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Does relative deprivation induce migration? Evidence from Sub-Saharan Africa¹

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Abstract:

This paper revisits the decades-old relative deprivation theory of migration in the context of sub-Saharan Africa. In contrast to the traditional view that migration is driven by absolute income maximization, we test whether relative deprivation induces migration in the context of sub-Saharan Africa. Taking advantage of the internationally comparable longitudinal data from integrated household and agriculture surveys from Tanzania, Ethiopia, Malawi, Nigeria, and Uganda, we use panel fixed effects to estimate the effects of relative deprivation on migration. Using per-capita consumption and multidimensional wealth index as wellbeing measures, we find that a household's migration decision is based not only on its absolute wellbeing status but also on the relative position of the household in the wellbeing distribution of the community it resides in. We also discover that the effect of relative deprivation on migration is amplified in rural, agricultural, and male-headed households. Results are robust to alternative specifications including use of Hausman Taylor Instrumental Variable (HTIV) estimator and pooled data across the five countries. Results confirm that the 'migration-relative deprivation' relationship holds in the context of sub-Saharan Africa also. We argue that policies designed to check rural-urban migration through rural transformation and poverty reduction programs should use care because such programs can increase economic inequality which further increases migration flow.

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1. Introduction

Why do people migrate? Numerous pathways exist to explain people's inherent motive for migration and multiple factors may be at play simultaneously. While researchers are in agreement that migration may be driven by both 'push factors' in the origin such as economic inequality and poverty, and 'pull factors' in the destination such as better economic opportunities and social safeties, the migration literature overlooks the role of economic inequality (relative deprivation) on migration. In this article, we revisit the decades old relative deprivation hypothesis of migration developed and tested in the context of Mexico-US migration by Stark (1984), Stark and Taylor (1989), Stark and Taylor (1991) and test empirically in the context of sub-Saharan Africa – Tanzania, Ethiopia, Malawi, Nigeria, and Uganda.

Traditional migration models predict that the main driver of migration is income or wage differentials between the point of origin and destination; that is, those with low income always have a higher propensity to migrate (Harris and Todaro 1970; Massey et al. 1993) as they seek to improve their wellbeing. However, there is no conclusive evidence to support this is the sole, or even primary, motivation for migration because migration does not necessarily lead to relatively higher wage returns (Flippen 2013).² Another strand of literature argues that the propensity of migration is not necessarily the highest among the poorest community, it is in fact the highest in the community with the highest social inequality (Stark and Yitzhaki 1988; Stark 1984; Stark and Taylor 1991). As the longstanding debate on the drivers of migration is still unsettled, policies to regulate or reduce internal or cross-country movement of people have been less effective. In this paper, we initiate a new angle of discussion on migration research by considering simultaneously the relationship between migration and both relative deprivation and absolute wellbeing. We

² Flippen (2013) notes that internal migration in the United States is dominated by north-south movement, even though wage differential is negative; wages are higher in northern states in general. So, the famous north-south migration may have been driven by relative deprivation because those relatively deprived in the north may find themselves to be in much better social status in the south.

examine the relationship in both consumption and wealth spaces in the context of sub-Saharan Africa.

While the welfare function approach depends on one's own utility (or income) maximization, relative deprivation is "*an increasing function of not having something one wants, sees someone else having, or sees as feasible to have*" (Runciman 1966). Hence a household's relative deprivation depends on wellbeing status of other households around it as well as the feeling of the household members about their position in the local well-being distribution. It is in this sense that people from more relatively deprived households have higher incentive to migrate because migration occurs not only to maximize the expected income or wage³ but also to minimize the feeling of deprivation relative to the community they reside in – a reference group (Stark and Yitzhaki 1988; Stark 1984; Stark and Taylor 1991).

Stark (1984) argues that as migration is a choice and people's choices are affected by their level of deprivation relative to the community they belong to, migration decisions are motivated by minimization of relative deprivation, not by absolute income maximization. However, we hypothesize that the migration decision is influenced by both income maximization and relative deprivation minimization at the same time. It is important to consider both absolute and relative deprivation at the same time to better understand causes of migration because households make migration decision considering both their relative deprivation as well as absolute levels of well-being (Czaika and Haas 2011; Quinn 2006). Evidence also points to different roles of relative deprivation on internal and international migration; while relative deprivation predicts the internal migration better, the income or wage differential approach explains the international migration better (Quinn, 2006).

³ That people move from one place to another to minimize their deprivation relative to others has been overlooked by traditional migration models which relate migration to income or wage differentials between origin and destination (Stark 1984; Stark and Yitzhaki 1988).

Stark (1984) is the first to theorize Runciman's relative deprivation concept in migration studies. This theory was quickly tested empirically by (Stark and Yitzhaki 1988) and (Stark and Taylor 1989; Stark and Taylor 1991) in the context of Mexico-US migration. After Stark, Taylor, and Yitzhaki's seminal work on relative deprivation and migration, this approach has been largely overlooked in the migration literature. After early 1990's, to the best of our knowledge, only a handful of studies have used the relative deprivation approach to study migration and all of them find positive association between the two. Specifically, (Bhandari 2004) finds positive relationship between relative deprivation of land holding size and migration in Nepal, Quinn(2006) also finds positive effects of relative deprivation of income, wealth, and land area on internal migration in Mexico, and Flippen (2013) confirms the same relationship for internal migration in the United States in all directions but South to North migration. Similarly, Czaika and de Hass (2012) use global bilateral migration data matrix from 262 countries and find a positive association between both international and internal relative deprivations and global migration. In addition, (Mehlum 2002) uses an overlapping generations model and demonstrates how relative deprivation increases rural to urban migration, both within and across generations.

