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INTRA-RURAL MIGRATION AND PATHWAYS TO GREATER WELL-BEING: EVIDENCE FROM TANZANIA

By

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Food Security Policy *Research Papers*

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ABSTRACT

Migration between rural locations is prevalent in developing countries and has been found to improve economic well-being in Sub-Saharan Africa. This article 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 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, generally, from more productive farmland. However, across all destinations, migrants are more likely to draw from off-farm or nonfarm income sources, suggesting that even intra-rural migration represents a shift away from a reliance on farm production, 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.

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ACRONYMS

AE	Adult equivalent
AFRE	Department of Agricultural, Food, and Resource Economics
DID	Difference-in-differences
FAO	Food and Agriculture Organization of the United Nations
FSG	Food Security Group
FSP	Food Security Policy
HH	Household
IFPRI	International Food Policy Research Institute
IHHFE	Initial household fixed effect
IHST	Inverse hyperbolic sine transformation
IV	Instrumental variable
LSMS	Living Standards Measurement Study
MMNL	Mixed multinomial logit
MSL	Maximum simulated likelihood
MSU	Michigan State University
SD	Standard deviation
TLU	Tropical livestock units
TSh	Tanzanian shillings
UP	University of Pretoria

1. INTRODUCTION

How do poor people exit poverty? This question remains of intense interest to the development community and to African governments. As in many African countries, a large majority of the poor in Tanzania resides in rural areas and is engaged in small-scale farming, and roughly one third of the rural population lives in poverty (World Bank 2015). Progress in reducing poverty, therefore, requires a better understanding of the opportunities available to rural people, including those who currently rely on farming for a major part of their livelihoods.

Evidence from Asia and Africa shows that processes of economic transformation and poverty reduction, while heterogeneous across countries, have typically been accompanied by sustained agricultural productivity growth and have almost always involved a movement of labor out of agriculture (Filmer and Fox 2014; Johnston and Mellor 1961). Often, this takes the form of relocation from rural to urban areas (de Brauw, Mueller, and Lee 2014), although emerging evidence also points to the potential importance of intra-rural migration (Lucas 2015). For example, and as presented in more detail below, 68% of rural, working-age Tanzanians migrating between 2008/09 and 2012/13 relocated to another rural area. Poverty reduction programs, therefore, need to also account for the role of migration in economic development, including rural-rural migration. Yet gaps remain in our knowledge of how rural people manage to exit poverty, and in particular, the diverse motivations for migration, and the effectiveness of different types of migration as a conduit to greater economic well-being.[1]

As will be discussed, intra-rural migration is prevalent in developing countries (Lucas 2015), and has been found to improve economic well-being in Sub-Saharan Africa (Beegle, de Weerdt, and Dercon 2011; Garlick, Leeibbrandt, and Levinsohn 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. This study, therefore, goes beyond a conclusion that migration promotes well-being by highlighting the importance of these various pathways through which intra-rural migration in Tanzania may influence consumption.

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; this seems to be the dominant channel through which migration confers an improvement in consumption.

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[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, de Weerdt, and Dercon 2011; Christiaensen, de Weerdt, and Todo 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 for understanding the causes and consequences of migration in Tanzania and for assessing the extent to which results from the Kagera region are generalizable. Second, and most important, no other study to our knowledge 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, de Weerdt, and Dercon 2011; de Brauw, Mueller, and Woldehanna 2013; McKenzie, Stillman, and Gibson 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, de Weerdt, and Dercon (2011) by regarding migration to various destinations (i.e., an urban location, a more densely populated rural area, or a less densely populated area) 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

The development economics literature has for decades commonly assumed rural people in agrarian societies to be either stationary or in the process of migrating to an urban area (e.g., Harris and Todaro 1970). This has nurtured an applied migration literature focusing almost exclusively on the flows between rural areas and urban centers (de Haan 1999), reflecting 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. While these models have inspired extensive study of rural-to-urban migration and its role in structural transformation (e.g., de Brauw, Mueller, and Lee 2014), they implicitly paint the rural sector as somewhat homogenous, thus under-emphasizing the potential variety of motives 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 heterogeneous 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 Bruijn and van Dijk 2003) 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, Leeibbrandt, and Levinsohn 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 generally 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 1962). 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, de Weerdt, and Dercon (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, Mueller, and Woldehanna 2013) and South Africa (Garlick, Leeibbrandt, and Levinsohn 2015). As noted by Beegle, de Weerdt, and Dercon (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 the diverse forms of migration and their potentially divergent effects on livelihood outcomes.

