Intra-rural migration and pathways to greater well-being: Evidence from Tanzania

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Abstract
Migration between rural locations is prevalent in many developing countries and has been found to improve economic well-being in sub-Saharan Africa. This paper explores the pathways through which intra-rural migration affects well-being in rural Tanzania. Specifically, we investigate whether such migration enables migrants to access more land, higher quality land, or greater off-farm income generating opportunities that may, in turn, translate into improved well-being. Drawing on a longitudinal data set that tracks rural migrants to their destinations, we employ a difference-in-differences approach, validated with a multinomial treatment effects model, and find that migration confers a benefit in consumption to migrants. Results do not indicate that this advantage is derived from larger farms or from more productive farmland. However, across all destinations, migrants are more likely to draw from off-farm and non-farm income sources, suggesting that even intra-rural migration represents a shift away from agriculture, and this is likely the dominant channel through which migrants benefit. We conclude that intra-rural migration merits greater attention in the discourse on rural development and structural transformation.

Keywords: internal migration, land access, poverty, rural nonfarm economy, Tanzania
JEL codes: G61, I32, O15, Q15

1. Introduction

How do poor people exit poverty? This question remains a focus of the development community as the global goal of eliminating extreme poverty is increasingly within reach. It is also a question of intense interest for policy makers in Tanzania, where a large majority of the poor resides in rural areas, and approximately one third of the rural population lives in poverty (World Bank 2015). To tackle the challenge of reducing poverty, it is therefore necessary to consider the opportunities available to the rural population. Over half of the rural poor in Tanzania rely on subsistence agriculture for their livelihoods (ibid), suggesting that improving agricultural opportunities and outcomes should be central to any poverty reduction program. As well, the process of structural transformation, in which societies transition to a higher-income economic base with a relatively small but productive agricultural sector, is accompanied by the movement of labor out of agriculture. Often, this takes the form of relocation from rural to urban areas (de Brauw et al. 2014). Poverty reduction programs therefore need to also account for the role of migration in economic development. Yet gaps remain in our knowledge of how rural people manage to exit poverty, and in particular, the role of different types of migration as a conduit to greater economic well-being.[1] This article seeks to fill this gap by exploring the pathways through which intra-rural migration in Tanzania may be used to achieve a higher level of consumption.

As will be discussed, intra-rural migration is prevalent in developing countries (Lucas 2015), and migration has been found to improve economic well-being in sub-Saharan Africa, even for those who move to a rural area (Beegle et al. 2011; Garlick et al. 2015). This suggests that it may be labor mobility rather than rural-to-urban movement *per se* that drives improvements in well-being. Given the importance of migration to rural livelihoods, it is imperative to better understand the pathways, or transmission channels, through which intra-rural migration may improve consumption. In this article, we highlight three possible channels (noting that other channels are also possible). Migrants' consumption may improve due to a ***land access effect*** if they increase their farm size by moving to areas with greater land availability; an ***agricultural productivity effect*** if they acquire higher yielding farmland by moving to areas with more favorable agricultural potential; and/ or an ***income diversification effect*** if they orient their livelihood portfolio toward off-farm income sources by moving to areas with greater off-farm economic activity. We use nationally representative longitudinal data from Tanzania to assess whether migration affects consumption and to examine these potential avenues of improved well-being. As a preview of our results, we find no evidence of a land access effect and limited evidence that migrants achieve greater agricultural productivity through migration. However, intra-rural migrants do tend to incorporate more off-farm work into their income portfolios once they reach their destinations, and this seems to be the dominant channel through which migration confers an improvement in consumption.

[1] Throughout this article, consumption is treated as a proxy for general well-being, and the terms 'consumption' and 'economic well-being' are used in the same manner.

This article makes several contributions to the existing literature on internal migration in developing countries. First, although migration within and from the Kagera region of northwestern Tanzania has been well-documented (Beegle et al. 2011; Christiaensen et al. 2013; Hirvonen and Lilleør 2015; Wineman and Liverpool-Tasie 2015), owing mostly to a unique 19-year longitudinal data set, this article extends the focus to the entire Tanzanian population. This provides a wider context within which to understand the case-study results from a specific region. Second, to our knowledge, no other study explores the highly policy-relevant question of the alternative channels through which intra-rural migration affects migrants' well-being. Rather than asking only *whether* migration improves consumption or incomes (Beegle et al. 2011; de Brauw et al. 2013; McKenzie et al. 2010), we explore *how* a migrant's consumption is affected. This allows for more nuanced policy implications than would otherwise be obtained. Third, we extend the identification strategy of Beegle et al. (2011) by regarding migration to various destinations (i.e., urban center or more/ less densely populated rural location) as a multinomial variable and addressing endogeneity within a multinomial treatment effects model. This allows us to better identify the effects of each type of migration.

The remainder of the article is organized as follows. Section 2 includes a literature review of the effects of migration and potential channels through which intra-rural migration may benefit migrants. Section 3 provides a simple conceptual framework and our research hypotheses, followed by a description of the data and identification strategy in section 4. Section 5 presents the results, including descriptive statistics, econometric results, and a set of robustness checks. We conclude with a discussion of the results and policy implications in section 6.

2. Background

In the economic development literature, people in rural Africa are commonly assumed to be either stationary or in the process of migrating between the rural and urban sectors. Thus, there persists a stereotype of a stable rural society characterized by tight-knit communities rooted in tribal homelands (Chimhowu and Woodhouse, 2006). In turn, the literature on migration focuses almost exclusively on the flows between rural areas and urban centers (de Haan 1999). This seems to reflect traditional two-sector models of development, such as the Lewis model of labor transition from the 'subsistence' to capitalist sector (Lewis 1954), or the Harris-Todaro model of migration to the urban sector (Harris and Todaro 1970). While these models have inspired extensive study of rural-to-urban migration and its role in structural transformation (e.g., de Brauw et al. 2014), they implicitly paint the rural sector as homogenous, thus failing to recognize any motive for intra-rural migration. The few existing studies of rural-to-rural migration tend to focus on seasonal or temporary migration (de Bruijn and van Dijk 2003; Hampshire and Randall 1999), again overlooking patterns of long-term migration.

Despite the overwhelming attention given to rural-urban migration, intra-rural migration is prevalent in many developing countries (Bilsborrow 1998; Lucas 2015), and is recognized in sub-Saharan Africa as the most common of the four major types of movement (the others being rural-urban, urban-urban, and urban-rural) (Oucho and Gould 1993). This pattern has been

observed in Botswana in the 1980s (Lesetedi 1992, cited in de Haan 1999), Ghana in the 1990s (Sowa and White 1997, cited in de Haan 1999) and Burkina Faso in the early 2000s (Henry et al. 2004). More recently in South Africa, two-thirds or all movements from rural households were to another rural destination (Garlick et al. 2015). In the Kagera region of northwestern Tanzania, Hirvonen and Lilleør (2015) find that almost half of the population moved from their initial village during a 10-year interval, with 74% of rural migrants settling in another rural area. Also in the same region, Wineman and Liverpool-Tasie (2015) find that over one-third of rural households can be classified as first-generation migrants. With an average of 18 years spent in the destination village, such moves are far from temporary.

