE), which leaves open the possibility that unobserved individual or household-level characteristics may be correlated with some of our explanatory variables. Such correlation potentially could result in omitted variable bias. We attempt to account for some place-related unobservables by including province fixed effects and latitude and longitude of the household as explanatory variables in the model[3]. Another shortcoming of the model lies in the data collection process: no information about the distance migrants moved, and so we cannot conclusively say whether or not the individual left their community or if they simply established their own household within the community of origin, if their destination was rural. Despite the econometric limitations we believe we have generated an informative model that allows us to discuss associations between land and opportunity access and migration decision among youth and young adults. This study can also be repeated when the data from the third wave of the RALS survey is released at the end of 2019, at which point another set of data will be available and it will be possible to reduce concerns about omitted variable bias through use of panel econometric techniques such as use of correlated-random effects.

[3] The GPS coordinates were captured via tablet in the 2015 wave of the survey and were plotted to ensure that points in the same cluster were near each other.

6. RESULTS

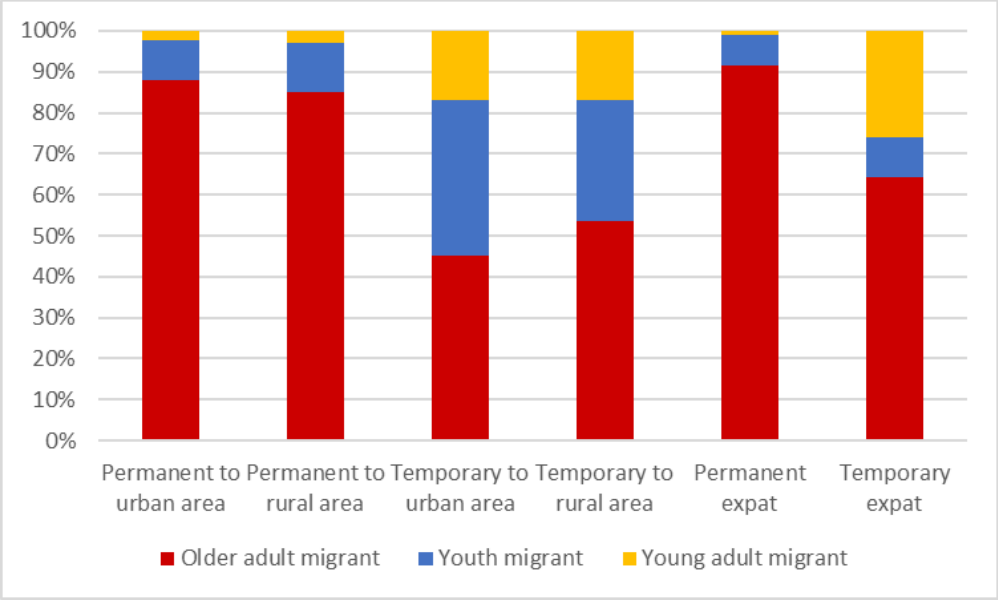
6.1 Descriptive Results

6.1.1 Prevalence of Migration by Age Group and Destination Type

In this section, we use descriptive analysis from the 2012 RALS household survey to evaluate the characteristics of youth and young adults that migrated between the 2012 and 2015 surveys, as compared with those that did not. Thirteen percent of the 14,121 individuals age 15-35 in the 2012 RALS sample migrated by 2015. When broken up into the age cohorts of interest, 15% of youth (15-24 year olds; n=1,326) in households re-interviewed in 2015 had migrated after 2012, as compared with 9% of young adults (25 to 35 year olds; n=444). It is not surprising that the sample of young adults is smaller than that of youth, because older individuals could have left the household prior to the first survey.

We find that among all possible age groups of migrants from rural areas, those above the age of 35 are predominantly moving permanently to other rural areas, which is the destination of 53% of this age category. However, for our age group of interest, temporary moves are more common, comprising about 60% of all youth migration and 72% of all young adult migration. Such results will naturally include at least in part individuals who are moving to go to school, particularly for individuals whose destination is urban, which is in part accounted for by including levels of completed education in the regression model. In this analysis we use a broad definition of migrants that includes individuals who left for schooling. Future work will check the robustness of our results by restricting our definition of migrants to exclude those that left their sending community to go to school.

Figure 1. Type of Migrant Destination by Age Group



Source: all figures produced by author with data from IAPRI 2012 and IAPRI 2015 unless otherwise noted.

6.1.2 Land Access for 2012 Survey Respondents

More than 70% of fields reported by the surveyed households are customary land that is allocated to the family by local authorities. Titled land, which can generally be bought and sold, makes up only 7.1% of all fields reported in the survey. Similarly, land rental is uncommon, making up just 3.5% of all reported fields. When summarized by household, we find that 8.5% of households own at least one titled field, while 6.7% of households rent or borrow at least one field. When calculated in terms of area, titled land comprises 7.7% of total land, and rented land comprises only 1.9% of total land.

Among the 8.5% of all households where at least one field is titled, the median size of titled holdings is 3.16 hectares, and makes up an average of 87% of total landholdings. Among the 6.7% of households with any amount of rental activity, the median landholding that is rented in or out is 0.98 hectares, comprising an average of 47% of total landholdings.

We transition to examining the land and assets available specifically within our cohort of youth and young adults. We find that the average inheritance discrepancy between migrants and nonmigrants is about 1.4 hectares to 1 for youth, respectively and 0.4 hectares to 0.7 for young adults, respectively. However, total landholdings for the household are nearly identical between migrants and nonmigrants for both groups, but youth migrants live in households with an average of 0.5 more hectares in landholdings than young adult migrants. We also find that households with young adults own fewer livestock assets as measured by tropical livestock units (see Table A4).

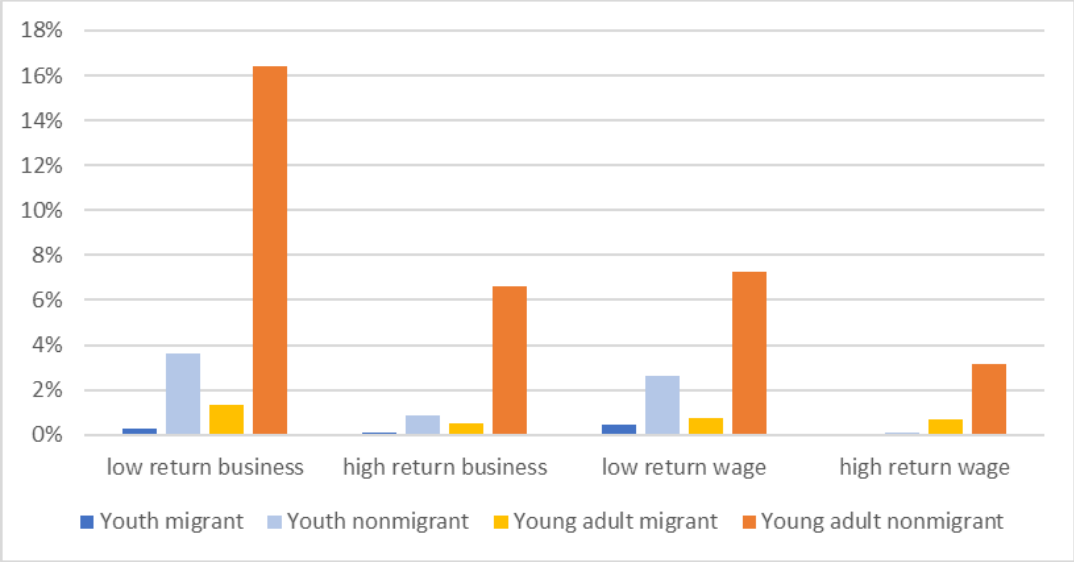
6.1.3 Demographics

The average education of migrants of both age groups relative to their non-migrant counterparts is statistically significantly higher, with nearly one extra year of education among the younger cohort and 1.3 years of extra education among the older cohort. Among both age categories, we find that a slightly higher percentage of household heads identify as local to their current homestead if the household has a migrant, when compared to corresponding homes with nonmigrant youth or young adults. We find that households with youth migrants are led by slightly older heads of household than households with youth nonmigrants. Similarly, we find that among households with young adults, the head is roughly two years older if the household has a migrant, and that head will have settled in their current location about one year later than households with young adult nonmigrants. It is also important to note that there are pronounced differences between the two age categories, which is partly attributable to the fact that roughly half of all household heads for those in the young adult category are young adults themselves. This may also help explain some of the discrepancies between the assets of households with youth and young adults. Household heads are nearly 10 years younger, on average, for young adults when compared to youth, and have correspondingly settled in their current location approximately five years later. This further motivates our decision to examine the two age categories of migrants separately in our regression.