As noted in the introduction, we first assess whether intra-rural migrants in Tanzania achieve an improvement in consumption, and then examine the relative importance of 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 (HH) 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, Chamberlin, and Headey 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, Chamberlin, and Headey 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, de Weerdt, and Dercon 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 nonmigrant neighbors, primarily through the land 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. In addition, 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; Tittonell and Giller 2013). If 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. 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, Hazell, and Reardon 2007), and agricultural transformation is often characterized by growth in the off-farm and nonfarm earnings of farm households. Poor rural residents may find migration to large villages and secondary towns 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).[2] 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 2014). 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.

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, de Weerdt, and Todo 2013). The authors refer to these smaller towns as *the missing middle*, as they are often overlooked in the literature on internal migration and structural transformation.[3] 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 discussed in this section (including land access, more favorable agricultural productivity, or income diversification) appear as plausible pathways of improved well-being. However, empirical evidence is needed to determine which channel prevails among intra-rural migrants in Tanzania.

[2] As will be discussed, the official definition of *rural* in Tanzania excludes places recognized as secondary towns.
[3] Christiaensen, de Weerdt, and Todo (2013) define *urban* centers as those with populations of at least one half million.

3. CONCEPTUAL FRAMEWORK AND HYPOTHESES

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 1962). At the same time, as members of rural households tend to generate income jointly (e.g., farm production or family businesses), pool resources, and benefit from public goods, consumption is captured at the household level and then divided by household size to reflect the individual well-being of its 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.

$$\begin{aligned} Income = \; & Income_{crop}(Land\ area, Land\ quality, Labor_{crop}, Z_{crop}) \\ & + Income_{livestock}(Livestock, Labor_{livestock}, Z_{livestock}) \\ & + Income_{off-farm}(Off-farm\ opportunities, Labor_{off-farm}, Z_{off-farm}) \end{aligned} \tag{1}$$

Each type of income is a function of several factors, where 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,

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

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 access to land, farmland quality, and the off-farm income-generating opportunities available.

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 channels 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, although *a priori* they are assumed to be the most important ones. It is beyond the scope of this article to explore every possible channel of improved well-being.

[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.

4. DATA AND IDENTIFICATION STRATEGY

This study draws primarily from two waves of the Living Standards Measurement Study (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 after 2008/09 and entire households that had relocated. Therefore, it 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, 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 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 (Food and Agriculture Organization of the United Nations) Rural Income Generating Activities project (FAO 2015).

4.1. 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 nonmigrants in our main analysis. In

[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, de Weerdt, and Dercon 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.

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 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 of food products consumed by the household 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 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 on the household farm, 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 nonagricultural wage workers); the share of household income from off-farm and nonfarm sources; and whether the household specializes in (i.e., derives ≥75% of its income from) agriculture, nonagricultural 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.

4.2. 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 nonmigrants. This is because migrants are likely to be systematically different from nonmigrants, 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, de Weerdt, and Dercon (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

[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.

2012/13. This setup controls for time-invariant unobservable characteristics at the individual level, such as risk preferences or ability, which may influence both the propensity to migrate and an individual's level of economic well-being. $\boldsymbol{M}_{\boldsymbol{ih},\mathbf{2013}}$ 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 $\boldsymbol{\beta}$. While we also control for migration to an urban center, our main focus is on the coefficients on migration to a more or less densely populated rural location. $\boldsymbol{X}_{\boldsymbol{ih},\mathbf{2009}}$ 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.

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, Leeibbrandt, and Levinsohn 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, $\boldsymbol{M}_{\boldsymbol{ih},\mathbf{2013}}$, 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, de Weerdt, and Dercon 2011; de Brauw, Mueller, and Woldehanna 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, Stillman, and Gibson 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 or less densely populated rural locations. We, therefore, follow the examples of Deb and Trivedi (2006) and Abreu, Faggian, and McCann (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 nonlinear 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.

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

5. RESULTS

In this section, we present both descriptive and econometric results and a consideration of the robustness of these results to alternate model specifications.

