Rural Migration and Social Dislocation: Using GIS data on social interaction sites to measure differences in rural-rural migrations

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Abstract:

Research on migration in Sub-Saharan Africa primarily focuses on rural-urban migration, and circular patterns of labor migration. Sparse attention has been devoted to the dynamics of rural-rural migration. While migration represents an important life transition, current classifications to distinguish types of rural migrations rely on crude measures of migration. Village boundaries and other political demarcations often bear little resemblance to the way individuals meaningfully interact across this space. We seek to build on this research by using GIS data to explore different spatial measures of rural-rural migration in Uganda. We employ the concept of social dislocation, using distance to the nearest trading centers as a proxy for spatial social networks. Individuals whose rural-rural move results in a new geographically proximate trading center are classified as experiencing a migration with social dislocation. We then explore the validity of this measure of rural-rural migration by examining a range of socio-economic and health outcomes among those experiencing a migration with and without social dislocation.

Introduction

Research on migration in Sub-Saharan Africa has primarily focused on rural-urban migrants, and seasonal migration patterns. The movement of people between rural spaces has been under-explored. The absence of research on rural-rural migration in Africa has been attributed to the lack of data, the over-visibility of rural-urban migrants due to high rates of urban growth, and assumptions of homogeneity across rural spaces (Lucas 1997). However, movement across rural spaces may be driven by similar economic motivations as those of other types of migrants, resulting in important consequences for migrant well-being.

> *"Opportunities are not structured homogenously within a community and different access to opportunities is reflected in disparities in livelihoods. Migration is one of the primary mechanisms available to people who face an opportunity deficit, whether for their very survival or for the attainment of long term goals.*" (Findley 2009)

In order to understand the impact of rural-rural migration, we first need measures that allow us to adequately define who is and who is not a rural migrant. Movements within rural areas can be classified into two primary types: residential mobility and rural-rural migration (Morrison, Bryan, and Swanson 2004). Residential mobility refers to the change in a household's geographic location without significant changes to an individual's social and economic environment. Rural-rural migration, on the other hand, implies a more significant change in an individual's geographic, economic and social setting. While residential mobility is considered commonplace, rural-rural migrations are important life events.

Despite differences in types of rural-rural movements, we have inadequate measures to allow us to differentiate these two types of rural movers in Africa. While residential mobility

may have limited effects on individual well-being, rural-rural migrations may have important consequences on well-being. It is therefore critical to be able to distinguish between these two types of movements.

Measuring Rural-Rural Migrations

One suggested measure to differentiate residential mobility from rural-rural migration is to use political or geographic boundaries. Lines of political demarcation are used as a means of defining differences across rural space. In the US these are often county or state lines, while in the context of Sub-Saharan Africa they may be villages or districts. There are two primary problems with this measure. First, this is a rather arbitrary distinction in rural areas, where lines of political demarcation may have little salience for individuals' lives. Where economic livelihoods are driven by subsistence agriculture and a limited government role in providing access to resources and services, such lines may have little impact on the well-being of those who reside inside and outside of such boundaries. Second, the meaning of political boundaries in differentiating types of movements may be very context-specific, limiting the generalizability of this measure.

We propose an alternative measure of migration – social dislocation. We define social dislocation as a move that results in a change in the nearest social interaction site. Regardless of whether village boundaries are crossed or not, if an individual has relocated to a new household that is more likely to be connected to a different social gathering site, we classify them as a rural-rural migrant. What differentiates rural-rural migration from residential mobility is the change in economic and social setting, and the resulting restructuring of social and economic ties. Our

measure of social dislocation is designed to capture this aspect of movement across rural-rural spaces. Movements may occur within and across geographic or political boundaries; what matters instead are the spatial dimensions of social interaction.

Social interaction sites are geographic spaces in which people within a given area are more likely to congregate and interact with one another. Both goods and social ties are spatially distributed, such that in the absence of fast means of transportation, social interaction sites may best be capturing the space in which social capital resides, and therefore, spaces which may shape one's access to resources and social support.

Health information that relies on social knowledge transfers is an example of a resource that is shaped by social interaction sites. Montgomery et al. (2011) looked at variation in trachoma infection by distance to social gathering sites, and found that individuals located further from social gathering sites had less access to health information resources and had higher rates of infection. Lower immunization rates were also found among migrant women's children in Ethiopia, which was attributed to the weaker social ties providing immunization-related health information (Kiros and White 2004).