6.1.4 Off Farm Opportunities

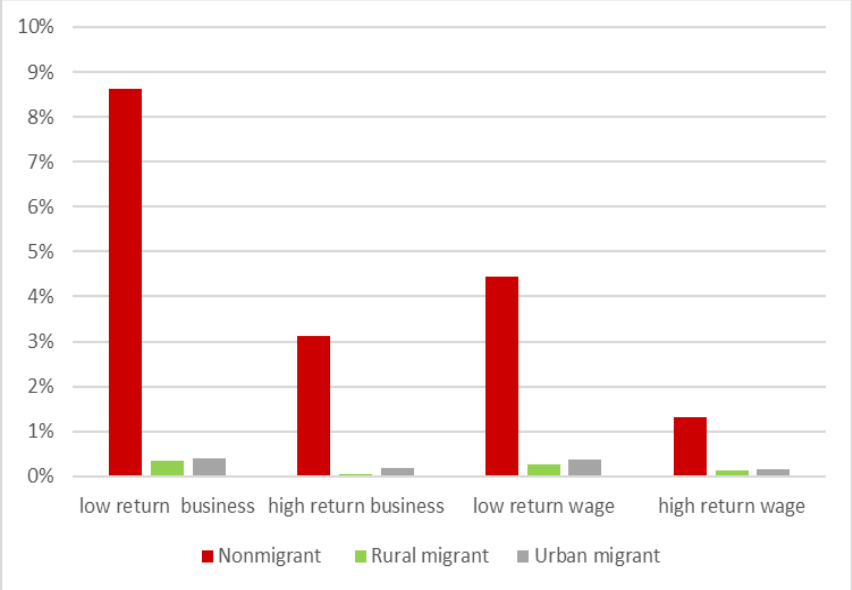
Among all youth and young adults in our sample, participation in any specific off-farm income generating activities such as own business, wage or salaried employment is relatively low (see Table A5). However, the data shows some initial discrepancies between age cohorts when grouped by the income generation of the activity (see Figure 2 below). Young adults in general have much better access to the various off-farm opportunities captured by the survey.

Figure 2. Percentage of Youth and Young Adults Engaged in Off-Farm Income Activities by Migration Status



Activities are classified as low return or high return by calculating their average net income (gross income less expenses for businesses, and gross income for wage or salaried work). Low return businesses are by far the most common in the overall population, followed by low return wage activities (see Figures 2 and 3). This may indicate there is room for future expansion of the rural nonfarm sector to include more lucrative jobs. We also see clearly from the descriptive statistics that nonmigrant individuals are participating in the nonfarm economy at a much higher rate than migrant individuals are, in both age groups.

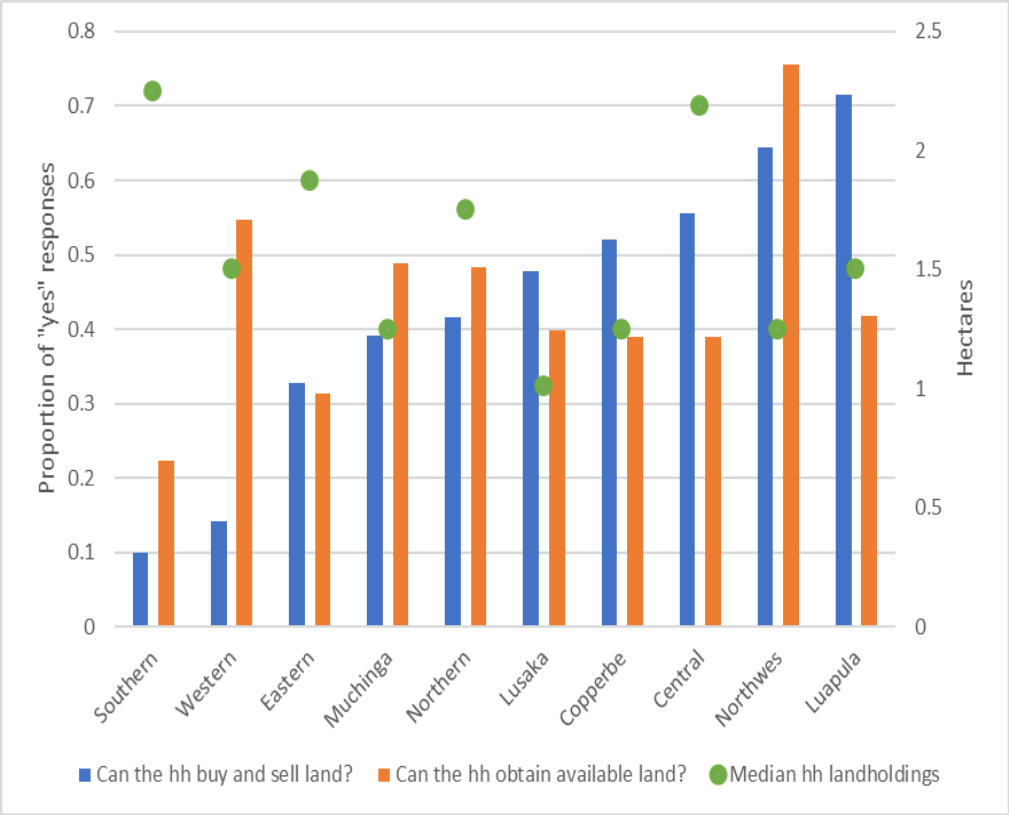
Figure 3. Percentage of Youth and Young Adults Involved in Income Generating Activity by Destination Type



Although Zambia is generally considered to be a land-abundant country, land is not as accessible to smallholder farmers as one would imagine (Sitko and Chamberlain 2016). In addition, perceptions of

land accessibility vary considerably across rural Zambia. For example, the percentage of household respondents—in most cases the household head—who perceive that land in their village is *liquid* (i.e., whether or not previously allocated land can be bought and sold or otherwise transferred between parties) ranges from over 70% of the smallholders in Luapula Province to as low as around 12% in Southern, a province that tends to be more resource-constrained (Table 4). Similarly, perception of availability of unallocated land to the household ranges from over 70% in Northwestern, where population density is very low and farming is relatively less common, to as low as about 21% in Southern Province. This suggests that attempts to implement land reform uniformly across the country have been to some extent unsuccessful based on unequal population distribution. Such disparities in land access have the potential to drive migration patterns as exogenous, uncontrollable factors, further motivation for including household geographic location as a control in the model.

Figure 4. Percentage of Households that Perceive that Land in their Village is Transferrable or Available and Median Farm size (Ha), by Province



6.2 Econometric Results

6.2.1 Introduction

In this section, we use logit regression analysis of individual-level data from the 2012 RALS survey to assess the average partial effects (APEs) of key explanatory variables that we hypothesize are likely to be significant determinants of a Zambian youth or young adult's decision to migrate from their village to either another rural area or to an urban area. In the first set of analyses, we use two different specifications of our logit model across three different samples, for a total of six regressions. Our baseline sample is for the entire sample of YYA, and the alternate specifications are as follows: Specification 1 measures employment by indicators of whether the activity is a business or salaried/wage, and the returns to the activity are low or high. Specification 2 measures employment by indicators of five categories of business engagement and five categories of wage or salaried employment. We repeat the alternate specifications within the mutually exclusive age groups of youth and young adults.

To gain additional information beyond the logit model, we then introduce a more nuanced analysis with a multinomial logit model that separates migrants by their destination type. Based on the information we learned from the logit analysis, we chose to break up the multinomial analysis into separate age groups as well, where youth and young adults are treated separately. However, due to concerns about the complete determination of some data points during these regressions, we restrict the analysis of the age group multinomial logits to those that categorize business and wage activities by their returns rather than by the categories themselves.

6.2.2 Logit Regression Analysis

We begin discussion of the results from our logit regressions by first noting that in general, APEs of our explanatory variables of interest (and one of the most important controls) are more likely to be statistically significant and of greater magnitude when we consider regressions that separate our two sub-samples by age category—youth (ages 15-24) and young adults (25 to 24). For that reason, we focus our discussion on results from regressions that use those sub-samples separately. To interpret the marginal results presented in Tables 2 and 3 in a meaningful way, we divide the percentage point result found in the tables by the percentage of each sample that is a migrant, using the percentages mentioned in the descriptive results section.

Among our sample, we find that the Average Partial Effect (APE) of the variable measuring land liquidity is associated with a 2 percentage point higher likelihood of migration for the youth cohort (Table 2). However, among young adults land liquidity is negatively associated with migration likelihood, although the result is statistically insignificant and of very small magnitude. This result suggests that youth in households that live in a village where it is possible to change customary land to titled, or to buy and sell it while it's classified as customary, are 15% more likely to migrate than those in households who do not perceive land in the village to be liquid. This may be attributed to the disparate access individuals have to land: older males are more likely to have the resources and inclination to obtain such land, which may reduce land availability among the younger individuals, particularly women (Toulmin 2009; Bezu and Holden 2009; de Brauw and Mueller 2012). Green and Norburg (2018) find that certification of customary rights can make land less accessible for women and younger individuals, corroborating this result.