5.1. Descriptive Results

We begin with an 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 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. Roughly 32% of all migrants relocated to an urban area, 22% moved to a more densely populated rural area, while the single largest share (46%) moved 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 or housing, while just 6% move for a land-related reason. However, we regard these stated motives with some caution, as it seems possible for respondents to associate a work-related motive with only salary employment, or to conflate a general desire for the family's improved well-being with a family-related motive for migration. In section 5.3, we will examine whether our results are robust to a narrower definition of migrant that excludes those who relocated for noneconomic reasons.

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 statistically significant 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 nonmigrants*.[11] (Note that these average differences necessarily mask heterogeneous experiences. 63.9% of migrants to more densely populated rural areas experience an improvement in consumption, while this value is 50.9% in less densely populated areas and 86.6% for urban 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 statistically significant improvement in farm profits per acre.

[9] 1.6% of our sample had aged out of the working-age bracket by 2012/13, though they are retained in analysis.
[10] Local population densities are based on 2010 estimates. Though we do not capture changes over the study period, these are not expected to change dramatically within four years.
[11] We acknowledge that, although our consumption measure accounts for the varying costs-of-living found in different settings (rural mainland, Dar es Salaam, other urban, and Zanzibar), prices may also vary between different rural or urban areas. Unfortunately, we are unable to account for these finer-scale price differences.

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 or 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	

Note: * Standard deviation

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 nonagricultural wage work, and their households at destination derive a significantly larger share of income from off-farm and nonfarm sources, as compared with their households at origin. Descriptive statistics for the variables in our regression analysis, including those serving as control variables, are given in Table B2 in the appendix.

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 harvest per acre (IHST)[a]	0.05	(4.50)	0.52	(6.23)	-4.22***	(9.13)
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 nonagricultural 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 nonfarm 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 nonagricultural 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. To retain values of zero, the inverse hyperbolic sine transformation (IHST) is used, though results can be interpreted as with a log transformation.

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, with full results available in the online appendix).[12] 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 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 31.0 log-point (36.3%)[13] increase in the rate of consumption growth. However, consistent with the results of Beegle, de Weerdt, and Dercon (2011),[14] even moving to a less densely populated area produces a 16.4 log-point (17.8%) 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). These IVs are jointly significant in the first stage regression (χ^2=135.4, P=0.000).[15] 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 (λ) provide some evidence of negative selection on unobservables for migration to rural areas and positive selection for rural-to-urban migration. Controlling for this naturally increases the estimated consumption growth associated with migration to rural areas, and decreases that associated with urban migration.

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[12] Key coefficients are reported in Table 4, though full results are available from the authors upon request.
[13] 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*($e^{\beta} - 1$)]%.
[14] Rather than focusing on population density, Beegle, de Weerdt, and Dercon (2011) categorize destinations as more or less remote by whether they are well-connected to an urban center.
[15] A test for overidentifying restrictions has not been developed for the multinomial treatment effects model. According to Deb and Trivedi (2006), this test may be conducted in a linear 2SLS framework with three endogenous variables for migrant destinations. However, with three IVs, our model would be perfectly identified.

Table 4. Effect of Migration on Consumption

	(1)	(2)	(3)			(4)
	DID	DID-IHHFE	First-stage MMNL 1=Migrated to			Second-stage MSL[a]
	Δ consumption (ln)	Δ consumption (ln)	*urban* location	*more densely populated rural* location	*less densely populated rural* location	Δ consumption (ln)
1= Migrated to *more densely populated rural* location	0.313***	0.310***				0.495***
	(0.000)	(0.009)				(0.000)
1= Migrated to *less densely populated rural* location	0.128**	0.164**				0.279***
	(0.030)	(0.046)				(0.000)
1= Migrated to *urban* location	0.693***	0.629***				0.230***
	(0.000)	(0.000)				(0.000)
1= Head or spouse			-0.887**	-2.220***	-1.012***	
			(0.020)	(0.000)	(0.001)	
1= Son of HH head			-0.708*	-1.661***	-0.987***	
			(0.066)	(0.000)	(0.004)	
Age rank in HH			-0.059	0.325**	0.104	
			(0.588)	(0.018)	(0.156)	
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)						-0.172***
						(0.001)
λ(Migrated to *less densely populated rural* location)						-0.192***
						(0.000)
λ(Migrated to *urban* location)						0.524***
						(0.000)
Observations	4,742	4,742	4,742	4,742	4,742	4,742
Adjusted R-squared	0.083	0.787				

Note: 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.