There is still lack of rigorous evidence on whether the relative deprivation-migration relationship persist over time and across countries. In recent years, sub-Saharan Africa (SSA) has been in the center of significant policy dialogue about migration and a plentiful of anecdotal evidence point to a rapid increase in internal and international migration from SSA. However, the 'relative deprivation – migration' relationship has not been explored in the context of sub-Saharan Africa (SSA) and it is both timely and critical to study the relationship and understand better the causes of migration within and from the region. Examination of the relative deprivation – migration relationship is of more importance in SSA because the region is characterized by persistent extreme poverty, high proportion of working age adults, high rate of unemployment or under employment, and high degree of social inequality – factors that are

believed to fuel migration flows. In addition, rapid urbanization is also considered as a contributor to migration flows in SSA (Gollin, Jedwab and Vollrath 2016; Potts 2016).

That both social inequality and absolute poverty may incentivize people to migrate is an interesting and equally important policy question and deserves further scrutiny. Does relative deprivation of consumption (income) induce migration? How do migration patterns change with absolute levels of consumption? Does the relationship hold in wealth space? Does the ‘relative deprivation – migration’ relationship persist with changes in local context and across countries? We answer these questions as follows. First, we estimate the relationship between relative deprivation of consumption and migration. While our main focus is on relative deprivation, we also estimate the relationship between absolute consumption level and migration because migration decision is based on both one’s own well-being level as well as well-being status relative to others in the same community. Second, we use an aggregate wealth index as a wellbeing variable to validate the findings from consumption space. Examining the ‘relative deprivation – migration’ relationship in both consumption and wealth spaces is critical because, in agrarian settings that characterize much of SSA, the majority of households lack monetary income and wellbeing status is often assessed using level of consumption, access to goods and services, and asset ownership. Lack of access to these services exacerbates household's relative position and the feeling of deprivation in the community, and household members may migrate hoping to minimize the relative deprivation and maximize the expected income and wealth. Finally, we provide a critical mass of evidence on the ‘relative deprivation – migration’ relationship across five SSA countries.

This study makes a set of contributions to the migration literature. First, to our knowledge this is the first empirical study to examine the relationship between relative deprivation and migration in the context of sub-Saharan Africa (SSA). Second, we provide a critical mass of evidence on the relative deprivation-migration relationship by examining the relationship across five different countries. Third, we provide evidence that the relative

deprivation-migration relationship consistently holds across both wealth and consumption spaces. We argue that if the link between relative deprivation and migration is sustained, it may enable policymakers to design appropriate policy instruments to promote rural transformation and reduce the alarming rate of both internal and international migration, especially in developing countries.

The rest of the analysis proceeds as follows. In Section 2, we describe the research methodology including the computation of the measure of relative deprivation, description of the empirical model, and potential endogeneity concerns. Section 3 describes the data, and we present both descriptive and empirical results from the model in Section 4. Section 5 concludes.

2. Methodology

2.1. Measure of relative deprivation

Social inequality can be explained in two ways; welfare function or utility approach and deprivation approach. Welfare or utility is an increasing function of having something but deprivation is an increasing function of not having something one wants, sees someone else having it, or sees as feasible to have (Runciman 1966; Stark and Yitzhaki 1988). Given a household's wellbeing status, its deprivation is a function of the wellbeing of other households around it – a reference group. For example, the deprivation for a household with income less than y is an increasing function of number of households in the reference group with income y or higher and the relativity is associated with the reference group the household resides in. Hence, the relative deprivation, which captures the feeling of not having y or more, is an increasing function of the number of households in the reference group that have at least y .

As we examine the 'relative deprivation – migration' relationship in both consumption and wealth spaces, we construct two relative deprivation variables, one based on consumption expenditure and another based on a multidimensional wealth index based on household assets. Because the relativity of this approach comes from reference groups, the construction of

reference groups is critical. We create reference groups based on survey enumeration area and other geographical information. We set the minimum number of households per reference groups to be 10 but, the average size of a reference groups varies by country – 24 in Ethiopia to 49 in Malawi. By construction, a reference group is bigger than the survey enumeration area and smaller than a sub-district or its equivalent administrative unit.

We closely follow Stark's (1984) and Yitzhaki's (1989) definition of relative deprivation but use consumption expenditure or wealth index in lieu of income. Let $F(y)$ be a cumulative distribution of consumption y , then $1-F(y)$ is the percentage of households with consumption higher than y . Therefore, measure of relative deprivation for a household i in a reference group r is defined as

$$RD_{ir}(y) = \int_{y_r^i}^{y_r^h} [1 - F(x)] dx \quad (1)$$

where RD_{ir} is the measure of relative deprivation for household i in reference group r , y_r^i is the value of consumption for household i , y_r^h is the highest value of consumption in the reference group r , and $F(x)$ is the cumulative distribution of consumption in the reference group. For practical purposes, equation (1) can be simplified to the following expression:⁴

$$RD_{ir} = \mu_r [1 - \phi(Y_{ir})] - Y_{ir} [1 - F(Y_{ir})] \quad (2)$$

where μ_r is the average consumption of the reference group r , $\phi(Y_{ir})$ is the proportion of total consumption of households in the reference area with level of consumption higher than Y_{ir} to the total consumption of all households in the reference area, and $F(Y_{ir})$ is the cumulative

⁴ See Appendix A for details on mathematical derivation

distribution of consumption in the reference group. Subsequently, any decrease in the consumption of households less deprived than household i will decrease the relative deprivation of household i . Analogously, any increase in the consumption of households more deprived than the household i will increase the relative deprivation of household i .