Table 2. Logit Regressions of Migration by Youth and Young Adults, by Age Cohort

Key Explanatory Variables	Youth/Young adult migrant	Youth/Young adult migrant	Youth migrant	Youth migrant	YA migrant	YA migrant
Can HH obtain	-0.00499	-0.00587	-0.00764	-0.00780	-0.00163	-0.00453
extra land?=1	(0.00932)	(0.00930)	(0.0122)	(0.0121)	(0.0116)	(0.0115)
Land liquidity=1	0.0129	0.0125	0.0232**	0.0232**	-0.00170	-0.00394
	(0.00899)	(0.00897)	(0.0117)	(0.0117)	(0.0115)	(0.0112)
HH has at least one	-0.00597	-0.00727	-0.00206	-0.00230	-0.0153	-0.0169
titled field=1	(0.0138)	(0.0135)	(0.0181)	(0.0182)	(0.0190)	(0.0182)
HH rents at least	0.00970	0.0110	0.0249	0.0262	-0.00802	-0.00539
one field=1	(0.0177)	(0.0177)	(0.0257)	(0.0258)	(0.0180)	(0.0181)
Landholding per	-0.00898	-0.00894	-0.00151	-0.000621	-0.0209	-0.0207
capita (Ha)	(0.0135)	(0.0134)	(0.0189)	(0.0188)	(0.0179)	(0.0174)
Inheritance (Ha)	-0.00210	-0.00224	-0.00200	-0.00196	0.000510	0.000547
	(0.00151)	(0.00154)	(0.00169)	(0.00168)	(0.00499)	(0.00492)
Tropical livestock	0.00110	0.000991	0.00261**	0.00254**	-0.00295*	-0.00280
units	(0.00104)	(0.00100)	(0.00104)	(0.00106)	(0.00173)	(0.00172)
Wage/Salary:						
Farm labor=1		-0.0188		0.00472		-0.0519***
		(0.0244)		(0.0449)		(0.0155)
Government =1		0.0181				7.98e-05
		(0.0496)				(0.0396)
Ag value		0.0281		0.330		-0.0191
added=1		(0.0927)		(0.282)		(0.0642)
Tourism=1		0.435*				0.330
		(0.231)				(0.220)
Private non-ag=1		0.118***		0.0486		0.115***
		(0.0382)		(0.0772)		(0.0350)
Business:						
Ag input/		0.0385		0.211		0.0142
Processing=1		(0.0420)		(0.141)		(0.0321)
Natural		-0.0182		-0.0628**		-0.00536
Resource=1		(0.0201)		(0.0302)		(0.0187)
Construction=1		0.0104		-0.136***		0.0361
		(0.0459)		(0.0122)		(0.0417)
Private non-ag=1		-0.0454*		-0.0744		-0.0175
		(0.0260)		(0.0566)		(0.0257)
Value Added		-0.0430*		-0.0683		-0.0203
Food=1		(0.0255)		(0.0549)		(0.0230)
Low return	0.0298		0.0289		0.0186	
wage=1	(0.0219)		(0.0403)		(0.0199)	
High return	0.0774				0.0555	
wage=1	(0.0524)				(0.0458)	
Low return	-0.0289**		-0.0621***		-0.00883	
business=1	(0.0132)		(0.0204)		(0.0137)	
High return	-0.0239		-0.0199		-0.0156	
business=1	(0.0207)		(0.0589)		(0.0178)	
Cotton	-0.00902	-0.00827	-0.0218	-0.0215	0.00983	0.0113
Production=1	(0.0120)	(0.0120)	(0.0147)	(0.0147)	(0.0184)	(0.0183)
Observations	14,121	14,121	8,954	8,954	5,161	5,161

Notes: † (Standard errors in parentheses) *** p<0.01, ** p<0.05, * p<0.1. †† Full set of control variables (such as demographic, locational, and weather related) are shown in the appendix (Table A9). ††† The following variables are modeled with a squared term: landholding per capita, inheritance, TLUs.

We also find that possession of an additional unit of livestock as measured by tropical livestock units (TLUs) is negatively associated with being a youth migrant, although the marginal effects here are quite small at 0.2 percentage points. This implies that a household's ownership of an additional unit of livestock (as measured by FAO 2011) is associated with a 1.3% increased likelihood of migration among youth (Table 2). Because TLUs can be a proxy of household wealth, this effect may imply that individuals that live in wealthier households may find it easier to bear the costs of migration, should they choose to do so.

Perhaps the more interesting results come from the nonfarm economy factors, as the significant factors with the largest magnitude of change of likelihood of migration are associated with categories of off-farm work. Among youth, participation in a construction or natural resource business (such as brickmaking or charcoal and wood selling, respectively) is associated with a 13 and 6 percentage point decrease in likelihood of migration, respectively (Table 2). This corresponds to a 40 to 89% lower likelihood of migration among youth who participate in these activities relative to those who do not participate in such activities. When we use measures of participation in non-farm activity that are defined by its returns (low or high), we find that participation in a low return business activity is associated with a 6 percentage point decrease in likelihood of migration in the youth cohort. This result suggests that ceteris paribus, a youth 40% less likely to migrate if they are engaged in some kind of business activity. The fact that it happens to be a low return own business activity may be due to the fact that youth are more likely to participate in a low as compared to a high return own business activity. Our results are consistent with literature that suggests that a robust non-farm economy in rural areas can provide a disincentive to forced or push out migration in search of work (Haggblade, Hazell, and Reardon 2010; Sakho-Jimbira and Bignebat).

Among young adults, employment in a private non-agricultural job (such as at a bank) is associated with a 12 percentage point increase in likelihood of migration, while engaging in work on another's farm is associated with a 5 percentage point lower likelihood of migration (Table 2). For these cases, a young adult employed in a private non-agricultural wage or salaried job is 150% more likely to migrate than they would be if they were not so employed, while those engaged in farm work are 63% less likely to migrate than if they were not so employed. The main matter of interest in these results are the different signs associated with the different activities.

When we use the combined sample of youth and young adults, participation in a value-added food-related business (such as working at a bakery or brewing beer) or private non-agricultural business (such as owning a shop or tailoring business) is associated with a 4 to 4.5 percentage point (34 to 36%) lower likelihood of migration (Table 2). However, participation in private non-agricultural wage or salaried work and tourism employment are associated with 12 to 44 percentage point (93-340%) increases in likelihood of migration. The large magnitudes of effects that we observe among nonfarm activity participation indicators suggest that some of these activities provide significantly higher wages or returns relative to most farm-related activities. Another factor that likely contributes to the large magnitude of the effects is due to the fact that relatively few YYA are engaged in these activities, though this can be tested with analysis of the next wave of the survey. We note that the only significant wage/salary activity that is negatively associated with likelihood of migration is farm work, which tends to be highly seasonal and provide much lower returns than other wage and salaried employment.

A potential reason for the different directions of correlation between these types of activities (own business versus wage or salaried employment) may have to do with the nature of the activities themselves. For example, private businesses likely require social connections with members of the community and may require a significant amount of time and expenditure to establish. Between this

commitment and the fact that own businesses likely provide higher returns per week/month than wage employment suggests that individuals participating in such activities are less likely to leave their community to look for work elsewhere. By contrast, participation in farm labor for another farm, which tends to be the most common of all employment types, is not a differentiated skill, and thus is more exclusively a source of extra income. However, the opportunity to earn extra money in this manner is still associated with a lower probability of migration, suggesting that this kind of work (which can be working for large scale or small scale farms) may contribute enough income to allow an individual to make a sufficient living without migration. Our result here is consistent with the literature (Dorward et al. 2009; Sakho-Jimbira and Bignebat 2006).

Although perhaps initially rather surprising, the fact that participation in a private non-agricultural wage or salaried activity, as well as in tourism employment, is associated with a higher likelihood of migration is not inconsistent with this result. The earning potential, transferrable skills and mobility associated with wage and salaried jobs in the private sector (such as banking or working for a telecom company) can increase access to information and provide the startup capital required to relocate (Moraga 2013). This is seen on an international scale with the well-known phenomenon of *brain drain*, but has also been described in local contexts due to the higher earning potential in urban areas (de Brauw, Mueller, and Lee 2014).

6.2.3 Multinomial Logit Regressions

We next employ a multinomial logit model to assess whether or not the factors associated with migration differ whether an individual migrates to an urban area or to another rural area (Table 3). We omit from this table the APEs of explanatory variables related to the base outcome, which is when an individual chooses to not migrate. Rather, we focus our attention only on the marginal effects of explanatory variables related to migration to an urban area or to other rural areas.

This model suggests that, in line with our logit analysis, liquidity of land is correlated with a 1.3 percentage point increase in likelihood of migration to other rural areas (Table 3). Conversely, household livestock ownership as measured by TLUs is statistically significantly correlated with an increased likelihood of migration to urban areas, but the magnitude of the effect is again far below 1 percentage point.

The relationships between nonfarm employment and likelihood of migration are much stronger than those relating to land access. We find that participation in private non-agricultural wage work is correlated with a 5 to 6 percentage point increase in likelihood of migration to both rural and urban areas. Conversely, and consistent with the results from the logit regression, we find that relationships between business activities and likelihood of migration are negative, varying from 2.7 percentage points in food value added businesses to 4.3 percentage points in agricultural processing businesses and private non-agricultural businesses like shopkeeping.

When we instead measure participation in nonfarm activities by their returns, we find that low return wage activity is correlated with a 3 percentage point increase in likelihood of migration for rural-urban migrants. We also find that participation in a low or high return business is associated with a 2 and 3.8 percentage points lower likelihood of migration to other rural areas, respectively.