What explains these migration flows between rural areas? Several influential models begin with the proposition that people move in order to maximize their expected incomes (Harris and Todaro 1970; Sjaastad 1964). Recently, a number of studies have concluded that migration improves economic well-being for migrants in sub-Saharan Africa, thereby establishing migration as a "pathway out of poverty". For example, Beegle et al. (2011) examine migrant tracking data over 13 years in Tanzania and find that migration results in a 36 percentage point increase in consumption growth, relative to remaining in the community. While this effect is larger for those moving to urban areas, the benefit persists even for those who move to a more remote (less well-connected) area. Similar conclusions have been reached in Ethiopia (de Brauw et al. 2013) and South Africa (Garlick et al. 2015). As noted by Beegle et al. (2011), "clearly, it matters where people move, but moving in itself seems to matter too." However, little is known about the dynamics of intra-rural migration (Lucas 1997), including what, precisely, happens along the way that facilitates upward mobility.

As noted in the introduction, we first assess whether intra-rural migrants in Tanzania achieve an improvement in consumption, and then whether this seems to occur through three transmission channels, including a land access effect, an agricultural productivity effect, and/or an income diversification effect (i.e., a shift away from reliance on the farm). We now discuss these in turn. Across rural sub-Saharan Africa, a strong relationship has been found between land access and household income (Jayne et al. 2003; Muyanga and Jayne 2014). At the same time, evidence of rising land pressures and declining median farm sizes has surfaced in a number of countries (Jayne et al. 2003; Jayne et al. 2014). In Kenya, for example, where 40% of the rural population resides on just 5% of the rural land, Muyanga and Jayne (2014) note that farm sizes have been gradually shrinking as household land endowments are subdivided with each generation. Rising population densities are correlated with lower incomes and, beyond a certain threshold, with decreasing labor productivity. This pattern suggests that residents may be able to improve their incomes by shifting to another area with readily accessible land, effectively equilibrating labor-to-land ratios over space (Jayne et al. 2014).

Along these lines, Jayne and Muyanga (2012) find that the most densely populated villages in Kenya see a significantly higher net outflow of labor. In Malawi, Potts (2006) explicitly attributes several decades of intra-rural migration flows to increasingly serious land shortages in the south. In Tanzania, land-constrained residents are seen to migrate farther than

those with greater landholdings (Beegle et al. 2011), suggesting that land pressure is among the drivers of outmigration. In a unique study of migrants who have settled in rural Tanzania, Wineman and Liverpool-Tasie (2015) find that the desire for more (and more productive) land stands out as a prime motivation for such migration, and migrant households are observed to amass slightly larger landholdings than their non-migrant neighbors, primarily through the market (Wineman and Liverpool-Tasie 2016). At the same time, there may be impediments to intra-rural migration motivated by land access. Tribal or cultural differences across regions and local resistance to land purchases by newcomers could present an obstacle to joining a new community. And farmers may be unwilling to trade the benefits of living in a more densely populated area, such as access to amenities, for the benefits of enhanced land access in a relatively remote area.

In a second transmission channel, we propose that intra-rural migrants may achieve an improvement in consumption by migrating to areas with greater land productivity. This argument mirrors the rationale for the land access effect, and may take the form of moving to areas of better soil fertility, more favorable rainfall patterns, a lower prevalence of crop disease, or any other factor that contributes to greater agricultural potential. As noted by Barrett and Bevis (2015), there exists a strong link between soil quality and economic well-being, with poor soils directly limiting labor productivity and farm income. In fact, a degraded natural resource base can constitute a poverty trap, in which low-nutrient soils are unresponsive to labor or fertilizer inputs, and farmers are compelled to respond with continuous cultivation that further degrades the soil – a classic negative feedback cycle (Barrett and Bevis 2015; Titonnell and Giller 2013). If more productive land is available elsewhere, migration may present an opportunity to exit this cycle. In Uganda, Baland et al. (2007) speculatively attribute high levels of intra-rural migration to the search for more productive land. Nevertheless, farmers may have difficulty transferring their skills to a very different agro-climatic setting (Jayne et al. 2014). Indeed, Bazzi et al. (2014) find that intra-rural migrants in Indonesia are more successful when they have relocated to areas of similar agro-climatic conditions.

The final transmission channel we explore is that of income diversification, whereby intra-rural migrants may relocate to larger villages with greater off-farm income generating opportunities. The relevance of rural nonfarm income and employment is widely recognized (Haggblade et al. 2007), and agricultural transformation is often characterized by growth in the off-farm/ non-farm earnings of farm households. Poor rural residents may find migration to large villages and secondary towns[2] preferable to urban migration for several reasons, including lower migration costs, the ability to maintain social connections with their original communities, lower search costs associated with job-hunting, and a higher likelihood of finding a job for which they are qualified (Christiaensen and Todo 2014). In both Ethiopia and Uganda, the workforce in rural towns tends to be unskilled or semi-skilled, as compared with a more skilled workforce in cities (Dorosh and Thurlow 2012). Although migration to rural hubs of nonfarm economic activity is less visible than rural-to-urban migration flows, the rationale for such movements are similar.

[2] As will be discussed, the official definition of 'rural' in Tanzania excludes places recognized as secondary towns.

Recent evidence even suggests that the shift away from farm-based livelihoods and migration to secondary towns is associated with a greater reduction in poverty than rural-to-urban migration. In the Kagera region of Tanzania, where the poverty rate fell by 28% over 19 years, almost half of this decline could be attributed to farmers either transitioning into the rural nonfarm economy or migrating to secondary towns (Christiaensen et al. 2013). The authors refer to these smaller towns as 'the missing middle',[3] as they are often overlooked in the literature on internal migration and structural transformation. In a cross-country study of developing countries, Christiaensen and Todo (2014) similarly find that a sectoral/geographic shift out of agriculture into rural nonfarm activities and to secondary towns is associated with a national reduction of poverty, while the same cannot be said for migration to larger cities. All three potential transmission channels (including land access, more favorable agricultural productivity, or income diversification) discussed in this section appear as plausible pathways of improved well-being. However, empirical evidence is needed to determine which channel prevails among intra-rural migrants in Tanzania.

3. Conceptual Framework and Hypotheses

In this paper, we regard migration as an individual strategy, such that the migrant (rather than the migrant-sending household) is the appropriate unit of analysis. This is consistent with the conceptualization of migration in several influential models (Harris and Todaro 1970; Sjaastad 1964). At the same time, as members of rural households tend to generate income jointly (e.g., farm production or family businesses) and pool resources, consumption is captured at the household level and then scaled to reflect the individual well-being of household members. Higher income is understood to be correlated with greater consumption.

We begin with a simple conceptual framework that itemizes the various sources of income of a rural household/ individual. Income is collected from several possible sources, including crop production, livestock production, and off-farm income sources, such as businesses or wage/ salary employment.

$$\begin{aligned} Income = \ & Income_{crop}\left(Land\ area, Land\ quality, Labor_{crop}, \boldsymbol{Z}_{crop}\right) \\ & + Income_{livestock}\left(Livestock, Labor_{livestock}, \boldsymbol{Z}_{livestock}\right) \\ & + Income_{off-farm}\left(Off-farm\ opportunities, Labor_{off-farm}, \boldsymbol{Z}_{off-farm}\right) \end{aligned} \quad (1)$$

Each type of income is a function of several factors, where $\boldsymbol{Z}$ is a vector of factors that are less relevant to the current research question. The key factors for this analysis, specified inside the parentheses, all positively relate to income from a given source. For example,

$$\frac{\partial Income_{crop}}{\partial Land\ area} \geq 0, \frac{\partial Income_{crop}}{\partial Land\ quality} \geq 0, \frac{\partial Income_{off-farm}}{\partial Off-farm\ opportunities} \geq 0 \quad (2)$$

Note that several of these factors can be adjusted through migration (as well as through other actions). Thus, by migrating to a new location, a rural individual can alter his/her land area accessed, farmland quality, and the off-farm income-generating opportunities available.

[3] Christiaensen et al. (2013) define 'urban' centers as those with populations of at least one half million.