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 fairly definitive rejection of our first hypothesis regarding a land access effect. (Note, however, that this is a lower bound estimate, as 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 nonagricultural wage work (column 6). It also results in a greater emphasis on off-farm and, more specifically, nonfarm 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.

5.3. Robustness Checks

Our results may be sensitive to choices around the measurement of consumption, model specification, and the identification of migrants. In this section, we repeat our main analysis with a set of alternative choices. We first note that household consumption, when captured as the value of consumption per adult equivalent, may not fully account for any economies of scale found within households (Drèze and Srinivasan 1997). Our consumption measure may therefore underestimate the relative welfare of larger households. To address this concern, we re-estimate household consumption/AE/day, where the number of adult equivalents is first raised to a scale-economies parameter. Although this parameter cannot be determined empirically, we follow the example of Horrell and Krishnan (2007) and the advice of Deaton and Zaidi (2002) by selecting the value of 0.9. This assumes that scale economies are somewhat minimal in a population where most of the household budget is allocated to food – an inherently private good. Table B3 (top panel) presents the key results of Table 4 when this revised consumption measure is used. In the DID-IHHFE model (column 2), migration to an urban center or a more densely populated rural area is significantly associated with an increase in estimated consumption growth, while the coefficient on migration to less densely populated areas, though positive, is no longer statistically significant. This indicates that our results are indeed somewhat sensitive to assumptions regarding household economies of scale. We are also concerned that our estimate of consumption, inclusive of larger purchases over the previous year, may capture expenditures that comprise the cost of moving. These may not correlate with welfare. The bottom panel of Table B3 presents the same analysis when the dependent variable refers only to food consumption, showing that the results are generally consistent with our main analysis.

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 per acre (IHST)	∆ 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	-1.038*	-2.298*	0.444	0.141*	0.061	0.141*	0.005
	(0.092)	(0.060)	(0.584)	(0.060)	(0.465)	(0.068)	(0.960)
1= Migrated to *less densely populated rural* location	-0.118	-0.391	0.357	-0.002	0.050	0.075	0.076
	(0.767)	(0.454)	(0.570)	(0.952)	(0.437)	(0.156)	(0.139)
1= Migrated to *urban* location	-0.745***	-1.362***	-2.580	0.117	0.032	0.263***	-0.037
	(0.001)	(0.001)	(0.563)	(0.125)	(0.651)	(0.000)	(0.380)
Observations	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 nonfarm sources	farming	self-employment	nonagricultural wage work
1= Migrated to *more densely populated rural* location	0.321***	0.228***	-0.337***	0.167**	0.056
	(0.000)	(0.005)	(0.000)	(0.018)	(0.350)
1= Migrated to *less densely populated rural* location	0.079*	0.057	-0.053	0.057*	0.030
	(0.097)	(0.228)	(0.388)	(0.093)	(0.472)
1= Migrated to *urban* location	0.365***	0.387***	-0.282***	0.091	0.324***
	(0.000)	(0.000)	(0.000)	(0.216)	(0.000)
Observations	4,742	4,742	4,742	4,742	4,742

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

Next, Table B4 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 nonagricultural wage work.

We also run several key models from Table 5 with a multinomial treatment effects model (Table B5). Recall that this controls for specific initial household characteristics but not IHHFE. Results of this alternative model specification are generally quite consistent with our main analysis: Intra-rural migrants are found to experience no improvement in farm size, though they do seem to experience higher farm profits per acre in more densely populated rural areas. This is the only specification in which we find support for the hypothesized agricultural productivity effect. 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 (results not reported to conserve space). 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

This study is motivated by the need to better understand the motives and effects of intra-rural migration. Intra-rural labor movement is arguably poorly understood compared to rural-urban migration, despite its comprising the majority of migrant flows in much of Sub-Saharan Africa. Tanzania is one such country, where 68% of rural working-age people who migrated between 2008/09 and 2012/13 relocated to another rural area. Our study explores patterns of migration by working-age individuals (with particular attention to intra-rural migration) in Tanzania and tests several hypotheses to determine 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.

Our 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 68% 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. Our findings lend support to other studies highlighting the rising importance of emerging small tertiary towns (Christiaensen, de Weerdt, and Todo 2013), which may possess some urban features but are still categorized as rural.