We hypothesize that social dislocation will have two competing effects on wellbeing. First, some individuals will change social interaction sites, and suffer a loss in social capital – leading to a decrease in well-being. However, individuals may also select destination areas based on their access to social or economic capital, and as such may be more likely to see improvements in well-being following a move. Our paper seeks to test this new measure of rural-rural migration, asking whether we can differentiate between types of rural-rural movements, and

if so, if this new measure does a better job than standard measurements that rely on village boundaries.

Setting

We use 10 years of longitudinal data from the General Population Cohort study in rural South-Western Uganda run by the Medical Research Council / Uganda Virus Research Institute. This study site is approximately 90km^2, with 20,000 inhabitants in 25 villages. There are no tarmac roads in the study site, and individual livelihoods are primarily based on subsistence agriculture, commercial cultivation of coffee, beans, and bananas, and selling fish.

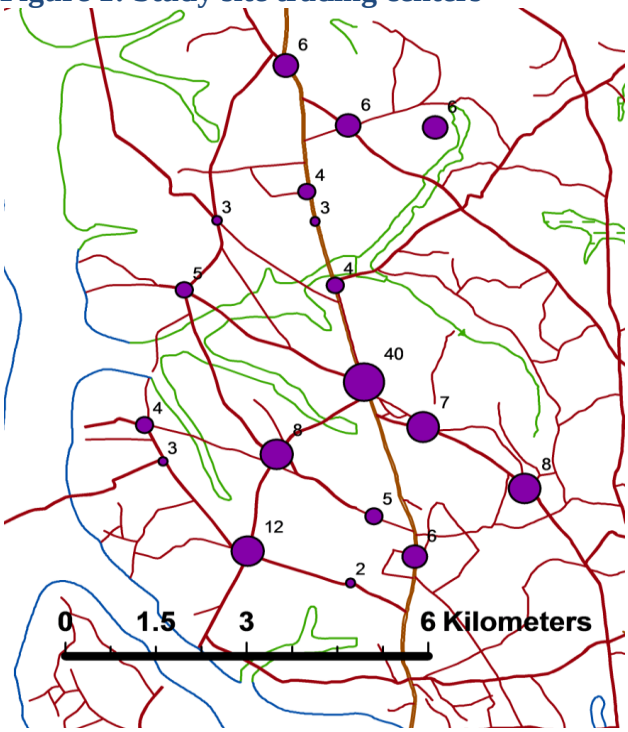
In Uganda, the village-level does not provide any distribution of resources or land. Land is distributed through inheritance. The village leader, the Local Chairperson (LC), plays a role in settling disputes, and in assisting with the selling or buying of land. The LC will also suggest to district officials where roads or wells are built, but does not play a role in contracting or monitoring this work. The only goods distributed at the village level are those that come from non-governmental organizations, where an LC helps identify vulnerable household recipients.

Respondents report their primary residence, defined as the household where they have spent a minimum of three months in the previous year. Household mobility is fairly high in the study site, with about 6% of respondents moving within the study site each year. Not all rural-rural migrations are observed: Only migrations within the study site are followed over time, and therefore moves that are more likely to be across shorter distances. In seeking to differentiate types of movers, we restrict our sample to only those individuals that moved households at some point over the 10 years of observation.

Methods

Social interaction sites are measured using geographic coordinates of local trading centers. Trading centers consist of a small gathering of shops, serving as a common place for people to congregate in rural areas. Figure 1 shows a map of trading centers in the study site, weighted by the number of shops. The main trading center has 40 shops, while the average trading center has 5 shops. These are most often general stores, where one can buy items such as grains, sugar and salt, as well as bars (See Table 1).

Figure 1: Study site trading centers



Note: Blue lines represent bodies of water, green lines are swamps, and red lines are dirt roads that run through the study site.

Table 1: Trading centers and shops

Village	General Shops	Bars	Other	Total Shops
A	2	4	0	**6**

B	4	4	0	**8**
C				**40**
D	7	0	0	**7**
E	2	0	0	**2**
F	9	1	2	**12**
G	2	3	0	**5**
H	6	0	0	**6**
I	5	0	1	**6**
J	5	0	1	**6**
K	2	0	1	**3**
L	3	0	1	**4**
M	4	0	0	**4**
N	3	0	0	**3**
O	3	1	1	**5**
P	7	0	1	**8**
Q	2	1	1	**4**
R	3	0	0	**3**

Trading centers offer a crude measure of social interaction sites. They may only be picking up particular types of social interaction – those occurring in spaces of enterprise – and therefore only provide one spatial dimension of social capital. Despite this limitation, trading centers are still a useful proximate measure of social interaction sites in a first attempt at operationalizing the concept of social dislocation.