A similar method is used to create relative deprivation of wealth. Our focus is on the relationship between migration and consumption-based relative deprivation but relative deprivation of wealth will be used as a robustness check. Wealth is measured through a weighted index of household asset holdings and housing characteristics. Asset variables include durable consumer goods, house characteristics, access to improved sanitation, access to drinking water, land holding size, and livestock ownership. We exclude agricultural tools and equipment because agricultural tools are endogenous and may not reflect household's wellbeing.⁵ Table 1 presents the details of asset variables used in each of the five countries considered. Asset variables are carefully chosen so that the wealth index is comparable across countries. However, due to lack of the data, the set of asset variables used is not exactly the same across countries.

We use principal component analysis (PCA) to construct the wealth index. Following the literature, we keep only the first principal component because the first component captures the maximum variance in the data and serves as a valid measure of wealth (Filmer and Pritchett 2001; Filmer and Scott 2008; McKenzie 2005; Sahn and Stifel 2003; Vyas and Kumaranayake 2006). In our case, the first principal component accounts for at least 13.4% variation in assets data in case of Uganda, 18.6% in Nigeria, 19% in Ethiopia, 21% in Tanzania, and 23% in the case of Malawi. To make the wealth index comparable across waves, we use a 'pooled approach'; we pooled the data across waves and use pooled mean and standard deviation to calculate appropriate weight for each asset variable. The pooled weight is then used to create the wave-

⁵ (Kafle et al. 2016) argues that in agrarian settings, agricultural tools and equipment may constitute wealth and so can be included in wealth index.

specific wealth index.⁶ Since the ‘pooled’ approach in wealth space is equivalent to the use of real (deflated) consumption expenditures in consumption space, inferences based on wealth index are comparable with those based on consumption expenditure.

2.2. *Migration definition*

A key issue in migration research is the definition of migration itself. The migration literature is dominated by domestic and international labor migration, but there is no universal definition for it; the definition of migration seems to vary with country, context, and the research question on hand. Stark and Yitzhaki (1988) define migration as a movement from one reference group to another. We define migration as "movement of individuals to any destination outside of the household location for more than one continuous month in the last 12 months for reasons ranging from economic, education, forced displacement, family reunification, to other purposes irrespective of the drivers of the movement". One could contest our definition of migration because not all movement out of the household location are considered migration. However, our primary interest is to examine the relationship between all forms of movements – permanent or temporary migration, seasonal migration, labor or non-labor migration, voluntary or involuntary migration, distress migration, family reunification etc. – and relative wellbeing of households in their respective communities. All newly born children and people who died in the last 12 months of survey are excluded, but we consider movement for family reunification as well as marriage and divorce as migration. Our view is that one should exclude marriage and divorce as migration phenomenon, but in our case, not all countries we considered have data on reasons for migration and therefore we are unable to distinguish and exclude movements due to marriage and divorce to consider it in a comparative analysis.

2.3. *Empirical model*

⁶ Practically, in STATA, we pooled the data across waves and run *pca* command on the pooled data. Then we reshaped the data to get wave-specific asset index.

We take advantage of the longitudinal data available and use panel fixed effects to estimate the effects of relative deprivation on migration. Controlling for household and demographic characteristics, we estimate whether households make migration decisions to overcome their feeling of relative deprivation with respect to other households in the reference group. Equation (3) is our main estimating equation.

$$M_{it} = \alpha_0 + \alpha_1 RD_{irt} + \beta_1 C_{it} + \theta X + \mu_i + u_{it} \quad (3)$$

where i indicates a household, r indicates a reference group, t is current survey period, M_{it} is number of migrants from household i in time t , RD_{irt} is relative deprivation of household i in the reference group r in time t , and C_{it} is logarithm of consumption expenditure per adult equivalent. Similarly, X is a vector of control covariates, μ_i is household level fixed effects, and u_{it} is an idiosyncratic error term. For consistency and comparability, we use the same set of control variables across countries. The control covariates are household size, dependency ratio, age, sex and marital status of the household head, indicator for rural residence, and an indicator for agricultural household. A positive and significant value of α_1 indicates that, controlling for income and other factors, relative deprivation induces migration. A positive and significant value of β_1 indicates that migration increases with consumption.

A number of studies find that migration increases with income but at a decreasing rate (Du, Park and Wang 2005; McKenzie and Rapoport 2007). We use a simple graphical approach to determine whether migration is non-linear on consumption or wealth. We run equation (3) in both consumption and wealth space and get the estimated coefficients on each variable. We calculate the predicted number of migrants keeping all variables constant but letting the consumption (wealth) variable to vary in a range from 0 to 100. A random number generator is used to pick a random value of consumption for each household from the range. The predicted

number of migrants is plotted against the randomly generated consumption (wealth) variable using local polynomial fit. We examine the shape of the curve (Figure 1) to determine the correct functional form for consumption (wealth). A careful examination of the local polynomial plots indicates that migration is non-linear in consumption but linear on wealth. Except for the case of Uganda where the number of migrants sharply decreases at first before it jumps up, ‘migration – consumption’ relationship is consistent with quadratic functional form in all other cases. We estimate both linear and quadratic models, but our preferred model is the panel fixed effects with quadratic term in the consumption space (Equation 4) and the linear panel fixed effects in the wealth space (Equation 3).