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, Chamberlin, and Headey 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 higher quality farmland (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 those migranting 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 nonagricultural wage work and rely more heavily on business income and other nonfarm 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, de Weerdt, and Todo 2013; Christiansen and Todo 2014; Haggblade, Hazell, and Reardon 2007).

6.1. 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. Though we found no evidence that migrants benefit from better land quality in a new area, those who cultivate tree crops may potentially realize greater farm profits over a longer time interval. The short time interval and lack of information on migrants' intentions also inhibit 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 nonmigrants. 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, Leeibbrandt, and Levinsohn 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.

6.2. 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, de Weerdt, and Dercon 2011; de Brauw, Mueller, and Woldehanna 2013; Garlick, Leeibbrandt, and Levinsohn 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, Chamberlin, and Headey 2014), and well-functioning land markets may 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 2014), 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, Mueller, and Lee 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 2014) 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, Faggian, and McCann 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.

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

V_{ij}^* is a function of 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 $d_i = [d_{io}, d_{i1}, \dots\ d_{iJ}]$. 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):

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

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

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

where y_i is the change in individual i's log of consumption from 2008/09 to 2012/13, x_i is a vector of exogenous covariates with associated parameters β, 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 z_i to include additional variables relative to 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.

APPENDIX B

Table B 1. 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 nonagricultural 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 (TSh)[a]	[(Annualized monetary value (TSh) of consumption of food and other items)/adult equivalents/365] The estimate of consumption excludes expenditures on tobacco, alcohol, health care, weddings, and 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, rents, or borrows
Net value crop harvest per acre (TSh)	[(Gross value of crop harvest, including field and tree crops, over previous main and short seasons – expenditures on inputs, labor, and equipment rental), and total land area under crop (summing over the two seasons)]
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).
HH (household) 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 nonfarm 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 nonfarm 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 farming	1= Household derives at least 75% of income from on-farm activities (from FAO (2015))
TLU	Index of tropical livestock units (TLU) owned, using the conversion factors of HarvestChoice (2015)
Asset index	Index of nonlivestock 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.

Source: Authors.

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

Table B 2. 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= HH experienced working-age death (past two years)	0.06	(0.24)
1= Age 45-64	0.21	(0.40)	TLU	3.93	(14.68)
1= Individual has completed primary school	0.53	(0.50)	Asset index	0.68	(2.96)
1= Individual has completed Form 10	0.03	(0.16)	Consumption per AE per day (ln of TSh/AE/day)	7.55	(0.55)
1= Head or spouse	0.61	(0.49)	Land accessed per capita (acres)	1.11	(1.90)
1= Son of HH head	0.17	(0.38)	Land accessed per working-age HH member (acres)	2.15	(3.30)
Age rank in HH	5.27	(3.18)	Net value crop harvest per acre (IHST of TSh/acre)[a]	11.54	(4.45)
1= Has been self-employed (past year)	0.14	(0.35)	1= Soil not severely nutrient-constrained	0.83	(0.38)
1= Has done nonagricultural wage work	0.07	(0.26)	Share HH income from off-farm sources	0.32	(0.34)
1= Has done agricultural wage work	0.10	(0.31)	Share HH income from nonfarm 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 nonagricultural 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 B 3. Effect of Migration on Consumption (With Alternate Measures of Consumption)

Consumption adjusted for household economies of scale	(1) DID	(2) DID-IHHFE	(3) Multinomial treatment effects[a]
		Δ consumption (ln)	
1= Migrated to more densely populated rural location	0.270***	0.269**	0.461***
	(0.001)	(0.034)	(0.000)
1= Migrated to less densely populated rural location	0.090	0.117	0.122*
	(0.127)	(0.169)	(0.051)
1= Migrated to urban location	0.647***	0.584***	0.158***
	(0.000)	(0.000)	(0.005)
Individual controls	Y	Y	Y
Household controls	Y		Y
Initial household fixed effects (IHHFE)		Y	
Observations	4,742	4,742	4,742
Adjusted R-squared	0.078	0.780	

	(1)	(2)	(3)
	Dependent variable = Δ log of value of food consumption/AE/day		
1= Migrated to more densely populated rural location	0.315***	0.270**	0.265*
	(0.000)	(0.029)	(0.072)
1= Migrated to less densely populated rural location	0.152**	0.163*	0.253**
	(0.013)	(0.052)	(0.032)
1= Migrated to urban location	0.560***	0.481***	0.858***
	(0.000)	(0.000)	(0.000)
Individual controls	Y	Y	Y
Household controls	Y		Y
Initial household fixed effects (IHHFE)		Y	
Observations	4,742	4,742	4,742
Adjusted R-squared	0.072	0.788	

Note: 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 (column 3) is estimated with 2,000 simulation draws.