GIS point coordinates were measured in 2009 with etrex(venture) using the WGS 1984 UTM Zone 36N projection. We have imputed coordinates backwards for households prior to 2009. This covers 67% of all households that existed in the study site from 2000 to 2009. One main reason for household coordinates not being measured in 2009 is that households missing GIS coordinates no longer exist. With largely semi-permanent shelters built from mud, over a 10 year period these are likely to be rebuilt. Newly built structures prior to 2009 were given new household identification numbers.

We calculated straight-line Euclidean distance between each household and the nearest trading center. If an individual moved, we measured the distance to the new nearest trading center, and the distance to their previous trading center. If the previous and new nearest trading center were different, an individual was classified as experiencing social dislocation. Of 2,100 moves, 689 were social dislocations.

$$Distance = \left(\frac{\sqrt{(\Delta longitude * \cos(latitude))^2 + (\Delta latitude)^2}}{360} \right) * R$$

Rural-rural migrants defined by social dislocation and those defined by village boundary changes have a correlation of 0.5642, suggesting that these two measures are capturing different variations in rural-rural movements.

To compare these two measures' ability to differentiate between types of rural-rural moves, we first examine differences in types of movers pre-migration using bivariate Pearson Chi-Square tests of independence. A good measure of rural-rural migrants should be able to differentiate types of migrants across a range of social and demographic characteristics. Second, we examine differences in the changes of well-being that result from migration to determine if one measure is better at predicting differences in post-migration outcomes.

Well-being is measured using a socio-economic status (SES) index constructed from data on ownership of household assets: pots for boiled water, breakable cups, beds, radios, bicycles, motorcycles and motor cars. The SES index is a continuous scale of a weighted sum, computed from a Principal Components Analysis with weights chosen in order to maximize variability of

SES between households. This provides smaller weights to common assets, and larger weights to rare assets, such as motorcycles and motor cars.

Using a multinomial logit model we compare medium SES as the reference category, and then calculate predicted probabilities of being in a low, medium or high socio-economic status household following a move. Controls are added to the model for age, sex, marital status, education, mobility between survey rounds, distance from the main trading center, and distance moved.

Third, we investigate how a village boundary measure versus a measure of social dislocation explains the overall variation in SES post-migration by examining model fit. We run an OLS model on the post-migration SES index and look at the differences in the explained sum of squares between a null model with just the controls, and a model with one of the rural-rural migration measures. We also compare the two multinomial logit models, using Akaike's information criterion.

Results

(a) Rural Movements in Uganda

Over the 10 years of observation, 20,371 adults over the age of 15 participated in the study. GIS data was available for 2,100 moves over the 10-year period. Most people live within 700 meters of their nearest trading center (Figure 2). This is equivalent to about 10 minutes of walking distance using Cairncross's (1999) approximation. Very few people live more than a 20-minute walk from their local trading center. Among those who experience a social dislocation,

the majority are more than a 20-minute walk from their previous trading center (Figure 3). The long right tail on the graph reveals that some people moving within the study site are moving a long distance from their previous homes.