In this article, we first assess whether migrants seem to achieve higher consumption (economic well-being), and then examine the channels through which migration benefits migrants. With a focus on intra-rural migrants, we evaluate three hypotheses:

(1) Intra-rural migrants obtain larger land areas per capita.

(2) Intra-rural migrants obtain higher quality farmland.

(3) Intra-rural migrants incorporate more off-farm income into their income portfolios.[4]

In each case, we *assume* a positive relationship between indicators of these transmission channel and consumption, with reference to the existing literature (section 2). As noted earlier, these are not the only channels through which migration may affect consumption. For example, intra-rural migrants may move to less remote locations where, holding all else constant, they are able to sell farm output with lower associated transport costs. However, it is beyond the scope of this article to explore every possible channel of improved well-being.

4. Data and Identification Strategy

4.1 Data Sources

This study draws primarily from two waves of the Living Standards Measurement Survey (LSMS) for Tanzania, a nationally representative longitudinal data set collected between 2008/09 and 2012/2013. The LSMS is implemented by the Tanzania National Bureau of Statistics, and is a research initiative within the Development Economics Research Group of the World Bank. The LSMS captures a rich set of information on household consumption, asset holdings, and income-generating activities, as well as detailed information on agricultural production. After the first round of data collection, the survey proceeds to track all household members that were at least 15 years old, including individuals that had split off from their original households and entire households that had relocated. It thus becomes an individual-level longitudinal survey, capturing information for the entire household of each individual who had been interviewed in an earlier round. This phenomenal tracking survey provides a unique opportunity to explore the dynamics of migration.

The original sample included 3,265 households, of which 2,063 were rural. This article focuses on these rural households and the 5,202 working-age (ages 15-64 (World Bank 2015)) individual household members therein. As will be explained in section 4.3, we use only the first and third waves of this survey, collected in 2008/09 and 2012/13. Relative to drawing from the intervening survey wave, this approach maximizes the amount of time migrants are likely to have spent in their new locations before we assess whether migration has been accompanied by an improvement in consumption. By 2012/13, 4,844 individuals from our study population were re-interviewed, producing a re-interview rate of 93.2%. Population weights are included in all

[4] Only hypothesis 3 is investigated by referring to income-generating activities at the individual (as well as the household) level, while hypotheses 1 and 2 are necessarily investigated with household-level information.

analyses.[5] Some observations are dropped due to incomplete surveys, leaving a final sample size of 4,742.

Appended to the LSMS data set are additional data drawn from other sources. These include local population density estimates, distance to the district headquarters, long-term average climate variables, and information on soil quality (NBS 2014). This study also incorporates the LSMS household income estimates from the FAO Rural Income Generating Activities project (FAO 2015).

4.2 Variables

Key variables are defined in table B1 in the appendix, though several variables merit further explanation. Individuals who had left their initial residence of 2008/09 and consider themselves to have *since* settled in a new community are identified as 'migrants'. This is determined primarily through respondents' 2012/13 self-reports of recent migration, triangulated with survey information on their relative locations in 2008/09 and 2012/13.[6] Specifically, individuals who claimed to have recently moved, but were never tracked to a new location and did not seem to have travelled more than 5 km from their initial communities, are re-classified as non-migrants in our main analysis. In some cases, individuals had clearly moved some distance but did not consider themselves to be migrants. Because there is some ambiguity around migrant status, robustness checks (section 5.3) are conducted to examine how our results vary with alternate definitions of 'migrant'.

A key component of this analysis is the household classification as 'rural' or 'urban'. The classification that accompanies the LSMS data set is based on the 2002 Tanzania Population and Household Census, and the determination of an area as 'urban' is made by a local census committee (Muzzini and Lindeboom 2008). In addition to other areas, all regional and district headquarters (bases of local government) are considered to be urban, regardless of their size or population density. Our analysis also includes a measure of consumption per adult equivalent (AE), where consumption is the annualized monetary value the household spent on, or consumed of, food products within the past week, the amount spent on other commonly-purchased products within the previous month, and the amount spent on less commonly-purchased goods over the past year.

To identify the pathways through which migration may benefit migrants, several variables serve as indicators for the three transmission channels described in section 2. For the land access effect, we consider the amount of land accessed per capita and per working-age

[5] Unfortunately, the LSMS data set does not track international migrants. However, a similar data set from the Kagera region that did track international migrants found that just 2% of re-interviewed individuals had moved outside the country (Beegle et al. 2011). Especially because we focus on rural households, we do not expect to be missing a substantial number of international migrants.

[6] These estimates are derived with the user-written <geodist> command in Stata (created by Robert Picard). They are based on the geographic information made available with the data set, which include community-level coordinates in 2008/09 and household-level coordinates in 2012/13. Hence, very short-distance movements may not be accurately captured.

household member. For the agricultural productivity effect, we consider a measure of whether soil in a given site is estimated to be nutrient-constrained (from the Harmonized World Soil Database), in addition to the net value of crop production per acre, as realized by cropping households.[7] For the income diversification effect, we consider a range of income-related outcomes, including whether individuals derive income from off-farm sources (from self-employment or as agricultural or non-agricultural wage workers); the share of household income from off-farm and non-farm sources; and whether the household specializes in (i.e., derives ≥75% of its income from) agriculture, non-agricultural wage-work, or self-employment. Among these indicators, which will serve as our outcome variables, our goal is to identify what is changing for migrants in tandem with any change in the rate of consumption growth.

4.3 Identification Strategy

To explore our three hypotheses regarding the transmission channels of any change in consumption, it is not enough to simply compare descriptive statistics of migrants and non-migrants. This is because migrants are likely to be systematically different from non-migrants, in terms of both observed and unobserved characteristics. Lacking experimental data to estimate the effects of migration, we closely follow the method employed by Beegle et al. (2011) to limit self-selection bias. The main equation is:

$$\Delta Y_{ih,2013-2009} = \alpha + \boldsymbol{M_{ih,2013}\beta} + \boldsymbol{X_{ih,2009}\gamma} + \delta_h + \varepsilon_{ih} \quad (3)$$

where the dependent variable is the change in outcome (including consumption and the indicators of transmission channels listed in section 4.2) for individual i in initial household h from 2008/09 to 2012/13. This setup controls for time-invariant unobservable characteristics at the individual level, such as risk preferences or ability, that may influence both the propensity to migrate and an individual's level of economic well-being. $\boldsymbol{M_{ih,2013}}$ is a vector of migration choices observed in 2012/13, including migration to an urban center, to a more densely populated rural area, and to an equally (or less) densely populated rural area. In this difference-in-differences (DID) setup, the estimated effect of a particular type of migration is captured by $\boldsymbol{\beta}$. Although we also control for migration to an urban center, our focus is on the coefficients on migration to a more or less densely populated rural location. $\boldsymbol{X_{ih,2009}}$ is a vector of individual characteristics, including age, marital status, and education, and δ_h is an initial household fixed effect (IHHFE) that controls for all household-level characteristics, such as social networks, wealth, and initial livelihood trajectories, that were shared by all household members in 2008/09. ε_{ih} is a stochastic error term.

[7] Farm profits per acre are a reflection of both agricultural productivity and prices. However, much of the data on input expenditures are not captured in per-unit terms, which would be necessary for construction of a productivity index. In addition, a crop's quality, and therefore its value, may differ depending on where it is produced in the country, and a productivity index is not able to capture this change as migrants move across space. We therefore prefer to employ a measure of farm profit that accounts for both expenditures and farmers' estimates of the value of crop production.