$$M_{it} = \alpha_0 + \alpha_1 RD_{irt} + \beta_1 C_{it} + \beta_2 C_{it}^2 + \theta X + \mu_i + u_{it} \quad (4)$$

In equation (4), a positive β_1 and negative β_2 accompanied by a joint significance of β_1 and β_2 indicates that migration increases with consumption but at a decreasing rate. We calculate the marginal effects of consumption using the expression $\widehat{\beta}_1 + 2\widehat{\beta}_2 C_{it}$. Although relative deprivation is a function of consumption, the marginal effects of consumption (C_{it}) is independent of α_1 because relative deprivation depends on consumption of the reference group only (C_{irt}).

2.4. *Endogeneity*

Migration is an endogenous phenomenon, more so when we examine the relationship between consumption and migration. We identify two potential sources of endogeneity. First, migration and consumption decisions can occur at the same time or factors that affect current household consumption or income likely influence the household’s migration decision – simultaneity. Unlike in the consumption space, simultaneity is less of a concern in the wealth

space because wealth is accumulated over time and the factors that contribute to wealth accumulation over time are assumed to have less influence on current migration. Second, migration and relative deprivation may cause each other – for example previous period’s migration increases current inequality (relative deprivation) which may further increase migration. The potential reverse causality between migration and relative deprivation can lead to biased estimates if not corrected for. In this analysis, we run two alternative model specifications to assess whether endogeneity influences our results. First, we run a ‘lagged regression model’; effectively regressing endline migration on baseline variables (Equation 5).

$$M_{irt} = \alpha_0 + \alpha_1 RD_{irt-1} + \beta_1 C_{it-1} + \beta_2 C_{it-1}^2 + \theta X + \mu_{ir} + u_{irt-1} \quad (5)$$

As lagged consumption (level of consumption in the last wave, two years ago) is expected to be exogenous for current migration, this approach addresses the potential endogeneity due to simultaneity. Results from Equation (5) are presented in Table A4 in the Appendix. The results are consistent with our main findings (Table 5).

Alternatively, we use the Hausman Taylor Instrumental Variable (HTIV)⁷ estimator to correct for the potential endogeneity coming from both consumption and relative deprivation variables. The HTIV is a panel estimator and allows to estimate the effects of time-invariant variable. The estimator finds instruments from within the model but requires four different types of variables to meet that requirement – time-variant endogenous, time-variant exogenous, time-invariant endogenous, and time-invariant exogenous. In this analysis, time-varying endogenous variables include relative deprivation, consumption expenditure and its squared term, and aggregated wealth index. Time-varying exogenous variables include household size, dependency

⁷ The Hausman Taylor Instrumental Variable (HTIV) estimator uses an instrumental variable approach but finds the instruments from within the model (Hausman and Taylor 1981) (Baltagi, Bresson and Pirotte 2003; Kafle, Jolliffe and Winter-Nelson 2018). Another advantage of this model is that, unlike the fixed-effects estimator, HTIV allows to estimate the effects of time-invariant variables.

ratio, indicator for rural residence, indicator for agricultural household, and age, gender, and marital status of the household head. Household head's level of education is considered as a time-invariant endogenous variable and the size of the reference group is considered as a time-invariant exogenous variable.

We provide the results from the alternative specifications as robustness check. Similarity between our main results and the results from the lagged regression indicate that simultaneity is less of a concern. If any, HTIV estimator corrects for the endogeneity that stems from both simultaneity and reverse causality. We find that our main results are consistent with both HTIV results and the results from the lagged regression.

3. Data

The data for this analysis come from five LSMS-ISA countries in sub-Saharan Africa. All surveys are nationally representative surveys implemented by the respective National Bureau of Statistics with technical support from the World Bank.⁸ Multiple rounds of data are available for each country. However, since more than two rounds of data are not available for all five countries, this analysis uses only the data from the first two waves. The sample size and the period of coverage do vary by country but the survey design and instruments are similar, which allows us to do cross country comparisons. All datasets have integrated household, agriculture, and community components and are standardized to the extent possible. These datasets serve well for migration study because, although not all datasets contain a specific migration module, each dataset contains a question about the number of months each household member is away from the household in the last 12 months. Even though migration information is at the individual level, other relevant information are available only at the household level. Therefore, this study assesses, the 'migration-relative deprivation' relationship at the household level. Table

⁸ For more information on the LSMS-ISA initiative, please visit www.worldbank.org/lms-isa.

2 presents the details of cross-sectional sample size, attrition rates, and panel sample sizes for all five countries. All datasets maintain a fairly low attrition rate at or below 5% with a slightly higher attrition rate in case of Uganda. A quick examination of attrition pattern shows that attrition occurs at random because no significant difference exists on migration rate of attrited and the remained sample.