Table 3. Multinomial Logit Regression of Rural-Rural and Rural-Urban Migration by Income Categories and Activity Types

	With Income Categories		With Activity Categories	
	rural migrant	urban migrant	rural migrant	urban migrant
HH can obtain extra land=1	-0.00303	-0.00184	-0.00358	-0.00234
	(0.00627)	(0.00660)	(0.00631)	(0.00659)
Land liquidity=1	0.0134**	-0.00114	0.0133**	-0.000993
	(0.00671)	(0.00593)	(0.00671)	(0.00588)
HH has at least one titled field=1	-0.00876	0.00144	-0.00957	0.00130
	(0.00875)	(0.00934)	(0.00873)	(0.00920)
HH rents at least one field=1	0.0178	-0.00563	0.0189	-0.00559
	(0.0124)	(0.0133)	(0.0126)	(0.0132)
landholdings per capita (Ha)	-0.00791	0.000730	-0.00731	0.000233
	(0.0102)	(0.00939)	(0.0102)	(0.00928)
Inheritance (Ha)	-2.68e-05	-0.00152	1.51e-05	-0.00150
	(0.00177)	(0.000957)	(0.00178)	(0.000939)
TLUs	-5.42e-05	0.00172**	-6.58e-05	0.00170**
	(0.000730)	(0.000859)	(0.000725)	(0.000846)
Wage Work:				
Farm labor=1			-0.00973	-0.00952
			(0.0157)	(0.0159)
Government=1			-0.00898	0.0200
			(0.0371)	(0.0338)
Ag value added=1			0.0205	0.00749
			(0.0749)	(0.0653)
Tourism=1			0.210	0.224**
			(0.185)	(0.113)
Private non-ag=1			0.0551*	0.0641**
			(0.0310)	(0.0284)
Business:				
Ag input/processing=1			-0.0428***	0.0606
			(0.0115)	(0.0377)
Natural Resource=1			-0.0163	-0.000735
			(0.0131)	(0.0148)
Construction=1			0.00885	0.00390
			(0.0355)	(0.0354)
Private non-ag=1			-0.0434***	-0.00286
			(0.0146)	(0.0227)
Value added Food=1			-0.0271*	-0.0131
			(0.0158)	(0.0215)
Low Return Wage	0.00128	0.0308*		
	(0.0139)	(0.0166)		
High Return Wage	0.0846	0.00939		
	(0.0559)	(0.0273)		
Low Return Business	-0.0203**	-0.00699		
	(0.00865)	(0.0110)		
High Return Business	-0.0385***	0.00740		
	(0.0115)	(0.0181)		
Cotton production=1	-0.00875	0.000930	-0.00984	0.000255
	(0.00898)	(0.00897)	(0.00890)	(0.00911)

Notes: † (Standard errors in parentheses) *** p<0.01, ** p<0.05, * p<0.1; †† Set of control variables are listed in the appendix. N=14,121.

Given the results from our logit regressions indicating that there are different factors associated with migration for youth and young adults, we also split the multinomial regression into age categories and find a similar general result. For example, land liquidity is associated with a 1.8 percentage point increased likelihood of migration among youth who leave for rural destinations, yet this association is not significant among young adults. This is consistent with the results from both our previous logit and multinomial logit analysis. However, among young adults ownership in the household of titled land is associated with a 2.1 percentage point lower likelihood of migration to other rural areas.

This result is new, and may be attributed to the fact that titled land is more secure in its tenure, as well as the fact that young adults may be preparing to take over the household land in the near future, which would discourage migration. Additionally, 7% of young adults from 2012 are the heads of their household and have titled fields, which would be a strong factor dissuading migration.

The associations between types of income generating activities and likelihood of migration remain fairly consistent with previous results. We find that participation in low-return salaried or wage employment is associated with a 3 percentage point increase in likelihood of migration to urban areas, for both youth and young adults. We expect that people who choose to migrate to urban areas should have skills that will be useful in those areas, as well as the capital necessary to establish themselves, which is easier to obtain through reliable salaried employment. We also find that participation in a business activity of either income level is associated with a negative impact on likelihood of migration that varies from 3.1 to 6.8 percentage points among youth migrating to rural areas. We also find that among young adults who migrate to rural areas, participation in a high return business activity also carries a 2.1 percentage point lower likelihood of migration. This result is interesting because it suggests that perhaps for young adults who have more experience with either farming or non-farming activities are not as beholden to their businesses unless those businesses are relatively more remunerative.

We additionally find the surprising result that participation in a high return salaried activity among youth is associated with a 7.2 percentage point lower likelihood of migration to rural or urban areas. This may indicate that simply having reliable and remunerative employment in itself is not enough to increase likelihood of migration, but rather that accumulation of income from such a job is necessary before the individual will consider leaving for better paying opportunities elsewhere. However, we interpret this result cautiously because of the relatively small percentage of youth engaged in such activities.

Because we are estimating our logit and multinomial regressions of individual migration using cross-sectional data, we generate a correlation matrix between all key variables of interest to assess assess whether or not the magnitude of their correlation might make it difficult to distinguish their partial effects within a regression. We find that the only variables among which correlation exceeds 0.10 occur among different types of farm assets (landholding, TLUs, farm asset value), though none of these bivariate correlations are above 0.25 (see Table 4 below).

Table 4. Multinomial Logit Regression of Rural-Rural and Rural-Urban Migration by Youth and Young Adults

	Rural Destination		Urban Destination	
	Youth	Young adult	Youth	Young adult
HH can obtain extra land=1	-0.00415	-0.00373	-0.00268	0.000931
	(0.00845)	(0.00767)	(0.00861)	(0.00836)
Land liquidity=1	0.0181**	0.00756	0.00536	-0.0111
	(0.00887)	(0.00793)	(0.00784)	(0.00802)
HH has at least one titled field=1	-0.00143	-0.0213**	-0.00232	0.00666
	(0.0133)	(0.00953)	(0.0116)	(0.0136)
HH rents at least one field=1	0.0300	0.000568	-0.00159	-0.0109
	(0.0192)	(0.0130)	(0.0201)	(0.0105)
landholdings per capita (Ha)	-0.00362	-0.0139	0.00190	-0.00216
	(0.0141)	(0.0169)	(0.0141)	(0.0114)
Inheritance (Ha)	0.000285	0.00118	-0.00172	0.000341
	(0.00216)	(0.00271)	(0.00107)	(0.00410)
TLUs	0.000557	-0.000686	0.00293***	-0.00134
	(0.000771)	(0.00192)	(0.00107)	(0.00114)
Income Activities				
Low Return Wage	0.0252	-0.0126	0.0204	0.0305*
	(0.0284)	(0.00999)	(0.0264)	(0.0178)
High Return Wage	-0.0718***	0.0591	-0.0737***	0.00342
	(0.00417)	(0.0456)	(0.00384)	(0.0223)
Low Return Business	-0.0316**	-0.00836	-0.0233	-0.000382
	(0.0146)	(0.00959)	(0.0167)	(0.0102)
High Return Business	-0.0680***	-0.0211*	0.0518	-0.00123
	(0.00595)	(0.0124)	(0.0606)	(0.0144)
Cotton production=1				
	-0.0172	-0.00525	-0.00578	0.0119
	(0.0112)	(0.0113)	(0.0123)	(0.0148)
Observations	8,954	5,161	8,954	5,161

Notes: † (Standard errors in parentheses) *** p<0.01, ** p<0.05, * p<0.1; †† Set of control variables are listed in the appendix.

7. DISCUSSION

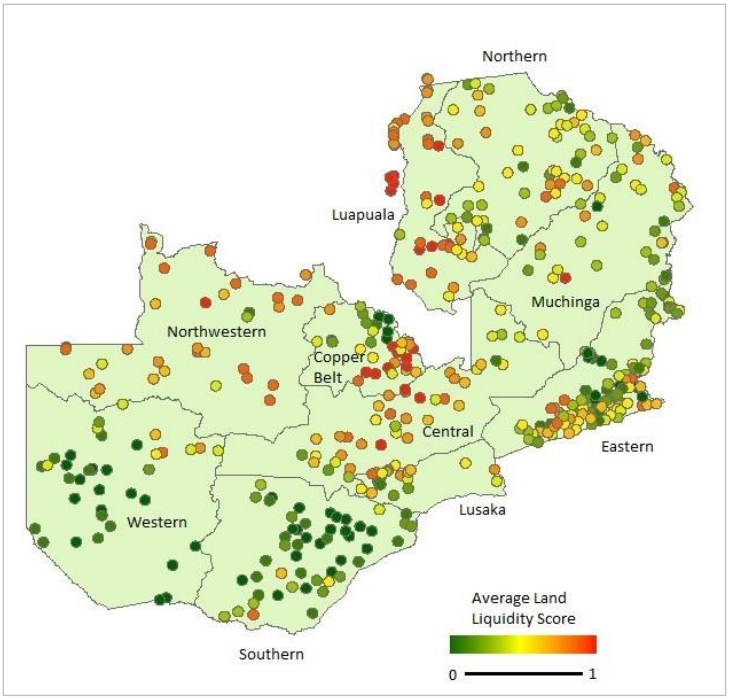
7.1 Logit Regression Analysis

This results suggests that the ability to change land tenure status, or to buy and sell it while it's classified as customary, has a statistically significant positive association with the decision of youth to migrate. This may be attributed to the disparate access individuals have to land: older males are more likely to have the resources and inclination to obtain such land, which may reduce land availability among the younger individuals, particularly women (Toulmin 2009; Bezu and Holden 2009; de Brauw and Mueller 2012). Green and Norburg (2018) find that in Eastern Province in Zambia, attempts to improve tenure security by attaching certificates to land tended to reinforce existing inequities in access among younger people and women, corroborating this result.