With equation (3), the impact of migration is identified using variation within the initial household, comparing amongst household members that have and have not migrated. It should be noted that this identification strategy does not address all sources of unobserved heterogeneity that may influence both migration and consumption levels. For example, while consumption estimates and most indicators of our hypothesized transmission channels necessarily reflect household-level outcomes, equation (3) does not control for the characteristics of the migrant's household by 2012/13 (Garlick et al. 2015). Nevertheless, it does reduce the likely sources of omitted variable bias.

Our main analysis is based on equation (3). However, we also use instrumental variables (IVs) to isolate the exogenous variation in migration decisions, $\boldsymbol{M_{ih,2013}}$, in order to produce unbiased estimates of the effects of migration on consumption. These IVs need to predict individual migration but not affect the *trajectory* of any outcome variable assessed – except through migration. We refer to the literature on migration to select appropriate IVs (Beegle et al. 2011; de Brauw et al. 2013). Several authors have proposed that geographic characteristics of the place of origin (e.g., distance to large cities) correlate with migration probability but not migrants' incomes or other outcomes at the destination (McKenzie et al. 2010). Accordingly, our IVs include indicators for being head, spouse, or son of the household head, age rank within the household (reflecting a differential propensity to split off from the household), and distance from the district headquarters. Instrumental variable techniques are commonly used with continuous and linear endogenous variables. However, in our case, the decision to migrate is a multinomial (categorical) choice among three possible types of destination, including urban centers and more/ less densely populated rural locations. We therefore follow the examples of Deb and Trivedi (2006) and Abreu et al. (2015) by estimating a multinomial treatment effects model, in which the first stage is a mixed multinomial logit (MMNL) model, and the two stages are estimated simultaneously using maximum simulated likelihood (MSL).[8] A full explanation of the model is provided in Appendix A. However, the non-linear first-stage model would produce inconsistent results with IHHFE, owing to the 'incidental parameters problem' (see discussion in Greene (2004)). As this is a key component of our identification strategy, we rely on equation (3) for the main analysis.

5. Results

5.1 Descriptive Results

We begin with a broad overview of migration flows from and between rural areas (table 1). With a focus on the working-age population (ages 15-64 in 2008/09),[9] 12% of rural residents had migrated from their 2008/09 community by 2012/13, and roughly two-thirds of rural migrants had moved to another rural community. These flows over this short four-year period are naturally lower than the stock of migrants in rural areas, where 26% of the working-age

[8] These estimates are derived with the user-written Stata command <mtreatreg> (created by Partha Deb).

[9] 1.6% of our sample had aged out of the working-age bracket by 2012/13, though they are retained in analysis.

population in 2008/09 reported that they had immigrated to their current communities. This figure is higher for women (at 29%) than for men (at 22%).

Table 2 sheds light on the characteristics of migration from rural households, inclusive of all destinations. Almost half (46%) of migrants move to another community within the same district. 22% move to a more densely populated rural area, while a larger share (46%) move to a rural area that is equally or less densely populated than their original community.[10] Migrants are most likely to cite marriage or family reasons as their motivation to migrate, and a substantial share (24%) move for better services/ housing, while just 6% move for a land-related reason. In section 5.3, we will examine whether our results are robust to a narrower definition of migrant that excludes those who relocated for non-economic reasons.

[Tables 1 and 2]

We next examine the changes experienced by migrants that had moved to a more or less densely populated rural area by 2012/13, and for purposes of comparison, the results for urban migrants are also reported (table 3). On average, migrants to more densely populated rural locations see a 0.21 log point increase in consumption. In contrast, migrants to less densely populated rural locations do not experience a statistically significant change in consumption, though this does not tell us whether they experience a higher rate of consumption growth *relative to non-migrants*. Focusing on the indicators of farm size, migrants to less densely populated rural areas experience, on average, no significant change in land area accessed. With regard to agricultural production, intra-rural migrants do not seem to experience, on average, a significant improvement in farm profits per acre. Finally, turning to the indicators of an income diversification effect, the direction and significance of average changes are remarkably similar across destinations. Even in less densely populated locations, migrants are more likely to be self-employed and to engage in non-agricultural wage work, and their households at destination derive a significantly larger share of income from off-farm/ non-farm sources, as compared with their households at origin. Descriptive statistics for the variables in our regression analysis, including those that will serve as control variables, are given in table B2 in the appendix.

[Table 3]

5.2 Econometric Results

While the descriptive results of section 5.1 reveal intriguing patterns around the migration experience, econometric analysis is needed to better determine whether these patterns are *uniquely* associated with migration. We begin by examining the effect of migration on consumption (table 4).[11] For reference, the coefficient on migration to an urban center is reported, although our focus remains on the coefficients related to intra-rural migration. In column 1, the change in log of consumption ($\ln(consumption_{2012/13}) - \ln(consumption_{2008/09})$) is a function of individual and household characteristics, while in

[10] Local population densities are based on 2010 estimates (from WorldPop). Though we do not capture changes over the study period, these are not expected to change dramatically within four years.

[11] Key coefficients are reported in table 4, though full results are available from the authors upon request.

column 2, household controls are replaced with initial household fixed effects (IHHFE), as per equation (3). These results confirm that migration brings about an improvement in consumption for migrants, relative to household members that remained behind. Specifically, migration to a more densely populated rural area results in a 31.1 log-point (36.5%)[12] increase in the rate of consumption growth. However, consistent with the results of Beegle et al. (2011),[13] even moving to a less densely populated area produces a 16.5 log-point (17.9%) improvement in the rate of consumption growth. The magnitude of the coefficients in column 2 suggests that the effect of moving to a rural area is under-estimated (and over-estimated for urban migration) when not explicitly focusing on intra-household variation.

To validate these results, we also present results from a multinomial treatment effects model (columns 3 and 4). In the first stage (column 3), additional IVs are included as regressors in the multinomial logit model of destination choice. Indicators of position within the household (age rank and status as head/ spouse or son of the head) are significant determinants of migration, with patterns that vary somewhat across destinations. We argue that these should otherwise be exogenous with the trajectory of consumption (particularly as our measure of consumption is based on household-level outcomes). A greater distance from the district headquarters reduces the likelihood of moving to a more densely populated rural area, although the coefficient is negative for all destinations. These IVs are jointly significant in the first stage regression (χ^2=60.56, P=0.000). Though a test for overidentifying restrictions has not been developed for this model, we follow Deb and Trivedi (2006) and conduct this test in a linear 2SLS framework with three endogenous variables. The Sargan statistic is not significant (P=0.33). When the latent factors that determine migration choice are accounted for in the second stage model (column 4), results confirm that migration to all locations produces a significant improvement in consumption. However, the coefficients for the latent factors of migration choice ($\boldsymbol{\lambda}$) provide evidence of negative selection on unobservables for intra-rural migration and positive selection for rural-to-urban migration. In other words, rural migrants are found to already be on a negative trajectory that would bias downward the estimated effects of intra-rural migration on consumption. (The opposite is true for urban migrants.) Controlling for this naturally increases the estimated consumption growth associated with intra-rural migration, though the coefficients still indicate a greater impact of migration to more densely populated locations.

[Table 4]

We now explore what *else* is changing for migrants, along with the aforementioned increase in consumption. Table 5 presents the key coefficients from equation (3) when indicators of our hypothesized pathways of consumption change are treated, in turn, as outcome variables. Results of columns 1 and 2, with negative coefficients on all migrant destinations, provide a

[12] In a semi-log model in which the dependent variable is logged, the effect of a 0 to 1 change in a binary regressor is [100*($e^{\beta} - 1$)]%.