Figure 2: Distance to nearest trading center

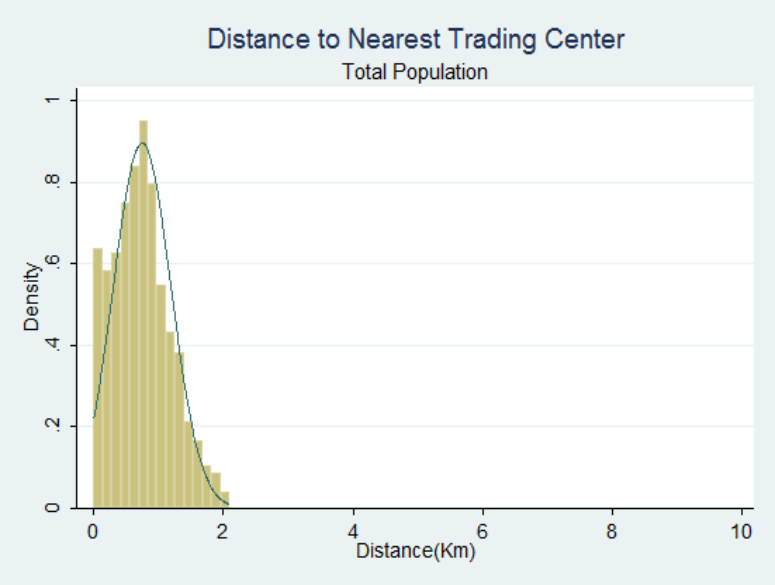
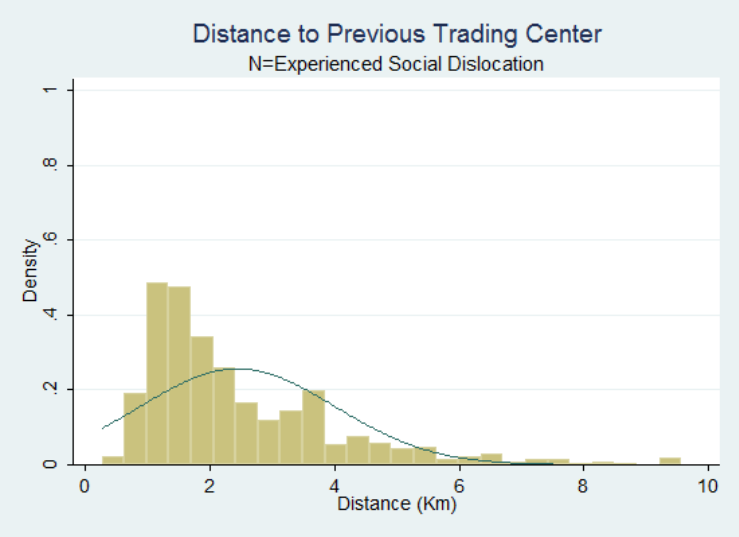


Figure 3: Distance to previous trading center among those experiencing social dislocation



(b) Pre-Migration Differences

We then compare how each of these measures differentiates migrants looking at bivariate Pearson Chi-Square Test of Independence. We run these tests across a range of demographic characteristics, and have chosen socio-economic status to highlight the general trend that we observe. Using the village boundary measure we are able to reject the null hypothesis that our measure of migration is independent from socio-economic status. This suggests that movers who move within versus out of villages have different socio-economic status, with out-village movers being less likely to have lower SES. Our measure of social dislocation, on the other hand, fails to reject the null hypothesis of independence.

Table 2: Village boundary measure of pre-migration SES

Pre-Migration SES	No Dislocation	Dislocation
Low	27%	25%
Middle	45%	45%
High	28%	30%