The ability to buy and sell land can also be used as an equilibrating mechanism, so if a household loses some labor due to migration it can sell off or rent out its excess land to accommodate the lost labor (Mullen, Grosjean, and Kontoleon 2011; de Brauw and Mueller 2012). It is also important to remember that the response captured for perception of land liquidity is from the head of the household, and not necessarily the youth or young adult members. However, it is possible to interpret this result in other ways: because the survey does not capture the distance the individuals travel when they migrate, it is possible that those who do migrate are moving to a nearby area because of their ability to more easily purchase land there and establish their own homestead. We also note that as of 2012, purchasing and renting land is fairly uncommon, making up just 8.2% of all fields captured in the survey. However, we do see that purchase occurs nearly evenly between titled (47%) and customary land (53%). See Table A8 for a full breakdown of land by acquisition and tenure status. This suggests that although land access and land marketing may not be as common as one might expect, lack thereof is not necessarily a primary driver of migration among youth and young adults. Further work can examine whether other agricultural inputs such as fertilizer or high yielding seeds are the more important factors for determining migration related to agricultural opportunity rather than strictly land availability.

To better visualize this result, we generate a map that displays the average response to land liquidity on a colorbar scale. We find that similar scores tend to cluster near each other (see Figure 5 below). A low score (closer to zero) represents a prevailing perception of inability to buy and sell land within the community, while a high score (closer to one) represents a perception of ability to buy and sell land. This suggests that if land is perceived to be more liquid in one's sending community, it is likely to be similarly liquid in nearby communities. We also find that perceptions of land liquidity tend to differ considerably by province: in the Copperbelt, Northwestern, and Luapula Provinces above 60% of respondents believe land is liquid, whereas in Southern and Western fewer than 20% of respondents believe that land is liquid. With similar responses in neighboring clusters, it is possible that higher land liquidity allows youth and young adults to sell their land in the sending community, buy land in a nearby community, or some combination of both. Determining the causation behind this result would require further analysis, perhaps by obtaining a comprehensive financial resource picture for the individuals who migrate, as well as tracking the distance to where they ended up settling.

Figure 5. Average Perception of Land Liquidity by Cluster



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

Our results regarding the rural nonfarm economy are consistent with other work asserting its value in promoting resilience of rural communities (Haggblade, Hazell, and Reardon 2007; Deotti and Estruch 2016). We find striking differences between the impact of wage or salaried work and employment in or ownership of a business that suggest each kind of nonfarm employment should be considered separately by policymakers. Place-based work (like construction, natural resource businesses, or shopkeeping) that requires some sort of knowledge of the area or physical infrastructure, tends to dissuade migration, particularly among youth. While not particularly remunerative, these businesses likely are time-intensive and require social capital in the community, and may be more difficult to restart elsewhere than they're worth. The consumption smoothing that such businesses can provide can allow youth and young adults to make a sufficient living that they are not inclined to migrate. However, salaried or wage employment, which tends to be more stable and require less investment by the individual, can provide both connections to other places, the startup capital required to move, and the transferrable skills that can provide more of a guarantee the individual can find a job at their destination.

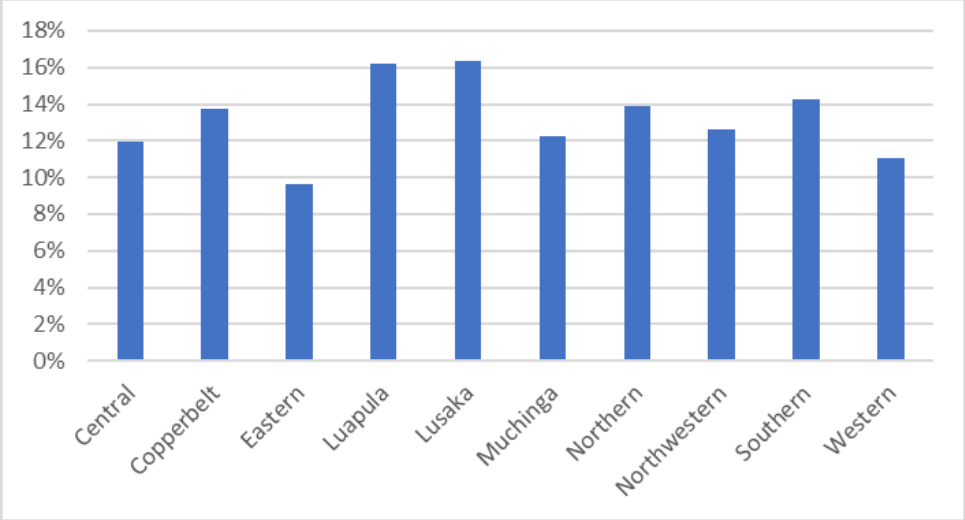
The implications of our results about the nonfarm economy can lead policymakers in several directions. Concerns about urban poverty rates and the higher cost of living in urban areas underscore the fact that a move to an urban area might not be a solution to an individual living in poverty. Additionally, this higher cost of living means someone who hopes to move from a rural area to an urban one may have a difficult time accumulating the money necessary to make the shift, particularly if they are reliant on farming or a relatively less remunerative business (Chibuye 2014). While the World Bank reports that poverty incidence is lower in urban parts of Zambia than rural areas, these figures do not necessarily account for the fact that low income households in urban areas are often priced out of purchasing staple items in bulk that would make them more affordable, and that even if they have sufficient income to be considered above the poverty line, access to resources like housing of a reasonable quality, health services, and transportation to buy food may be out of

reach (Katayama, Revilla, and Beuran 2012; Chibuye 2014). Imai, Gaiha, and Garbero (2017) also find that on a macro level, increases in the share of the rural areas of a country, both in its farming and nonfarming sectors, tend to have the largest impact on poverty reduction, while increases of population shares in urban centers tends to have the opposite effect (2017). Our findings support the converse of this result in terms of migration, suggesting that facilitation of business opportunities to develop the rural nonfarm economy are associated with reductions in migration. However, our results that show increased likelihoods of migration being associated with salaried employment should be taken as a separate case for policymakers. For workers like these, earning potentials are likely to be higher if the individual is moving from a less populated to more populated area, as we saw in the multinomial logit results and will discuss further below.

Consistent with what is known about migration trends specific to Zambia, every specification of the model yields a significant positive relationship between living in Southern Province and likelihood of migration. Although a cursory examination of the percentage of youth and young people moving in each province does not appear extreme (see Figure 6), when included in the regression model the significant relationships emerge. Much of the news coming out of Southern Province in recent years has detailed difficulties with both drought and land constraints that are encouraging farming families to seek better opportunities elsewhere (ACAPS 2019). This often involves the family moving north to one of the more remote parts of the country that is known to have comparatively ample water and land, as well as fertile soil. Although farming historically has not been common in the northern parts of the country, that is beginning to change with recent years of drought in the traditional Zambian maize belt in Southern Province.

We also find that education plays an important role in influencing migration decision. This result comes out in the full sample, as well as that of the youth cohort. Completion of additional benchmarks of education (finishing primary school and secondary school) are associated with a 4 to 6 percentage point (26-54%) increase in likelihood of migration. The fact that this result is present among youth and not young adults is not unexpected, in part because of our previous assertion that some individuals of that age group would likely have already migrated if they had been inclined to do so.

Figure 6. Proportion of Migrants among YYA Population by Province of Origin



The results of the general logit model tend to fit with what is known about the Zambian context. Issues of land do not appear to be prominently associated with migration decision in either direction, supporting the perception that Zambia is more land abundant than many of its neighbors. The large magnitudes associated with the various types of nonfarm activities covered in the survey may suggest a few things- that because these activities are still quite rare among the reference population there is significant room to grow the rural nonfarm economy and this could have an impact by retaining young adults in rural communities.

7.2 Multinomial Logit Regression Analysis

The multinomial logit analysis suggests that there are indeed differences in the drivers of urban-bound and rural-bound migrants. We only find significant results for land parameters among rural destined migrants, which is consistent with what we would expect about the kinds of activities people tend to pursue in rural or urban areas.

One of the key findings from this model is that participation in even a lower return wage activity can significantly influence decision to migrate. This evidence suggests that such employment may provide increased mobility to those who have access to it and is consistent with the results from the logit model that measures activities by category. However, participation in a high return business activity or in a value-added food business (such as a bakery) once again has a significant negative relationship with likelihood of migration. This follows our hypothesis that participation in such activities that diversify income sources and (in the case of business activities) require significant investment of time and effort on the part of the business owner, deter people from leaving their current location, and is supported in the literature (Dorward et al. 2009; Sakho-Jimbira and Bignebat 2006). The fact that this relationships persists strictly for migration to rural areas suggests that among our sample, the rural destinations people were migrating to were not substantially more appealing in terms of their business environment, or perhaps that people are not willing to take a chance on relocating their business without more information on business conditions in other rural areas.

Lastly, we find that the correlations between completion of educational benchmarks and likelihood of migration are quite different based on destination type. We find that completion of primary and secondary school are both associated with a 2.2 to 3.8 percentage point higher likelihood of migration to urban areas for both youth and young adults. However, we find that for youth completion of these levels of education are associated with a 3.6 to 5.7 percentage point lower likelihood of migration to rural areas. This suggests that education is a driver of migration to urban areas, likely because of the opportunities in those areas that require some level of education. However, it is possible that for youth migrating to rural areas there is a higher likelihood of engaging in farming or other activities that do not require attainment of educational benchmarks.