[13] Rather than focusing on population density, Beegle et al. (2011) categorize destinations as more/ less remote by whether they are well-connected to an urban center.

fairly definitive rejection our first hypothesis regarding a land access effect. (Note, however, that this is a lower bound estimate, as initial households likely experience a boost in per capita land access with the departure of a household member.) With regard to the hypothesized agricultural productivity effect, results of columns 3 and 4 provides no real evidence that improved well-being occurs through more profitable farms, although migrants moving to more densely populated areas do seem to arrive at more favorable soil quality.

Columns 5-13 explore the effect of migration on income diversification. Moving to a more densely populated rural area shifts individuals toward non-agricultural wage work (column 6). It also results in a greater emphasis on off-farm and, more specifically, non-farm income sources (columns 8 and 9) and a decreased likelihood of specializing in agriculture, relative to other initial household members (column 10). Migration to a less densely populated location is also significant for the income share derived from off-farm sources, which includes agricultural wage work, and is close to statistically significant for the likelihood of specializing in self-employment (P=0.101). These results provide support for our third proposed transmission channel, in which migrants achieve an improvement in consumption through a reorientation away from a reliance on farm income.

[Table 5]

5.3 Robustness Checks

Our results may be sensitive to choices around model specification and how to identify migrants. In this section, we repeat our main analysis with a set of alternative choices. To conserve space, some results are presented in the appendix while others are available upon request. Table B3 presents results of several key models from tables 4 and 5, using equation (3) throughout, but with alternative definitions of 'migrant'. In the top panel, respondents who self-report that they are *not* immigrants in their 2012/13 communities, but who were tracked in the interim and are either observed to have moved at least 5 km or to reside in another district, are now considered as migrants. This likely bundles together out-migrants and returnees in the migrant category (656 migrant observations). Results are quite consistent with our main analysis. In the middle panel, we alternatively define migrants as any individual who has moved at least 5 km between the 2008/09 and 2012/13 interviews, regardless of their self-report (468 migrant observations). Now, migration to a less densely populated location does not bring a statistically significant improvement in consumption, although the coefficient is similar to our main analysis. In the bottom panel, the migrant label is limited to those who report being motivated to migrate for reasons other than marriage or school (419 migrant observations). Now, intra-rural migrants do not experience a statistically significant boost in consumption, though they more readily engage in non-agricultural wage work.

We also run several key models from table 5 with a multinomial treatment effects model (table B4). Recall that this controls for specific initial household characteristics but not IHHFE. Results of this alternative model specification are quite consistent with our main analysis: Migrants to less densely populated areas are found to experience no improvement in farm size,

though they do experience higher farm profits a significantly higher likelihood of non-agricultural wage work. This is the only specification in which we find support for the agricultural productivity effect, at least with respect to migrants to less densely populated areas. Next, although we could not test for attrition bias when using two panel waves, we adjust population weights for the likelihood of attrition using inverse probability weights (Wooldridge 2002) and confirm that the results remain quite consistent with those reported. Finally, the detected boost in consumption that accompanies migration may reflect the way migrants are interviewed somewhat later than other initial household members (on average, 1.5 months later), as they must be tracked to a new location. When we control for the number of months since the 2008/09 interview, results remain consistent, although the effect of migration to a less densely populated rural area is less precisely estimated (P=0.103).

6. Conclusions

6.1 Summary of Results

In this article, we explore patterns of rural migration (with particular attention to intra-rural migration) in Tanzania and test several hypotheses to explain why such migration generally brings about an improvement in well-being. Specifically, we test whether migration enables intra-rural migrants to access more land, higher quality land, or off-farm income generating opportunities that may, in turn, translate into greater consumption. This analysis has produced several noteworthy findings. First, the rural population of Tanzania is highly mobile, with 18% of those aged 15-30 moving to a new community within the span of four years. The rate of migration to other rural destinations exceeds the flow to cities (with 69% of rural migrants moving to another rural location), mirroring the pattern seen in other developing countries (Bilsborrow 1998; Lucas 1997 and 2015; Oucho and Gould 1993). It is clear that the flow of migrants from rural households is not characterized by a steady march to the cities, and a narrow focus on rural-to-urban migration would miss much of the story around migration and rural development.

Second, this article highlights the relevance of high density rural settlements as a destination for rural migrants. Recall that, by the official definition of 'urban', these sites are not large cities, nor are they regional or even district headquarters (the bases of local government). Yet moving to higher density areas seems to confer a benefit to rural migrants. Muzzini and Lindeboom (2008) find that approximately 17% of the population in mainland Tanzania resides in high density settlements that are not officially recognized as 'urban'. The authors argue that "significant urbanization may be occurring off the radar screen of government agencies", and that may be what we have keyed into in our analysis of intra-rural migration.

Third, in our main analysis, we do not find evidence that migrants to less densely populated locations are able, on average, to secure larger landholdings at their destinations. This suggests that migration is not generally used as a pathway to access more land, and thus, we would not expect migration to equilibrate population densities (and factor ratios) over space. In the face of rising land pressures and declining median land sizes in a number of African

countries (Jayne et al. 2003; Jayne et al. 2014; Muyanga and Jayne 2014), our analysis does not indicate that migration is an effective response to this particular challenge – at least in Tanzania. With regard to our hypothesis of an agricultural productivity effect, we generally do not find evidence that migrants are able to achieve more profitable farms (among those who remain in agriculture). Migration does not appear to be a strategy used to achieve a better farming outcome.

Fourth, across all destinations, we find evidence that migrants are fashioning income portfolios of reduced agricultural emphasis. Though the evidence here is weakest for migrants to less densely populated rural locations, it is the only pathway of change we investigated that seems likely to produce the observed improvement in consumption. For migrants to more densely populated locations, results unequivocally show that they draw more readily from non-agricultural wage work and rely more heavily on business income and other off-farm wage/salary opportunities. This underscores the importance of the rural nonfarm economy in alleviating poverty, a finding consistent with that reached by other authors (Christiaensen et al. 2013; Christiansen and Todo 2014; Haggblade et al. 2007).

6.2 Directions for Further Research

This article exhibits several limitations that should be noted, particularly as future research may aim to address these shortcomings. The relatively short time interval of this study may result in an underestimate of the benefits of migration if returns take longer to accrue. For example, moving to a different agro-ecological context may entail a learning curve for farmers, and acquiring land in a new community may require time to locate a seller. The short time interval also inhibits us from distinguishing between permanent and temporary (circular) migration, although temporary migration is common in developing countries (Lucas 2015), and the dynamics of each type of migration may differ. We are likewise unable to explicitly capture the phenomenon of return migration, which may occur when migrants are unsuccessful at their destinations or when successful migrants return with capital to invest at home.

By studying the experience of the individual migrant, we overlook the perspectives of the sending and receiving households and communities. However, migration may bring negative externalities for non-migrants. For example, sending households may see the departure of their most capable members for greener pastures elsewhere, while households that host guests may initially suffer a drop in consumption with more mouths to feed (Garlick et al. 2015). In addition, there may be alternate avenues through which migration can benefit intra-rural migrants that were not explored here. For example, more secure land rights in a destination village may also serve as a pathway through which migration can bring about improved well-being. The transmission channels examined here are not exhaustive.

6.3 Policy Implications

Our results point to several implications for researchers and policy makers. As we find that migration confers a benefit to migrants, consistent with results seen elsewhere (Beegle et al.

2011; de Brauw et al. 2013; Garlick et al. 2015), this suggests that labor mobility is beneficial and should be facilitated, particularly where market failures are inhibitive. Transport and communication infrastructure and the improved provision of education or health services may turn more remote areas into viable destinations (Jayne et al. 2014), and well-functioning land markets may also facilitate intra-rural migration (Wineman and Liverpool-Tasie 2015). However, policy makers that aim to facilitate migration, particularly to less densely populated areas, should weigh the costs of any intervention against the relatively limited benefits observed this this article.