4. Results

4.1. Descriptive results

Summary statistics are presented in Table 3. We present summary of demographic characteristics, wellbeing variables, relative deprivation, and migration information for each of the five countries considered in this analysis. We perform t-test to test the difference of mean estimates between two waves. The average household size is between five and six in each of the five countries considered and has increased over time by less than one individual, but statistically significantly. Both the number of children (ages 0-14) and the number of economically active adults (ages 15-64) in each country are between two and three and both numbers increase over time, although it is statistically significant only in the in cases of Malawi, Nigeria, and Uganda. These statistics indicate that a large proportion of the population in these sub-Saharan African countries consists of children and senior adults; an observation consistent with the existing body of literature on demographic pattern of Africa (de Brauw, Mueller and Lee 2014). Dependency ratio for each county is more than 1.5 and does increase over time, although the increase is not statistically significant. On average, household heads are aged about mid-forties in all five countries considered. Although household head's age increases over time by about two years, their other characteristics are not expected to vary much. As the household headship changes over time due to death, migration, or other intra-household dynamics such as marriage, household split etc., gender and marital status of household head do change over time too, albeit not significantly. Household head's education level is mostly time-invariant. In a few cases,

where the head's level of education does change over time, the maximum education level across the two waves is taken so that the variable is time invariant.

The last section of Table 3 presents the variables of interest. Consumption expenditures are expressed in real terms monthly per-adult equivalent in local currency, and in US dollars equivalent. The baseline consumption is at about the same level in all countries (about \$20-\$25 per-adult equivalent/month), but growth in consumption differs. In the cases of Ethiopia, Malawi, and Uganda real consumption decreases over time, but Tanzania and Nigeria experience a significant increase. However, relative deprivation of consumption increases in all countries but Ethiopia. This implies that increases in absolute consumption does not necessarily imply a decrease in relative deprivation because consumption growth that favors households above (below) poverty line increases (decreases) the relative deprivation of households at or below the poverty line, for example. Unlike consumption, wealth index shows less variation over time; it significantly increase in Ethiopia and Malawi but no significant changes are observed in other countries. Likewise, changes in the relative deprivation of wealth is not consistent across countries; it increases in Tanzania and Malawi, decreases in Ethiopia, but is constant in Nigeria and Uganda.

Relative deprivation of consumption and wealth are not comparable with each other because they are based on different base variables. However, each measure is comparable across countries and the results show that relative deprivation of consumption is about 0.30 points and relative deprivation of wealth is about 0.70 points. However, these statistics do not necessarily mean that the households are more deprived in wealth space than in consumption space because one point of relative deprivation of consumption does not equal to one point of relative deprivation of wealth. But, as one would expect, these two variables are highly correlated with a correlation coefficient of 0.6.

In general, migration has increased over time. The proportion of households with at least one migrant in baseline ranges from 12% in Malawi to 51% in Uganda. The low level of

migration prevalence in sub-Saharan Africa is evident in the literature too. As (de Brauw et al. 2014) noted, historically, sub-Saharan Africa has had a slow rate of rural-urban migration. On average, the net migration was only about 1.7% per annum during 1990 to 2000. In fact, de Brauw and colleagues also report that several countries even had negative net migration in rural areas indicating an increase in re-ruralization of sub-Saharan Africa. Despite a slow rate of migration, with the exception of Ethiopia, the proportion of migrant households increases over time in all countries. As a consequence, in all those countries the number of migrants per household also increased significantly. Since we consider all kinds of movements away from the household as migration, migration variables in endline are independent of migration variables in baseline period; therefore a migrant household (individual) at baseline may not necessarily be a migrant by endline.

4.2. *Migration and relative deprivation of consumption*

Table 4 presents the effects of relative deprivation of consumption on migration. The results are based on equation (3); a panel fixed effects model linear on log of consumption expenditure. Results from all five countries show that migration increases with income (proxied by consumption in this analysis), although not statistically significant in the case of Ethiopia and Malawi. A positive and significant coefficient on relative deprivation variable indicates that even though migration increases with consumption level, it increases more among the relatively more consumption deprived households. In all five countries considered, an increase in relative deprivation – the feeling of deprivation of a household compared to other households in its neighborhood - increases the number of migrant members. This finding is consistent with the relative deprivation theory of migration; individuals migrate not only to maximize their expected income but also to minimize the feeling of relative deprivation in the place of origin. Positive coefficients on both relative deprivation and consumption indicates that as relative deprivation

of consumption induces migration, level of consumption amplifies the effects of relative deprivation.

Other control variables also have the expected effects. A larger household size increases the incidence of migration but the dependency ratio has an adverse effect. Even though migration increases with household size, any increase in the number of dependents (children and seniors) reduces migration, except in the Nigerian case where the dependency ratio holds a significantly positive relationship with the number of migrants. Female headed households seem to have fewer migrants but the relationship is not consistent across countries; negative in Tanzania, Ethiopia, and Malawi but positive in Nigeria and Uganda. Households with married heads also appear to have fewer migrants but the relationship is exactly opposite in case of Tanzania.

Among other variables, age of household head has a consistent positive effect on migration, meaning increases in the age of the head increases the number of migrants from a household. When everything else is controlled for, residing in a rural area as well as being an agricultural household has no effects on migration except in the case of Tanzania where rural households have fewer migrants compared to urban households. Even though the effects of household head's characteristics and other demographics are more or less consistent across countries and of comparable magnitudes, these results should be taken with caution as the variables barely change over time and, therefore, a large portion of their effects may be captured by the fixed effects. In addition, lack of consistency of the effects of demographic variables on migration across countries highlights the complication of cross country analysis. Similarly, the size of the effect of relative deprivation is not directly comparable across countries because both consumption and relative deprivation of consumption are in local currency of respective country.