8. CONCLUSION

In general, the results suggest that the ability to diversify income sources, especially into nonfarm activities, may provide motivation for youth and young adults to remain in their home communities. While this is not always the desired outcome (particularly if the individual would have otherwise left for school), the presence of a variety of economic opportunities in a young individual's village can encourage them to either remain in or return to their sending community. Nonfarm income activities can also potentially strengthen a rural community's economic resilience and provide liquidity necessary to make investments that can increase agricultural productivity. Our results also suggest that salaried employment can serve as a jumping-off point by which young adults can accumulate the capital and skills necessary to move to areas (often urban) of higher earning potential. This mechanism of rural to urban migration is likely preferable to having individuals who have not been prepared with marketable skills and a savings base to establish themselves moving to an urban area.

We find only limited evidence of statistically significant associations between indicators of improved land access and young individuals' migration decisions. This is consistent with recent literature that among many youth and young adults, agriculture is not particularly appealing or even a desired primary livelihood (AU 2006). However, because our land information comes from 2012, when the new land debates were just starting to take place in Zambia, it will be important to repeat the analysis with more recent survey data to see if titling efforts and changing perceptions are starting to have an impact on migration decisions and land access in general.

For policymakers and local leaders whose goals include empowering and retaining youth and young people in their communities, support of the rural nonfarm economy is important. Because we find evidence for an association between business employment and lower likelihood of migration, local leaders can work to encourage and support youth and young adult participation in these activities. Such support may entail connecting individuals with competitive financing for the resources needed to start businesses, as well as support for infrastructure that allows development of further business opportunities that would benefit from better access to roads and markets, transportation, or electricity. Among sectors of the nonfarm economy that are associated with increased likelihoods of migration, local leaders can ensure that training and knowledge transfer programs are in place to ensure that when outmigration does occur, it isn't accompanied by a loss of knowledge and skills necessary for the positions that are being vacated.

Rather than instigate a blanket policy to encourage or discourage all migration, officials should consider that the impact of push and pull factors will be very different on a community. They can simultaneously encourage migration that contributes to overall gains in productivity while working to reduce migration that is caused by a real or perceived lack of opportunity, especially among the young population. Facilitation of voluntary migration to properly allocate a country's labor force, whether the destination is rural or urban, is an important component of structural transformation and may prove to be an important driver of Zambia's continued economic expansion.

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APPENDIX

Table A 1. Summary Statistics of Variables Used in Regression Analysis

	All youth/young adults		Youth		Young adults	
	mean	SD	mean	SD	mean	SD
=1 if HH can obtain extra land	0.41	0.49	0.41	0.49	0.42	0.49
= 1 if Land is liquid	0.40	0.49	0.40	0.49	0.40	0.49
=1 if HH has titled field(s)	0.10	0.29	0.10	0.30	0.09	0.28
=1 if HH rents field(s)	0.07	0.26	0.07	0.26	0.08	0.27
Landholding per cap. (Ha)	0.38	0.43	0.38	0.40	0.39	0.47
Inheritance (Ha)	0.90	11.43	1.04	14.07	0.68	5.13
TLU's	2.18	8.03	2.49	8.82	1.70	6.61
Wage and Business Returns						
Low wage return	0.051	0.219	0.031	0.174	0.081	0.272
High wage return	0.016	0.125	0.001	0.034	0.039	0.193
Low business return	0.093	0.291	0.039	0.194	0.178	0.382
High business return	0.034	0.180	0.009	0.097	0.071	0.257
=1 if Wage /Salaried activities						
Farm work	0.034	0.182	0.025	0.156	0.048	0.214
Government work	0.010	0.101	0.001	0.023	0.026	0.158
Ag value added	0.002	0.044	0.000	0.020	0.004	0.066
Tourism	0.001	0.027	0.000	0.008	0.002	0.042
Private non-ag	0.020	0.141	0.007	0.082	0.041	0.198
=1 if Business activities:						
Ag input/ processing	0.013	0.112	0.003	0.059	0.027	0.161
Natural Resource	0.043	0.204	0.017	0.130	0.084	0.277
Construction	0.010	0.101	0.002	0.045	0.023	0.150
Private non-ag	0.011	0.105	0.004	0.063	0.022	0.148
Food value added	0.022	0.147	0.011	0.103	0.040	0.195
Value of Ag Assets ZMK	565701	2986519	607916	2843422	500449	3194298
Value of other assets ZMK	2731928	21600000	2917820	23800000	2444594	17700000
year HH head settled in this area	1985.8	17.8	1984.0	18.7	1988.6	15.9
=1 if HH head is considered local	0.12	0.32	0.12	0.32	0.12	0.32
=1 if improved:						
Wall material	0.37	0.48	0.39	0.49	0.35	0.48
floor material	0.21	0.41	0.23	0.42	0.19	0.39
roof material	0.30	0.46	0.31	0.46	0.27	0.44
No. HH members	6.65	2.86	7.00	3.01	6.12	2.54

	All youth/young adults		Youth		Young adults	
	mean	SD	mean	SD	mean	SD
Ed. categories						
Completed primary	0.48	0.50	0.52	0.50	0.42	0.49
Completed secondary	0.05	0.22	0.04	0.20	0.07	0.26
Completed postsecondary	0.01	0.12	0.01	0.08	0.03	0.16
HH head yrs. of ed.	6.31	3.63	6.27	3.73	6.38	3.48
Age	23.09	6.04	18.84	2.78	29.65	3.15
Age of HH head	43.69	14.28	47.01	14.33	38.56	12.60
=1 if married	0.40	0.49	0.18	0.39	0.75	0.43
=1 if male	0.49	0.50	0.50	0.50	0.47	0.50
km to road	1.89	6.43	1.86	6.75	1.93	5.90
km to market	25.59	31.93	25.52	30.81	25.69	33.59
km to tarmac	30.55	36.69	30.05	35.78	31.32	38.05
km to agrodealer	31.28	31.09	31.64	31.54	30.72	30.38
latitude	-13.307	2.407	-13.326	2.404	-13.277	2.411
longitude	28.834	2.905	28.827	2.892	28.844	2.925
Precip diff. (mm) from 16 yr average						
07/08	-38.93	66.48	-39.84	66.67	-37.52	66.16
08/09	78.16	46.22	78.40	46.05	77.79	46.47
09/10	48.04	61.24	48.86	61.58	46.78	60.71
10/11	-43.02	56.87	-42.51	56.73	-43.82	57.07
11/12	-24.19	65.83	-23.81	66.46	-24.77	64.84
Growing Season Temp (Kelvin)						
07/08	294.40	1.17	294.40	1.17	294.40	1.17
08/09	295.69	1.25	295.69	1.25	295.70	1.25
09/10	295.89	1.28	295.89	1.29	295.90	1.28
10/11	295.82	1.18	295.82	1.18	295.83	1.17
11/12	294.90	1.60	294.91	1.63	294.88	1.57

† Education categories are 1) completed primary 2) completed secondary 3) completed postsecondary

Table A 2. Percentage of Individuals by Migration Destination and Age Group

	Age Group:			
Type of Migration Destination	Older than 35	Youth (15-24)	Young Adult (25-35)	Total
Permanent to urban	10.1%	23.8%	22.4%	21.3%
Permanent to rural	24.8%	46.4%	44.2%	42.5%
Temporary to urban	38.1%	19.7%	20.6%	22.8%
Temporary to rural	25.7%	9.6%	12.0%	12.6%
Permanent outside country	0.1%	0.4%	0.4%	0.4%
Temporary outside country	1.2%	0.1%	0.4%	0.4%
Total	100%	100%	100%	100%

Table A 3. Percentage of Individuals by Household Land Access and Land Tenure by Age Group

Cohort	Migrant Status	Land liquidity (%)	Extra land obtainable (%)	Titled Land (%)	Rented Land (%)
Youth	No	39%	41%	10%	7%
	Yes	44%	40%	11%	9%
Young Adult	No	40%	42%	9%	8%
	Yes	40%	41%	9%	8%
Youth and Young Adult	No	39%	42%	9%	7%
	Yes	43%	40%	11%	9%

Table A 4. Mean Household Asset and Crop Outgrower Opportunities by Age Group

Cohort	Migrant Status	Inheritance (Ha)	Landholding (Ha)	TLUs	Ag asset value (ZMK)	Other asset value (ZMK)	Cotton Prod (%)
Youth	No	0.98	2.43	2.42	575,207	2,392,792	37%
	Yes	1.37	2.58	2.87	498,359	5,134,224	33%
Young Adult	No	0.70	2.25	1.73	616,896	2,587,349	37%
	Yes	0.40	2.07	1.33	555,293	4,854,237	33%
Youth and Young Adult	No	0.87	2.35	2.14	515,618	2,113,284	37%
	Yes	1.10	2.43	2.44	339,637	5,956,813	34%

Table A 5. Percentage of Youth and Young Adults Participating in Off-farm Activities

Activity	Wage/Salaried or Own Business	Percent involved
Agricultural Value Added	Wage	0.2%
Agricultural Value Added	Business	1.3%
Tourism	Wage	0.1%
Food Value Added	Business	2.2%
Government	Wage	1.0%
Private Non-Agricultural	Wage	2.0%
Farm Work	Wage	3.4%
Construction	Business	1.0%
Natural Resource Selling	Business	4.3%
Private Non-agricultural	Business	1.1%

Table A 6. Percentage of Individuals by Household Land Access and Land Tenure, By Migration Destination

Destination Type	Land liquidity (%)	Extra obtainable land (%)	Titled Land (%)	Rented Land (%)
not a migrant	39%	42%	9%	7%
rural	45%	40%	9%	10%
urban	41%	40%	13%	9%