The positive consumption effect of moving to a more densely populated rural location demonstrates that intra-rural migration plays an important role in the development process and deserves a place in the discourse on migration. The poverty reducing effects of rural migration seem to derive less from population clustering in megacities and more from migration to other destinations (Christiaensen and Todo 2014; Dorosh and Thurlow 2012), including, as we have shown, growing villages and small towns that do not yet qualify as 'urban'. Although such migration flows are overlooked in the literature on structural transformation (de Brauw et al. 2014), including within efforts to explicitly widen the focus beyond urbanization in megacities (Christiaensen and Todo 2014), even intra-rural migration seems to represent a shift away from agriculture toward other income sources. Our results support the conclusions reached by several others (Christiaensen and Todo 2014; Dorosh and Thurlow 2013) that development strategies ought to encompass both the agricultural and rural nonfarm economy, inclusive of secondary towns.

For policy makers, this may suggest that resources, if available, may be directed to rural locations with growing populations in order to encourage intra-rural migration, and to ease the pressure on cities dealing with immigration rates that outstrip job opportunities. Policy makers hold a range of tools that can be used to promote the growth of up-and-coming villages, including the provision of services and incentives for businesses to operate in these sites. For researchers, this article challenges a common assumption that the only interesting story around migration in developing countries is that between rural areas and already-established cities. Research on migration and structural transformation would benefit from a wider lens.

Appendix A

The Multinomial Logit Treatment Effects Model

The multinomial logit treatment effects model consists of two stages. The first stage estimates the probability of selecting among several mutually exclusive and exhaustive variables – in our case, the choice of an individual from a rural household to remain at home or relocate to a city, a more densely populated rural area, or a less densely populated rural area. To accommodate this variable structure, the first stage is therefore a multinomial logit model. The second stage estimates the effect of this endogenous multinomial variable on the outcome – in our case, the change in log of consumption between 2008/09 and 2012/13. The second stage is a linear regression, and the two stages are estimated simultaneously with a Maximum Simulated Likelihood (MSL) approach in which the error terms are assumed to be jointly normally distributed (Deb and Trivedi 2006; Abreu et al. 2015).

With regard to the first stage, let j represent a treatment (choice of residence in 2012/13), such that $j = 0,1, \dots J$, and let V_{ij}^* denote the indirect utility for individual i associated with treatment j.

$$V_{ij}^* = \boldsymbol{z_i \alpha_j} + \sum_{k=1}^{J} \delta_{jk} l_{ik} + \eta_{ij} \quad \text{(A1)}$$

V_{ij}^* is a function of $\boldsymbol{z_i}$, a vector of exogenous covariates with associated parameters α_j, and unobserved, latent characteristics, l_{ik}, that are common to the individual's migration strategy and outcome. η_{ij} are i.i.d. error terms, and the latent factors, l_{ik}, are assumed to be independent of η_{ij}.

Although the indirect utility, V_{ij}^*, is not observed, we do observe individual i's choice of migration strategy in the form of a vector $\boldsymbol{d_i} = [d_{io}, d_{i1}, \dots\ d_{iJ}]$. We assume that the probability of selecting a given migration strategy, conditional on the latent factors l_{ik}, has a mixed multinomial logit structure (i.e., a multinomial probability distribution):

$$\Pr(d_i | z_i, l_i) = \frac{\exp(\boldsymbol{z_i \alpha_j} + l_{ij})}{1 + \sum_{k=1}^{J} \exp(\boldsymbol{z_i \alpha_k} + l_{ik})} \quad \text{(A2)}$$

Then, the expected value of our outcome variable is given by:

$$E(y_i | \boldsymbol{d_i, x_i, l_i}) = \boldsymbol{x_i \beta} + \sum_{j=1}^{J} \gamma_j d_{ij} + \sum_{j=1}^{J} \lambda_j l_{ij} \quad \text{(A3)}$$

where y_i is the change in individual i's log of consumption from 2008/09 to 2012/13, $\boldsymbol{x_i}$ is a vector of exogenous covariates with associated parameters $\boldsymbol{\beta}$, and γ_j is a vector of treatment effects relative to the base group that remained at home. Because $E(y_i)$ is a function of the latent factors l_{ij}, the outcome is affected by the unobserved characteristics (e.g., ambition or capability) that also affect selection into the treatment.

According to Deb and Trivedi (2006), identification of this model requires that restrictions be set at $\delta_{jk} = 0$ for all $j \neq k$, meaning that each migration choice is affected by a *unique* latent factor.

For the model to be identified, it is not strictly necessary for vector $\boldsymbol{z_i}$ to include additional variables relative to $\boldsymbol{x_i}$. However, we include several exclusion restrictions where we believe a variable is likely to affect the propensity to migrate to various destinations, but unlikely to affect the subsequent trajectory of consumption.

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Tables

Table 1. Prevalence of Migration Among Working-Age Population, 2008/09 – 2012/13

	Status in 2012/13		
Rural working-age population, 2008/09	Remained in same location	Migrated to rural location	Migrated to urban location
N=4,844	**88.21%**	**8.07%**	**3.72%**
representing 12.64 million	11.15 million	1.02 million	0.47 million

Table 2. Characteristics of Migration Among Working-Age Rural Migrants, 2008/09 – 2012/13

	Mean	SD
Distance moved (km)	125.30	(208.10)
1= Moved to new region	0.33	(0.47)
1= Moved to new district in same region	0.20	(0.40)
1= Moved within the same district	0.46	(0.50)
1= Moved to an urban center	0.32	(0.46)
1= Moved to a more densely populated rural location	0.22	(0.42)
1= Moved to an equally/ less densely populated rural location	0.46	(0.50)
1= At least one working-age HH member remained at home	0.84	(0.36)
Reasons for migration		
1= Moved for work	0.09	(0.29)
1= Moved for school	0.01	(0.11)
1= Moved for marriage	0.26	(0.44)
1= Moved for other family reasons	0.27	(0.44)
1= Moved for services/ housing	0.24	(0.43)
1= Moved for land	0.06	(0.24)
1= Moved for any other reason	0.06	(0.23)
Observations	539	

Table 3. Changes Associated with Migration from Rural Households, 2008/09 – 2012/13

	(1) Migrated to **more densely populated rural** location		(2) Migrated to **less densely populated rural** location		(3) Migrated to **urban** location	
Variable (2012/13 minus 2008/09 values)	Mean Δ	SD	Mean Δ	SD	Mean Δ	SD
Consumption per AE per day (ln)	0.21***	(0.69)	0.03	(0.76)	0.63***	(0.63)
Land accessed per capita (acres)	-0.30**	(1.40)	0.02	(3.13)	-0.37***	(1.34)
Land accessed per working-age HH member (acres)	-0.56**	(2.41)	-0.16	(5.07)	-0.55***	(2.80)
Net value crop/tree crop harvest per acre (100,000s TSh)[a]	-0.04	(3.05)	0.39	(3.59)	-0.68*	(2.36)
1= Soil not severely nutrient-constrained	0.12**	(0.41)	0.01	(0.25)	0.11***	(0.44)
1= Has been self-employed in past year	0.15***	(0.50)	0.07**	(0.48)	0.15***	(0.47)
1= Has done non-agricultural wage work in past year	0.16***	(0.43)	0.11***	(0.40)	0.29***	(0.48)
1= Has done agricultural wage work in past year	0.12**	(0.57)	0.12***	(0.49)	0.02	(0.32)
Share HH income from off-farm sources	0.32***	(0.48)	0.15***	(0.44)	0.50***	(0.39)
Share HH income from non-farm sources	0.19***	(0.47)	0.10***	(0.37)	0.47***	(0.43)
1= HH specializes in agriculture (>= 75% of income)	-0.37***	(0.62)	-0.16***	(0.61)	-0.41***	(0.54)
1= HH specializes in self-employment	0.12**	(0.44)	0.04**	(0.31)	0.19***	(0.44)
1= HH specializes in non-agricultural wage work	0.05*	(0.30)	0.07***	(0.28)	0.34***	(0.53)
Observations	106		250		183	

Note: Asterisks reflect the results of a Wald test of the null hypothesis that the mean change equals zero; *** p<0.01, ** p<0.05, * p<0.1.