Table 5 presents the results estimated using equation (4), a panel fixed effects model with quadratic specification for the relationship between consumption and migration. This is our preferred model because local polynomial smooth between consumption and predicted number

of migrants in each case shows a non-linear relationship and the non-linearity is consistent with quadratic functional form in all cases but Uganda. The Ugandan case is unique in that, at first, the number of migrants decreases with consumption but then it increases at an increasing rate for most of the relevant income range – migration is non-linear in consumption but the relationship is not quadratic. Hence our preferred model is linear for Uganda and quadratic for the case of the other four countries. Results confirm that an increase in relative deprivation of consumption increases migration in sub-Saharan Africa. One unit increase in relative deprivation of consumption increases number of migrants by at least 0.27 units (Malawi) and up to 0.56 units (Ethiopia). Similarly, one percent increase in consumption per adult equivalent increases the number of migrants by at least 0.97 units (Nigeria) up to 1.88 units (Tanzania). However, negative coefficient on quadratic term indicates that the rate of increase in the number of migrants decreases with the level of consumption.

Since the effects of level of consumption and consumption squared go in opposite directions and the effects are jointly significant, the net effect of consumption on migration can be better understood with marginal effects. We compute the marginal effects of consumption by differentiating equation (4) with respect to log transformed consumption and use the estimated coefficients on consumption and consumption squared to estimate the marginal effects at different points of the consumption distribution (Table 5). As expected, the effect of consumption on migration is the largest among the poorest group in all countries except Uganda. In all four cases, the positive effect gets smaller with consumption and even becomes negative at the 95th percentile in the case of Nigeria and Ethiopia. This finding is consistent with existing literature. A number of studies find an inverted-u-shaped relationship between migration and absolute income indicating that migration increases with income but at a decreasing rate (Du, Park, and Wang 2005; McKenzie and Rapoport 2007). In the case of Uganda, however, the effect of consumption on migration increases at an increasing rate.

Table 6 presents the effects of consumption-based relative deprivation and level of consumption on migration under various scenarios – rural vs. urban, agricultural vs. non-agricultural, male headed vs. female headed households, and finally households with the number of youth more than local average vs. households with less youth. The results are based on our preferred estimated model; panel fixed-effects (linear) for Uganda and panel fixed-effects with quadratic term for other four countries. Results show that, in general, relative deprivation of consumption has larger positive effects on migration among rural households, male headed households, households with more youth (number of youth ages 15-24 is greater than median number of youth), and agricultural households. This finding is more or less consistent across countries with one exception; relative deprivation has greater positive effects among urban and non-agricultural households in Uganda. However, as the sub-groups “rural household” and “agricultural household” are not mutually exclusive, inference should be made with caution. For example, the identical pattern of results on rural vs. urban and agricultural vs. non-agricultural households indicate that a part of the ‘agricultural effect’ may be captured by the ‘rural effect’.

4.3. *Migration and relative deprivation of wealth*

Table 7 presents the effects of relative deprivation of wealth on migration. Results are consistent with those of relative deprivation of consumption in that an increase in relative deprivation increases the number of migrants. One unit increase in relative deprivation of wealth increases number of migrants in the range of 0.05 units in Ethiopia to 0.23 units in case of Malawi. Similarly, the effects of wealth index on migration is also consistent with the effects of consumption on migration. An increase of one point in the aggregated wealth index increases the number of migrants in the range of 0.01 units in Ethiopia to as much as 0.21 units in Uganda. These increases are relatively small in magnitude. Since the variable of interest is some function of a weighted index, we don’t attempt to interpret the magnitude of effects but rather focus on the direction of the effects and its level of statistical significance. Other than the wealth index

and relative deprivation of wealth, all control variables included in this model are exactly the same as those included in the analysis in the consumption space. On average, migration increases with household size and age of head, but decreases with the dependency ratio, households with a married head, and female headed households. These results are consistent across countries and confirm our findings in the consumption space. Next, we breakdown the sample to various groups and assess the effects of wealth and associated relative deprivation.

Table 8 presents the effects of relative deprivation of wealth on migration across demographic groups and sectors of household activities. Results in this table are comparable to the consumption space results in Table 6. As in the consumption space, relative deprivation of wealth has larger positive effect on migration among rural households, male headed households, households with more youth, and agricultural households. Despite a few discrepancies, the results hold consistent across countries; relative deprivation of wealth has no effects whatsoever on migration and has greater positive effects among urban and agricultural households in Tanzania.

4.4. *Robustness check*

Our finding that relative deprivation of consumption induces migration is robust across five countries in sub-Saharan Africa. The finding is also robust to the use of a wealth index as a wellbeing variable in lieu of consumption; relative deprivation of wealth also has consistent positive effects on migration in all five countries considered. We employ four different approaches to assess the robustness of our findings.

First, we pooled the data from all five countries together and estimate the relative deprivation – migration relationship with the metadata. Pooling the data across countries may create cross-variable inconsistencies and incomparability⁹, but our results add to the literature

⁹ The main concern was the inconsistencies in local currencies across countries. We use the market exchange rate as of November 21, 2017 and convert all local currencies to US Dollars. Another concern was use of sample weights. However, our regression analysis does not use sample weight neither in intra-country analysis nor in pooled analysis. Other demographic variables were more or less similar.

that the migration – relative deprivation relationship holds in both individual countries and sub-Saharan Africa region irrespective of the country. Results from the ‘pooled’ analysis are presented in Table 9. Model 1 is a linear fixed effects on consumption space, model 2 is a quadratic fixed effects on the consumption space, and model 3 is a linear fixed effects on wealth space. Results indicate that, irrespective of the country, relative deprivation plays an important role in household’s migration decision. Specifically, one unit increase in the relative deprivation of consumption increases the number of migrants by 0.16 and the same increase in the relative deprivation of wealth increases the number of migrants by 0.9. Consistent with the intra-country results, migration increases with consumption but at a decreasing rate, albeit the later is not statistically significant.