Table A 7. Household Assets and Agricultural Outgrowing Opportunities by Destination Type

Destination Type	Inheritance (Ha)	Landholding (Ha)	Tropical Livestock Units	Ag asset value (ZMK)	Other asset value (ZMK)	Cotton Prod (%)
not a migrant	0.87	2.35	2.14	575,961	2,396,991	37%
rural	0.54	2.42	2.32	472,703	2,701,115	34%
urban	1.65	2.45	2.57	511,570	7,444,977	32%

Table A 8. Surveyed Fields by Acquisition Type and Tenure Status

	Acquisition type					
Tenure Status	Purchased	Inherited	Allocated	Rented	Just walked in	Total
State land titled	1.2%	0.2%	1.4%	0.8%	0.0%	3.6%
Former customary land, now titled	1.0%	0.3%	1.8%	0.2%	0.2%	3.5%
Customary no title	2.5%	11.4%	70.8%	2.4%	5.4%	92.5%
I don't know	0.0%	0.0%	0.1%	0.1%	0.0%	0.2%
Other (specify)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
State land, no title	0.0%	0.0%	0.2%	0.0%	0.0%	0.2%
Total	4.7%	11.9%	74.3%	3.5%	5.6%	100.0%

Table A 9. Logit Regressions for Age Cohorts

	Youth/Young adult	Youth/Young adult	Youth	Youth	Young adult	Young adult
Can the HH obtain extra land if it wants it?	-0.00499	-0.00587	-0.00764	-0.00780	-0.00163	-0.00453
	(0.00932)	(0.00930)	(0.0122)	(0.0121)	(0.0116)	(0.0115)
Land liquidity	0.0129	0.0125	0.0232**	0.0232**	-0.00170	-0.00394
	(0.00899)	(0.00897)	(0.0117)	(0.0117)	(0.0115)	(0.0112)
HH has at least one titled field	-0.00597	-0.00727	-0.00206	-0.00230	-0.0153	-0.0169
	(0.0138)	(0.0135)	(0.0181)	(0.0182)	(0.0190)	(0.0182)
HH has at least one rented field	0.00970	0.0110	0.0249	0.0262	-0.00802	-0.00539
	(0.0177)	(0.0177)	(0.0257)	(0.0258)	(0.0180)	(0.0181)
Landholding per capita (Ha)	-0.00898	-0.0089436	-0.00151	-0.000621	-0.0209	-0.0207
	(0.0135)	0.0134126	(0.0189)	(0.0188)	(0.0179)	(0.0174)
Inheritance (Ha)	-0.00210	-0.00224	-0.00200	-0.00196	0.000510	0.000547
	(0.00151)	(0.00154)	(0.00169)	(0.00168)	(0.00499)	(0.00492)
Tropical livestock units	0.00110	0.000991	0.00261**	0.00254**	-0.00295*	-0.00280
	(0.00104)	(0.00100)	(0.00104)	(0.00106)	(0.00173)	(0.00172)
Farm wage work		-0.0188		0.00472		-0.0519***
		(0.0244)		(0.0449)		(0.0155)
Government wage work		0.0181				7.98e-05
		(0.0496)				(0.0396)
Ag value added wage Work		0.0281		0.330		-0.0191
		(0.0927)		(0.282)		(0.0642)
Tourism		0.435*				0.330
		(0.231)				(0.220)
Private non-ag wage work		0.118***		0.0486		0.115***
		(0.0382)		(0.0772)		(0.0350)
Ag input/processing business		0.0385		0.211		0.0142
		(0.0420)		(0.141)		(0.0321)
Natural Resource Business		-0.0182		-0.0628**		-0.00536
		(0.0201)		(0.0302)		(0.0187)
Construction Business		0.0104		-0.136***		0.0361
		(0.0459)		(0.0122)		(0.0417)
Private non-ag business		-0.0454*		-0.0744		-0.0175
		(0.0260)		(0.0566)		(0.0257)
Added Value Food business		-0.0430*		-0.0683		-0.0203
		(0.0255)		(0.0549)		(0.0230)
low return wage job	0.0298		0.0289		0.0186	
	(0.0219)		(0.0403)		(0.0199)	
high return wage job	0.0774				0.0555	
	(0.0524)				(0.0458)	
low return business	-0.0289**		-.0621***		-0.00883	
	(0.0132)		(0.0204)		(0.0137)	
high return business	-0.0239		-0.0199		-0.0156	
	(0.0207)		(0.0589)		(0.0178)	
Cotton Produced in Community	-0.00902	-0.00827	-0.0218	-0.0215	0.00983	0.0113
	(0.0120)	(0.0120)	(0.0147)	(0.0147)	(0.0184)	(0.0183)

Value of Agricultural Assets ZMK	-3.00e-09	-3.64e-09	-4.39e-09	-4.42e-09	1.40e-08	1.27e-08
	(3.17e-09)	(2.80e-09)	(3.51e-09)	(3.49e-09)	(1.07e-08)	(1.04e-08)
Value of other assets ZMK	1.16e-10	8.06e-11	-1.92e-10	-1.81e-10	5.10e-10	5.10e-10
	(2.97e-10)	(2.94e-10)	(4.68e-10)	(4.65e-10)	(3.49e-10)	(3.35e-10)
=1 if wall material is improved	0.000793	-0.000255	0.00355	0.00467	0.00118	-0.00111
	(0.0108)	(0.0107)	(0.0133)	(0.0134)	(0.0141)	(0.0138)
=1 if floor material is improved	-0.0127	-0.0112	-0.0155	-0.0165	-0.00989	-0.00691
	(0.0117)	(0.0117)	(0.0158)	(0.0157)	(0.0162)	(0.0159)
=1 if roof material is improved	0.00827	0.00741	-0.00698	-0.00606	0.0270	0.0249
	(0.0124)	(0.0122)	(0.0154)	(0.0153)	(0.0187)	(0.0179)
Number of HH members	-0.000519	-0.000304	0.000690	0.000825	-0.00285	-0.00331
	(0.00138)	(0.00138)	(0.00165)	(0.00166)	(0.00238)	(0.00238)
Age of household head	-0.000477	-0.000474	-0.000985*	-0.00100*	0.000776	0.000778
	(0.000420)	(0.000417)	(0.000568)	(0.000566)	(0.000511)	(0.000505)
Education of household head (years)	0.00265*	0.00256*	0.00231	0.00227	0.00382*	0.00372*
	(0.00139)	(0.00139)	(0.00184)	(0.00185)	(0.00199)	(0.00197)
year HH head settled in this area	1.22e-05	1.41e-05	-0.000224	-0.000235	0.000388	0.000355
	(0.000274)	(0.000271)	(0.000345)	(0.000345)	(0.000375)	(0.000369)
=1 if HH head is considered local	0.0101	0.0114	0.0235	0.0239	-0.00823	-0.00587
	(0.0129)	(0.0129)	(0.0182)	(0.0183)	(0.0150)	(0.0148)
Completed primary school	0.0461***	0.0450***	0.0614***	0.0615***	0.0190	0.0156
	(0.00732)	(0.00729)	(0.00971)	(0.00969)	(0.0116)	(0.0114)
Completed Secondary School	0.0687***	0.0658***	0.0654**	0.0611**	0.0392	0.0377
	(0.0193)	(0.0189)	(0.0271)	(0.0268)	(0.0260)	(0.0255)
Completed Postsecondary School	0.0214	0.0438	0.0194	0.0193	-0.00372	0.0195
	(0.0342)	(0.0378)	(0.0432)	(0.0431)	(0.0325)	(0.0404)
Age of individual	-0.00193**	-0.00219**	-0.00147	-0.00159	4.87e-06	0.000174
	(0.000871)	(0.000861)	(0.00218)	(0.00216)	(0.00144)	(0.00143)
=1 if married	-0.0643***	-0.0658***	-0.0614***	-0.0637***	-0.0535***	-0.0543***
	(0.0125)	(0.0126)	(0.0160)	(0.0161)	(0.0174)	(0.0175)
=1 if male	-0.00311	-0.00557	-0.0124	-0.0125	0.0128	0.00733
	(0.00741)	(0.00750)	(0.0103)	(0.0103)	(0.0115)	(0.0118)
Distance Controls	Yes	Yes	Yes	Yes	Yes	Yes
Precipitation Controls	Yes	Yes	Yes	Yes	Yes	Yes
Temperature Controls	Yes	Yes	Yes	Yes	Yes	Yes
Province/Location Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sample Size	14,121	14,121	8,954	8,954	5,161	5,161

Table A 10. Multinomial Logit Regressions for Rural/Urban Destination (Observations = 14,121)