Table B 4. Effects of Migration (With Alternate 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 per acre (IHST)	(4) ∆ 1= Individual is a nonagricultural 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	-0.375	0.121*	0.283***	-0.303***
	(0.010)	(0.188)	(0.693)	(0.062)	(0.000)	(0.000)
1= Migrated to *less densely populated rural location*	0.146*	-0.154	0.273	0.074	0.091**	-0.064
	(0.051)	(0.642)	(0.608)	(0.110)	(0.035)	(0.248)
1= Migrated to *urban location*	0.621***	-0.797***	-2.334	0.262***	0.363***	-0.286***
	(0.000)	(0.000)	(0.570)	(0.000)	(0.000)	(0.000)
Observations	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= Migrated to *more densely populated rural location*	0.283**	-1.544	-1.304	0.118	0.218***	-0.219**
	(0.029)	(0.255)	(0.269)	(0.153)	(0.006)	(0.019)
1= Migrated to *less densely populated rural location*	0.133	0.053	0.057	0.079	0.124**	-0.130*
	(0.169)	(0.918)	(0.940)	(0.101)	(0.022)	(0.060)
1= Migrated to *urban location*	0.617***	-0.798***	-3.925	0.227***	0.345***	-0.273***
	(0.000)	(0.001)	(0.455)	(0.002)	(0.000)	(0.000)
Observations	4,742	4,742	4,058	4,742	4,742	4,742

Table B 4. Cont'd

Migrant = Self-report *and* individual shifted for a reason *other than* marriage or school	(1)	(2)	(3)	(4)	(5)	(6)
1= Migrated to *more densely populated rural location*	0.257	-0.776**	0.893	0.191*	0.338***	-0.356***
	(0.138)	(0.030)	(0.547)	(0.059)	(0.000)	(0.000)
1= Migrated to *less densely populated rural location*	0.102	-0.062	0.490	0.127*	0.083	-0.055
	(0.283)	(0.895)	(0.622)	(0.051)	(0.116)	(0.412)
1= Migrated to *urban location*	0.596***	-0.724***	-1.495	0.331***	0.297***	-0.198***
	(0.000)	(0.001)	(0.773)	(0.000)	(0.000)	(0.001)
Observations	4,742	4,742	4,058	4,742	4,742	4,742

Note: 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 B 5. Effects of Migration (Multinomial Treatment Effects Model)[a]

	(1) ∆ HH land per capita (acres)	(2) ∆ Net value crop harvest per acre (IHST)	(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	-0.545***	2.467***	0.365***	0.395***	-0.423	0.227
	(0.006)	(0.002)	(0.000)	(0.000)	(0.367)	(0.182)
1= Migrated to *less densely populated rural* location	-0.030	1.507	-0.053	0.076	-0.181	0.167
	(0.916)	(0.184)	(0.435)	(0.110)	(0.485)	(0.387)
1= Migrated to *urban* location	-0.246	-4.000**	0.255***	0.192***	-1.269**	0.167***
	(0.131)	(0.044)	(0.000)	(0.002)	(0.032)	(0.000)
λ(Migrated to *more densely populated rural* location)	0.121***	-2.455***	-0.274***	-0.202***	0.001	-0.144
	(0.008)	(0.002)	(0.000)	(0.001)	(0.988)	(0.424)
λ(Migrated to *less densely populated rural* location)	-0.029	-0.899	0.146**	-0.041	-1.981	-0.157
	(0.461)	(0.456)	(0.024)	(0.152)	(0.561)	(0.448)
λ(Migrated to *urban* location)	-0.263**	0.143	-0.013	0.189***	-0.007	-0.019
	(0.014)	(0.822)	(0.841)	(0.000)	(0.896)	(0.515)
Distribution of dependent variable	normal	normal	logistic	normal	logistic	logistic
Observations	4,742	4,058	4,742	4,742	4,742	4,742

Note: 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.

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