Second, we estimate the ‘relative deprivation – migration’ relationship using a quasi-maximum likelihood estimator (QMLE). Given that our dependent variable is a count variable and the data is over-dispersed, we use a pooled negative binomial model. To make the estimates as close to the fixed-effects as possible, we adopt the Chamberlin-Mundlak approach – we estimate our preferred model (quadratic in consumption space, linear in wealth space) with negative binomial estimator including time constant pooled means for all explanatory variables in the model. Results in consumption space are presented in Table A1 and the results are coherent with our main finding that migration increases with consumption at a decreasing rate and the relative deprivation of consumption adds to the positive effects of consumption. Table A2 presents equivalent results in the wealth space. With the exception of Tanzania, results in the wealth space are also consistent with the main finding – migration increases with wealth but it increases more among relatively deprived households.

Third, we use the lagged regression approach – essentially regression migration outcome in the follow up wave on the explanatory variables in the baseline. Results are presented in Table A3 in the Appendix. The results are consistent with our main findings for all countries but Ethiopia suggesting that analysis in the Ethiopian case may have suffered from endogeneity

which is apparent when we examine the results from Hausman Taylor Instrumental Variable (HTIV) estimator. Finally, results from the HTIV estimator are presented in Table A4 and Table A5. In Table A4, HTIV results in consumption space are presented. HTIV results in wealth space are presented in Table A5. The results are consistent with (in most cases better than) our main results in Table 4 and Table 5. As the HTIV results are similar to our main results, we present the results from the fixed effects estimator as our main results and HTIV results as robustness check.

5. Conclusion

In this article, we test the relative deprivation theory of migration in the sub-Saharan African context under various scenarios. In contrast to the traditional migration theory that focuses on wage differentials or expected income maximization as the primary drivers of migration, we test empirically if households also make migration decision to minimize their relative deprivation resulting from social inequality in the community they reside. We use both consumption and an aggregated asset index as wellbeing measures and examine whether, and the extent to which, relative deprivation induces migration. Migration is defined as a movement of individuals out of the household for more than one continuous month in the last twelve months irrespective of the reason, excluding death and new births.

Using longitudinal data from integrated household and agriculture surveys from five countries in sub-Saharan Africa, we estimate the effects of both relative deprivation and absolute consumption or wealth on the number of migrants per household. We find that relative deprivation induces migration; the more relatively deprived a household is, the more likely it is to have more migrants. Migration increases with the level of consumption but at a decreasing rate indicating that the average number of migrants is higher in poor communities than in richer communities. Except in case of Uganda, the marginal effect of consumption on number of migrants decreases with income percentiles and even becomes negative at the 95th percentile. For

example, in Ethiopian case, 1% increase in consumption for households at or below the first quintile of consumption distribution increases number of migrants by 0.28, but a 1% increase in consumption of households in the fifth quintile decreases number of migrants by 0.043.

Taking together the decreasing marginal effects of consumption and positive effects of relative deprivation on migration, it can be inferred that the net effects of consumption on migration is positive for poor and relatively deprived households. For households at the upper level of wellbeing distribution, increase in income may have zero to negative effects on migration. The relative deprivation – migration relationship holds in the wealth space too, consistently. Relative deprivation of wealth is positively associated with migration and migration increases with the absolute level of wealth as well. When demographic sub-groups are considered, the effect of relative deprivation on migration amplifies among male headed households, rural households, households with more youth, and agricultural households. Although the intensity of the estimated effects of relative deprivation on migration is not the same in the consumption space and asset space, the direction and the level of significance of the estimated effects are the same across both spaces.

Our findings have multiple policy implications. First, there is a need for renewed discussion on effects of social inequality on migration. Second, pro-poor policies that are simply informed by aggregate poverty incidence and pay little attention to spatial differences and distributional aspects may fail to understand the dynamics of migration flows. If policies are aimed at influencing migration flows, focusing on smoothing the local income and wealth distribution and reduce social inequality stands a better chance to succeed than policies at the national level. If the objective is to slow the rural-urban migration, then policies that increase aggregate income without distributional improvements, may not yield the desired result because such policies raise relative deprivation which ultimately incentivizes migration. Our findings that the positive effects of relative deprivation on migration is amplified among rural households, households with more youth, and agricultural households implies that policies that aim to check

rural-urban migration flow may need to pay attention to the demographic structure of the population for better results. Policies that account for the demographic and occupational heterogeneity and create opportunities for youth, rural residents, and farmers in their locality may fare better than those that target general population. Finally, based on our examination of the data on migration from each of the five countries, we suggest that future rounds of these surveys or other similar surveys should consider adding a questions to enquire about the reasons for movements out of the households. Among the five countries we consider in this analysis, adequate information on reasons for migrating are available only in case of Uganda and Nigeria.