	With Income Return		With activity categories	
	Rural migrant	Urban migrant	Rural migrant	Urban migrant
= 1 if HH can obtain extra land	-0.00303	-0.00184	-0.00358	-0.00234
	(0.00627)	(0.00660)	(0.00631)	(0.00659)
Land liquidity	0.0134**	-0.00114	0.0133**	-0.000993
	(0.00671)	(0.00593)	(0.00671)	(0.00588)
HH has at least one titled field	-0.00876	0.00144	-0.00957	0.00130
	(0.00875)	(0.00934)	(0.00873)	(0.00920)
HH rents at least one field	0.0178	-0.00563	0.0189	-0.00559
	(0.0124)	(0.0133)	(0.0126)	(0.0132)
Landholding per capita (Ha)	-0.00791	0.000730	-0.00731	0.000233
	(0.0102)	(0.00939)	(0.0102)	(0.00928)
Inheritance (Ha)	-2.68e-05	-0.00152	1.51e-05	-0.00150
	(0.00177)	(0.000957)	(0.00178)	(0.000939)
TLUs	-5.42e-05	0.00172**	-6.58e-05	0.00170**
	(0.000730)	(0.000859)	(0.000725)	(0.000846)
Wage Work:				
Farm labor			-0.00973	-0.00952
			(0.0157)	(0.0159)
Government			-0.00898	0.0200
			(0.0371)	(0.0338)
Ag value added			0.0205	0.00749
			(0.0749)	(0.0653)
Tourism			0.210	0.224**
			(0.185)	(0.113)
Private non-ag			0.0551*	0.0641**
			(0.0310)	(0.0284)
Business:				
Ag input/processing			-0.0428***	0.0606
			(0.0115)	(0.0377)
Natural Resource			-0.0163	-0.000735
			(0.0131)	(0.0148)
Construction			0.00885	0.00390
			(0.0355)	(0.0354)
Private non-ag			-0.0434***	-0.00286
			(0.0146)	(0.0227)
Value added Food			-0.0271*	-0.0131
			(0.0158)	(0.0215)
Low Return Wage	0.00128	0.0308*		
	(0.0139)	(0.0166)		
High Return Wage	0.0846	0.00939		
	(0.0559)	(0.0273)		
Low Return Business	-0.0203**	-0.00699		
	(0.00865)	(0.0110)		
High Return Business	-0.0385***	0.00740		
	(0.0115)	(0.0181)		
=1 if community grows cotton	-0.00984	0.000255	-0.00875	0.000930
	(0.00890)	(0.00911)	(0.00898)	(0.00897)

Ag asset value ZMK	-1.70e-09	-1.32e-09	-1.66e-09	-1.43e-09
	(1.59e-09)	(3.06e-09)	(1.58e-09)	(3.02e-09)
Other Asset Value ZMK	1.32e-10	-0	1.14e-10	-0
	(2.36e-10)	(1.83e-10)	(2.39e-10)	(1.82e-10)
=1 if wall is improved	0.00245	-0.00153	0.00198	-0.00202
	(0.00801)	(0.00733)	(0.00801)	(0.00727)
=1 if floor is improved	-0.0175**	0.00628	-0.0170**	0.00745
	(0.00860)	(0.00868)	(0.00860)	(0.00864)
=1 if roof is improved	0.00851	-0.00425	0.00783	-0.00473
	(0.00844)	(0.00799)	(0.00836)	(0.00792)
HH size	0.000578	-0.00117	0.000593	-0.00124
	(0.00113)	(0.000969)	(0.00113)	(0.000969)
Education of HH head	-0.000587	0.00335***	-0.000558	0.00328***
	(0.000941)	(0.000941)	(0.000934)	(0.000947)
Age of HH head	-0.000555*	0.000114	-0.000549*	0.000127
	(0.000296)	(0.000294)	(0.000296)	(0.000293)
Year HH head settled	-2.42e-05	8.38e-05	-1.97e-05	7.22e-05
	(0.000190)	(0.000182)	(0.000188)	(0.000180)
= 1 if head is local	-0.00180	0.0121	-0.00144	0.0118
	(0.00924)	(0.00928)	(0.00925)	(0.00918)
Completed Primary School	0.00747	0.0383***	0.00706	0.0380***
	(0.00546)	(0.00530)	(0.00538)	(0.00532)
Completed Secondary School	-0.00960	0.0710***	-0.00835	0.0678***
	(0.0124)	(0.0144)	(0.0125)	(0.0141)
Completed Postsecondary School	-0.0232	0.0446	-0.00229	0.0407
	(0.0209)	(0.0301)	(0.0296)	(0.0296)
Age of individual	-0.000116	-0.00188***	-0.000224	-0.00202***
	(0.000645)	(0.000646)	(0.000652)	(0.000640)
Married = 1	-0.0450***	-0.0190**	-0.0455***	-0.0200**
	(0.00879)	(0.00867)	(0.00891)	(0.00862)
Male = 1	-0.00471	0.00229	-0.00604	0.00140
	(0.00541)	(0.00555)	(0.00547)	(0.00560)
Distance Controls	Yes	Yes	Yes	Yes
Precipitation Controls	Yes	Yes	Yes	Yes
Temperature Controls	Yes	Yes	Yes	Yes
Province/Location Controls	Yes	Yes	Yes	Yes

Table A 11. Multinomial Logit Regressions for Rural/Urban Destination by Age Group

	Rural destination		Urban Destination	
	Youth	Young adult	Youth	Young adult
= 1 if HH can obtain extra land	-0.00415	-0.00373	-0.00268	0.000931
	(0.00845)	(0.00767)	(0.00861)	(0.00836)
Land liquidity	0.0181**	0.00756	0.00536	-0.0111
	(0.00887)	(0.00793)	(0.00784)	(0.00802)
HH has at least one titled field	-0.00143	-0.0213**	-0.00232	0.00666
	(0.0133)	(0.00953)	(0.0116)	(0.0136)
HH rents at least one field	0.03	0.000568	-0.00159	-0.0109
	(0.0192)	(0.013)	(0.0201)	(0.0105)
Landholding per capita	-0.00362	-0.0139	0.0019	-0.00216
(Ha)	(0.0141)	(0.0169)	(0.0141)	(0.0114)
Inheritance (Ha)	0.000285	0.00118	-0.00172	0.000341
	(0.00216)	(0.00271)	(0.00107)	(0.0041)
TLUs	0.000557	-0.000686	0.00293***	-0.00134
	(0.000771)	(0.00192)	(0.00107)	(0.00114)
Low Return Wage	0.0252	-0.0126	0.0204	0.0305*
	(0.0284)	(0.00999)	(0.0264)	(0.0178)
High Return Wage	-0.0718***	0.0591	-0.0737***	0.00342
	(0.00417)	(0.0456)	(0.00384)	(0.0223)
Low Return Business	-0.0316**	-0.00836	-0.0233	-0.000382
	(0.0146)	(0.00959)	(0.0167)	(0.0102)
High Return Business	-0.0680***	-0.0211*	0.0518	-0.00123
	(0.00595)	(0.0124)	(0.0606)	(0.0144)
=1 if community grows cotton	-0.0172	-0.00525	-0.00578	0.0119
	(0.0112)	(0.0113)	(0.0123)	(0.0148)
Ag asset value ZMK	-3.42e-09	5.30e-09	-8.81e-10	-1.04e-09
	(2.74e-09)	(6.08e-09)	(3.84e-09)	(6.20e-09)
Other Asset Value ZMK	2.65e-10	1.16e-09	-4.42e-10	1.84e-10
	(3.11e-10)	(1.13e-09)	(3.37e-10)	(2.05e-10)
=1 if wall is improved	0.0102	-0.00856	-0.0100	0.0102
	(0.0103)	(0.00935)	(0.00991)	(0.00994)
=1 if floor is improved	-0.0252**	-0.00566	0.0128	0.00430
	(0.0111)	(0.0130)	(0.0115)	(0.0125)
=1 if roof is improved	0.00617	0.0101	-0.0140	0.0115
	(0.0113)	(0.0116)	(0.0104)	(0.0124)
HH size	0.000990	-0.000119	-0.000485	-0.00315*
	(0.00141)	(0.00145)	(0.00127)	(0.00177)
Age of HH head	-0.000947**	0.000170	-9.50e-06	0.000614
	(0.000405)	(0.000320)	(0.000397)	(0.000402)
Education of HH head	-0.00158	0.00116	0.00425***	0.00247*
	(0.00126)	(0.00129)	(0.00122)	(0.00139)
Year HH head settled	-0.000148	0.000165	-0.000110	0.000373
	(0.000256)	(0.000259)	(0.000230)	(0.000250)
= 1 if head is local	0.0150	-0.0239***	0.00762	0.0146
	(0.0136)	(0.00917)	(0.0129)	(0.0117)
Completed Primary	0.0101	-0.00557	0.0501***	0.0215***
School	(0.00705)	(0.00832)	(0.00744)	(0.00818)

	Rural destination		Urban Destination	
	Youth	Young adult	Youth	Young adult
Completed Secondary	-0.0367***	-0.00253	0.0976***	0.0381**
School	(0.0137)	(0.0166)	(0.0231)	(0.0175)
Completed Postsecondary	-0.0571***	-0.0160	0.0847*	0.0106
School	(0.0106)	(0.0228)	(0.0484)	(0.0242)
Age of individual	0.00201	-8.89e-05	-0.00339**	-0.000209
	(0.00149)	(0.000958)	(0.00158)	(0.00117)
Married = 1	-0.0421***	-0.0440***	-0.0166	-0.0161
	(0.0107)	(0.0131)	(0.0124)	(0.0125)
Male = 1	-0.00987	0.00629	-0.000119	0.00733
	(0.00776)	(0.00791)	(0.00740)	(0.00863)
Distance Controls	Yes	Yes	Yes	Yes
Precipitation Controls	Yes	Yes	Yes	Yes
Temperature Controls	Yes	Yes	Yes	Yes
Province/Location Controls	Yes	Yes	Yes	Yes