Pearson Chi²(2) = 1.811
P= 0.404

Table 3: Social dislocation measure of pre-migration SES

Pre-Migration SES	In-Village	Out-Village
Low	28%	23%
Middle	43%	48%
High	29%	29%

Pearson Chi²(2) = 6.2513
P= 0.044

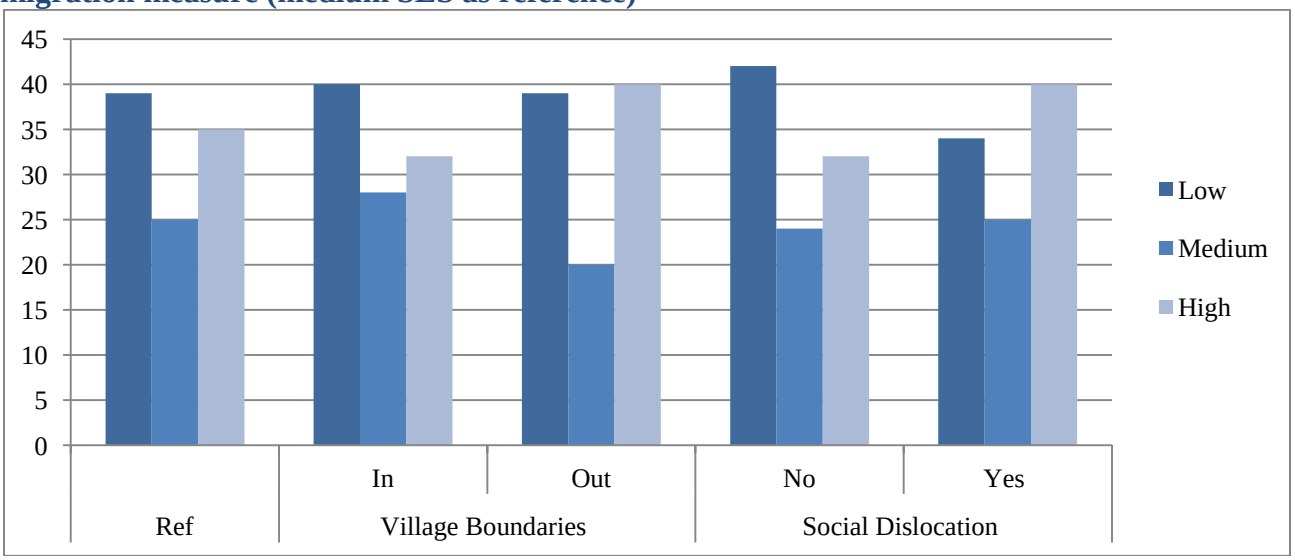
(c) Post-Migration Differences

Using the results from the multinomial logit model we calculate a reference group from our model with just controls, arbitrarily choosing our reference person to be a 25 year old married male with some primary education, who wasn't away from his home for more than one month in the previous year, lives the mean distance of 3km from the main trading center, and moved a mean distance of 1km. This is our base on which to compare how the predicted probabilities of SES post-moving change based on our classification of movers.

Those who move within village boundaries are slightly more likely to have lower SES than our reference. However, those moving outside of village boundaries are 5 percentage points more likely to be in a high SES household, and 5 percentage points less likely to be in a medium SES household. These are significant differences at the 10% level.

However, when we compare this to our measure of social dislocation, those experiencing social dislocation are also 5 percentage points more likely to be in a high SES household, but this is significant at the 1% level. Moreover, while there are no differences among the predicated probabilities of being low SES among the reference group and in- and out-village movers, those moving with social dislocation are 5 percentage points less likely to be in a low SES household compared to our reference person.

Figure 4: Mulitnomial logit model predicted probabilities of post-migration SES by migration measure (medium SES as reference)



Note: Reference category: 25 year old married male with some primary education, non-mobile, 3km from main trading center, and moved 1km; p<0.10 *, p<0.05 **, p<0.01***

(d) Variation in Post-Migration SES

In comparing measures, we are not just interested in the magnitude and significance of the predicted effects, but also in how well each measure explains the post-move variation in

well-being. Therefore, we also examine measures of model fit. First, we look at an OLS model of the change in standardized SES score, and examine the difference in the residual sum of squares between our model with just our controls, and our model with each of our measures plus controls. We see that the out-village migration measure has an explained sum of squares of 28, or 5.5% of the variation in movers SES left unexplained. The social dislocation measure appears to explain much less of the variation in SES, with an explained sum of squares of 3.5, which is only 2% of the variation left unexplained. Akaike's information criterion confirms this, showing a slightly better fit in the out- village model.

Table 4: Model fit of rural-rural migration measures

	Explained Sum of Squares	Akaike's Information Criterion
Out-Village Model	28.17	3818.4814
Social Dislocation Model	3.50	3822.2429

Discussion

In comparing the measure of rural-rural migration based on village boundaries to our newly constructed measure of social dislocation, we find mixed results. Social dislocation does not significantly differentiate movers' pre-migration SES, and provided a poorer model fit in explaining the variation in post-migration SES status. However, social dislocation did show larger and more significant changes in the predicted probability of being in each SES category following migration, compared to the village boundary measure. This suggests that this measure may be better at differentiating the well-being between types of movements.

We propose three criteria to help compare and contrast these two measures in light of our results. First, we need to consider which measure best captures differences in well-being among types of movers. Village boundaries did a better job at differentiating the level of well-being among those before they move, but social dislocation was better able to predict higher well-being post-migration. Second, we need to consider what explanatory mechanisms each measure posits. While village boundaries explain more of the variation in SES among migrants, it is unclear what social or economic processes this measure is capturing. In choosing how to differentiate types of rural-rural movements, we must also consider how a measure helps us understand the social mechanisms occurring alongside migration. Third, we should also consider the external validity of a measure. Social dislocation may be more comparable across study sites. However, political boundaries may be more salient in other rural contexts.

This study is not without limitations. Our measurement is confined by the geographic boundaries of the study site, censoring out-migrants who may also be rural-rural migrants. We may also be missing social interaction sites that lie beyond the borders of the study site, as well as missing other potentially important points of social gathering within the study site. Our study rests on the strong assumption that trading centers are the main social centers – something that needs to be confirmed with future research. The methods employed in this paper should also be used on other measure of social interaction sites to test the sensitivity of the social dislocation measure to different specifications of the spatial dimensions of social networks. By using trading centers as a proxy for social interaction sites we may be capturing spaces of amenity-based social interaction, which is only one space in which social capital may reside.

Despite these limitations, this study provides an initial foray into thinking about the dimensions of rural-rural moves, and our need to think more creatively about how we classify and understand rural-rural migration.

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