[a] Only applicable if individual resided in a cropping household in both 2008/09 and 2012/13. Number of observations: migrants to urban (49), less remote rural (75), more remote rural (187) locations.

Table 4. Effect of Migration on Consumption

	(1) DID Δ consumption (ln)	(2) DID-IHHFE Δ consumption (ln)	(3) First-stage MMNL 1=Migrated to **urban** location	(3) First-stage MMNL 1=Migrated to **more densely populated rural** location	(3) First-stage MMNL 1=Migrated to **less densely populated rural** location	(4) Second-stage MSL[a] Δ consumption (ln)
1= Migrated to **more densely populated rural** location	0.311***	0.311***				0.446***
	(0.000)	(0.009)				(0.000)
1= Migrated to **less densely populated rural** location	0.129**	0.165**				0.250**
	(0.029)	(0.044)				(0.029)
1= Migrated to **urban** location	0.694***	0.629***				0.192***
	(0.000)	(0.000)				(0.002)
1= Head or spouse			-0.816**	-2.207***	-1.036***	
			(0.037)	(0.000)	(0.001)	
1= Son of HH head			-0.706*	-1.663***	-1.020***	
			(0.064)	(0.000)	(0.003)	
Age rank in HH			-0.032	0.321**	0.112	
			(0.771)	(0.023)	(0.125)	
Distance to district headquarters (km)			-0.000	-0.010**	-0.001	
			(0.982)	(0.017)	(0.741)	
Individual controls	Y	Y	Y	Y	Y	Y
Household controls	Y		Y	Y	Y	Y
Initial household fixed effects (IHHFE)		Y				
λ(Migrated to **more densely populated rural** location)						-0.156***
						(0.000)
λ(Migrated to **less densely populated rural** location)						-0.123*
						(0.068)
λ(Migrated to **urban** location)						0.554***
						(0.000)
Observations	4,742	4,742	4,742	4,742	4,742	4,742
Adjusted R-squared	0.082	0.786				

P-values in parentheses; standard errors clustered at HH level; *** p<0.01, ** p<0.05, * p<0.1

[a] The multinomial treatment effects model is estimated with 2,000 simulation draws.

Table 5. Effects of Migration on Various Indicators of Transmission Channels for Improved Well-Being

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	△ HH land (acres)…				△ 1= Individual is…		
	per capita	per working-age HH member	△ Net value crop harvest (100,000s TSh/ acre)	△ 1= Soil not severely nutrient-constrained	self-employed	a non-agricultural wage worker	an agricultural wage worker
1= Migrated to **more densely populated rural** location	-1.036*	-2.293*	0.355	0.142*	0.061	0.139*	0.004
	(0.092)	(0.061)	(0.423)	(0.060)	(0.464)	(0.070)	(0.965)
1= ...to **less densely populated rural** location	-0.117	-0.386	0.284	-0.001	0.051	0.075	0.076
	(0.767)	(0.460)	(0.395)	(0.967)	(0.430)	(0.159)	(0.140)
1= ...to **urban** location	-0.738***	-1.366***	-0.497	0.119	0.029	0.257***	-0.040
	(0.001)	(0.001)	(0.565)	(0.121)	(0.679)	(0.000)	(0.350)
Obs.	4,742	4,742	4,058	4,742	4,742	4,742	4,742

	(8)	(9)	(10)	(11)	(12)
	△ Share HH income...		△ 1= HH specializes in...		
	from off-farm sources	from non-farm sources	agriculture	self-employment	non-agricultural wage work
1= ...to **more densely populated rural** location	0.320***	0.228***	-0.336***	0.165**	0.056
	(0.000)	(0.005)	(0.000)	(0.020)	(0.343)
1= ...to **less densely populated rural** location	0.079*	0.057	-0.053	0.056	0.031
	(0.097)	(0.228)	(0.392)	(0.101)	(0.462)
1= ...to **urban** location	0.362***	0.384***	-0.279***	0.088	0.321***
	(0.000)	(0.000)	(0.000)	(0.232)	(0.000)
Obs.	4,742	4,742	4,742	4,742	4,742

P-values in parentheses; standard errors clustered at household level; *** p<0.01, ** p<0.05, * p<0.1
Note: Individual controls and IHHFE are included in all regressions.

Table B1. Definitions of Key Variables

Variable	Definition
Urban	1= An area that is either (a) a regional or district headquarters, (b) adjacent to headquarters, and possessing urban characteristics, such as a predominance of non-agricultural occupations, or (c) not adjacent to any other urban center, but possessing urban characteristics
Migrant	1= Individual meets the following criteria: (a) Reported in 2012/13 that s/he had immigrated to current community within the previous four years, and *either* (b) was tracked by survey implementers to a new location, or (c) moved at least 5 km, as estimated by survey coordinates
Consumption per AE per day[a]	[(Annualized monetary value (TSh) of consumption of food and other items)/ adult equivalents (weighted by time spent at home)/ 365] The estimate of consumption excludes expenditures on tobacco, alcohol, health care, and weddings/ funerals. These annualized values are weighted with a Fisher food price index specific to geographic stratum and quarter to reflect the cost of living in different settings (NBS 2014).
Land accessed (acres)	Agricultural land area that a household owns or rents/ borrows
Net value crop harvest per acre (100,000s TSh)[b]	[(Gross value of crop harvest, including field and tree crops, over previous main and short seasons – expenditures on inputs, labor, and equipment rental)/ Total land area under crop (summing over the two seasons)], This is winsorized at the 95th percentile to address outliers.
Soil not severely nutrient-constrained	1= Soil is not estimated to face severe nutrient constraints, based on a scale of three (not constrained, moderately constrained, and severely constrained) (from the Harmonized World Soil Database, established by the International Institute for Applied Systems Analysis and FAO)
HH income	Annualized household income with the costs of production netted out. For farm production, these include expenditures on agricultural extension, seed, fertilizer, agro-chemicals, on-farm labor, livestock fodder and labor, rental of land and agricultural equipment. For non-farm enterprises, these include expenditures on wages, raw materials, and operating expenses.
Share of HH income from off-farm sources	Proportion of household net income that is derived from sources other than own-farm and own-livestock production (from FAO (2015))
Share of HH income from non-farm sources	Proportion of household net income that is derived from sources other than agricultural wage work, own-farm, and own-livestock production. Note that this is a subset of off-farm income sources (from FAO (2015)).
HH specializes in agriculture	1= Household derives at least 75% of income from agriculture (from FAO (2015))
TLU	Index of tropical livestock units owned, using the conversion factors of HarvestChoice (2015).
Asset index	Index of non-livestock physical assets and residence characteristics (e.g., number of rooms) constructed with principal component analysis, specific to households in rural areas. The mean value is zero for rural households, with higher values indicating greater wealth.

[a] All monetary values are adjusted to 2013 levels using the Consumer Price Index.

[b] As results are somewhat sensitive to how this variable is measured (e.g., field crop profits versus total crop profits, where area under field crops is more accurately captured in the data set), the results may evolve in a future draft.

Table B2. Descriptive Statistics of Working-Age Individuals from Rural Households, 2008/09

Individual characteristics	Mean	SD	**Characteristics of individual's household (HH)**	Mean	SD
1= Married male	0.24	(0.43)	HH size	6.82	(3.89)
1= Unmarried male	0.24	(0.43)	Proportion dependents	0.45	(0.20)
1= Married female	0.29	(0.46)	Age of HH head	46.87	(13.83)
1= Unmarried female	0.22	(0.42)	1= Female-headed household	0.18	(0.39)
1= Age 15-30	0.52	(0.50)	1= Migrant HH head	0.25	(0.44)
1= Age 30-45	0.32	(0.47)	1= Someone in HH has completed primary school	0.28	(0.45)
			1= HH experienced working-age death (past two		
1= Age 45-64	0.21	(0.40)	years)	0.06	(0.24)
1= Individual has completed primary school	0.11	(0.31)	TLU	3.93	(14.68)
1= Individual has completed Form 10	0.03	(0.16)	Asset index	0.68	(2.96)
1= Head or spouse	0.61	(0.49)	Consumption per AE per day (ln of TSh/ AE/ day)	7.55	(0.55)
1= Son of HH head	0.17	(0.38)	Land accessed per capita (acres)	1.11	(1.90)
Age rank in HH	5.27	(3.18)	Land accessed per working-age HH member (acres)	2.15	(3.30)
1= Has been self-employed (past year)	0.14	(0.35)	Net value crop harvest per acre (100,000s TSh)[a]	1.87	(3.15)
1= Has done non-agricultural wage work	0.07	(0.26)	1= Soil not severely nutrient-constrained	0.83	(0.38)
1= Has done agricultural wage work	0.10	(0.31)	Share HH income from off-farm sources	0.32	(0.34)
			Share HH income from non-farm sources	0.20	(0.30)
			1= HH specializes in agriculture (≥ 75% of income)	0.55	(0.50)
			1= HH specializes in self-employment	0.04	(0.21)
			1= HH specializes in non-agricultural wage work	0.03	(0.16)
			1= HH specializes in agricultural wage work	0.01	(0.08)
			Population density (persons/km^2)	287.89	(442.74)
			Distance to district headquarters (km)	36.65	(43.07)
			Annual avg. rainfall (mm)	1,058.56	(318.23)
			Annual avg. temperature (10s °C)	221.78	(23.65)
			Elevation (m)	1,065.55	(481.81)
Observations	4,724			4,724	

[a] Relevant only for individuals with crop income (N = 4,425).

Table B3. Effects of Migration (With Alternative Definitions of Migrant)

Migrant = Self-report *or* individual was tracked and shifted 5 km or to another district	(1) △ consumption (ln)	(2) △ HH land per capita (acres)	(3) △ Net value crop harvest (100,000s TSh/ acre)	(4) △ 1= Individual is a non-agricultural wage worker	(5) △ Share HH income from off-farm sources	(6) △ 1= HH specializes in agriculture
1= Migrated to **more densely populated rural** location	0.276***	-1.232	0.258	0.121*	0.283***	-0.303***
	(0.010)	(0.188)	(0.490)	(0.062)	(0.000)	(0.000)
1= …to **less densely populated rural** location	0.146*	-0.154	0.372	0.074	0.091**	-0.064
	(0.051)	(0.642)	(0.201)	(0.110)	(0.035)	(0.248)
1= …to **urban** location	0.621***	-0.797***	-0.280	0.262***	0.363***	-0.286***
	(0.000)	(0.000)	(0.726)	(0.000)	(0.000)	(0.000)
Obs.	4,742	4,742	4,058	4,742	4,742	4,742

Migrant = Individual shifted at least 5 km	(1)	(2)	(3)	(4)	(5)	(6)
1= …to **more densely populated rural** location	0.283**	-1.544	-0.003	0.118	0.218***	-0.219**
	(0.029)	(0.255)	(0.995)	(0.153)	(0.006)	(0.019)
1= …to **less densely populated rural** location	0.133	0.053	0.300	0.079	0.124**	-0.130*
	(0.169)	(0.918)	(0.406)	(0.101)	(0.022)	(0.060)
1= …to **urban** location	0.617***	-0.798***	-1.184	0.227***	0.345***	-0.273***
	(0.000)	(0.001)	(0.119)	(0.002)	(0.000)	(0.000)
Obs.	4,742	4,742	4,058	4,742	4,742	4,742

Table B3. Cont'd

Migrant = Self-report *and* individual shifted for a reason *other than* marriage or school	(1)	(2)	(3)	(4)	(5)	(6)
1= …to **more densely populated rural** location	0.257	-0.776**	0.251	0.191*	0.338***	-0.356***
	(0.138)	(0.030)	(0.664)	(0.059)	(0.000)	(0.000)
1= …to **less densely populated rural** location	0.102	-0.062	0.218	0.127*	0.083	-0.055
	(0.283)	(0.895)	(0.541)	(0.051)	(0.116)	(0.412)
1= …to **urban** location	0.596***	-0.724***	-1.006	0.331***	0.297***	-0.198***
	(0.000)	(0.001)	(0.226)	(0.000)	(0.000)	(0.001)
Obs.	4,742	4,742	4,058	4,742	4,742	4,742

P-values in parentheses; standard errors clustered at household level; *** p<0.01, ** p<0.05, * p<0.1
Individual controls and initial household fixed effects (IHHFE) are included in all regressions.

Table B4. Effects of Migration (Multinomial Treatment Effects Model)[a]

	(1) △ HH land per capita (acres)	(2) △ Net value crop harvest (100,000s TSh/ acre)	(3) △ 1= Individual is a non-agricultural wage worker	(4) △ Share HH income from off-farm sources	(5) △ 1= HH specializes in agriculture	(6) △ 1= HH specializes in self-employment
1= Migrated to **more densely populated rural** location	-0.504**	0.222	0.398***	0.534***	-0.446	0.309***
	(0.015)	(0.581)	(0.000)	(0.000)	(0.340)	(0.000)
1= …to **less densely populated rural** location	-0.110	0.668**	0.124***	0.060	-0.189	-0.025
	(0.699)	(0.031)	(0.001)	(0.118)	(0.456)	(0.381)
1= …to **urban** location	-0.147	-1.051**	0.324***	0.350***	-1.24**	0.180***
	(0.395)	(0.025)	(0.000)	(0.000)	(0.033)	(0.000)
λ(Migrated to **more densely populated rural** location)	0.079**	-0.301**	-0.311***	-0.343***	-0.004	-0.243***
	(0.022)	(0.025)	(0.000)	(0.000)	(0.932)	(0.000)
λ(Migrated to **less densely populated rural** location)	0.065***	-0.352***	-0.051	-0.020	0.001	0.056***
	(0.009)	(0.000)	(0.139)	(0.286)	(0.982)	(0.003)
λ(Migrated to **urban** location)	-0.366**	0.421***	-0.099***	0.011	0.002	-0.038
	(0.016)	(0.000)	(0.000)	(0.703)	(0.963)	(0.168)
Sargan statistic P-value	0.203	0.891	0.767	0.132	0.183	0.965
Distribution of dependent variable	normal	logistic	logistic	normal	logistic	logistic
Obs.	4,742	4,058	4,742	4,742	4,742	4,742

P-values in parentheses; standard errors clustered at household level; *** p<0.01, ** p<0.05, * p<0.1
Individual and household controls and instrumental variables are included in all regressions.
[a] Estimated with 2,000 simulation draws.