While we discovered that income inequality fuels emigration, emigration, there is evidence that migration further increases inequality in the sending community (Barham and Boucher 1998; Czaika and Haas 2011; Mckenzie and Rapoport 2007). Barham and Boucher (1998) consider non-migrant households as counterfactuals and find positive impact of migration and remittance on income inequality in Nicaragua. Mckenzie and Rapoport (2007) examine the case of Mexico-US migration and discover that migration increases inequality when migrant network at destination is weak. However, once enough people migrate and the migration network becomes stronger, migration decreases income inequality because a strong network reduces the cost of migration and poor people also can afford it. Czaika and de Hass (2012) suggest that even though a rapid economic growth may halt migration initially, increased inequality due to ‘take-off’ economic growth increases migration subsequently. Even though migration leads to income growth in the originating communities (Nguyen, Raabe and Grote 2015), the migration-led growth may not be distributed proportionately and therefore increases inequality. If appropriate policy interventions are not identified in time, the ‘migration – relative deprivation – migration’ chain may increase rural-urban migration rapidly because we find that inequality induces migration and existing evidence points that migration increases inequality further.

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Tables

Table 1. Asset variables used to create wealth index

Assets	Definition	Countries
<i>Household durables</i>		
1. Radio/Cassette player	Number of Radio/cassette players	All
2. TV/Satellite dish	Number of TV/Satellite dishes	All
3. Bicycle	Number of bicycles	All
4. Motorbike	Number of motorbikes	All
5. Car or large vehicles	Number of car, trucks etc.	All
6. Phones	Number of cell phones/fixed line phones	All
7. Furniture	Number of couches, sofas, tables etc.	All
8. Musical instruments	Number of DVDs, HiFi system etc.	All but Uganda
9. Bed	Number of mattresses, beds, blankets etc.	All but Uganda
10. Sewing machine	Number of sewing machines	All but Uganda
11. Stoves	Number of cooking stoves (all kinds)	All but Uganda
12. Fridge/Refrigerator	Number of refrigerators	All but Uganda
13. Computer	Number of computers	All but Ethiopia
14. Iron/Microwave	Number of Iron, Microwaves etc.	Nigeria, Malawi, Tanzania
15. AC/Fan	Number of ACs, fans etc.	Nigeria, Malawi, Tanzania
16. Generator/Invertor	Number of generators, inverters	Uganda, Nigeria, Malawi
17. Washing machine	Number of washing machine	Nigeria, Malawi
18. Solar panel	Number of solar panels	Uganda, Malawi
19. Boat	Number of boats	Uganda, Tanzania
20. Water heater	Number of water heaters	Tanzania
21. Mitad	Number of Mitads (all kinds)	Ethiopia
22. Weaving machine		Ethiopia
<i>Housing characteristics</i>		
1. Home ownership	1 if home owner; 0 else	All
2. Number of rooms	Number of rooms	All
3. Quality of roof material	1 if iron sheets, tiles, concrete; 0 else	All
4. Quality of wall material	1 if burnt bricks, concrete, iron, blocks; 0 else	All
5. Quality of floor material	1 if smoothed cement, tiles, wood; 0 else	All
6. Improved drinking water	1 if source is tap, tube well, boring and within 30 minutes round trip; 0 else	All
7. Improved sanitation	1 if flush, covered pit, VIP and not shared with other households; 0 else	All
8. Access to electricity	Yes= 1, 0=No	All
9. Improved cooking fuel	1 if natural gas, electricity, biogas; 0 else	All
<i>Livestock</i>		
1. Cattle	Number of dairy cattle, oxen, calves	All
2. Goat/sheep	Number of goats, sheep	All
3. Pig	Number of pigs	All but Ethiopia
4. Donkey	Number of donkeys, mules, horses, camels	All
5. Poultry	Number of chicken, turkey, guinea fowl etc.	All

Notes. All asset variables are number of item counts unless otherwise specified in the definition.

Table 2. Sample size and attrition

Country	Wave 1		Wave 2		Attrition (%)	Panel Sample Size
	Year	Sample Size	Year	Sample Size		
Tanzania	2008/09	3265	2010/11	3168	2.9	3168
Ethiopia [‡]	2011/12	3969	2013/14	3776	4.9	3776
Malawi	2010/11	3246	2013	3104	4.4	3104
Nigeria [†]	2010/11	4916	2012/13	4716	4.1	4437
Uganda [†]	2009/10	2975	2010/11	2716	8.7	2646

Notes. [†]In case of Uganda and Nigeria, the panel sample size is smaller than the wave 2 sample size because we lose several observations to measurement error.

[‡]All but Ethiopian sample is nationally representative. In case of Ethiopia, the baseline sample covers rural and small town areas only therefore the Ethiopian panel is representative of rural and small town areas only.

Table 3. Summary statistics of model variables

	Tanzania		Ethiopia		Malawi	
	Wave 1	Wave 2	Wave 1	Wave 2	Wave 1	Wave 2
<i>Household characteristics</i>						
Household size	5.09 (0.050)	5.25** (0.051)	5.13 (0.037)	5.78*** (0.039)	4.79 (0.040)	5.24*** (0.041)
Number of children, 0-14	2.34 (0.034)	2.34 (0.034)	2.43 (0.028)	2.41 (0.028)	2.29 (0.029)	2.45*** (0.030)
Number of adults, 15-64	2.64 (0.029)	2.70 (0.029)	2.50 (0.021)	2.51 (0.021)	2.33 (0.022)	2.57*** (0.024)
Dependency Ratio	1.65 (0.051)	1.70 (0.053)	1.56 (0.039)	1.97*** (0.044)	1.79 (0.054)	1.68 (0.048)
Rural residence (1=Yes, 0=No)	0.74 (0.008)	0.71*** (0.008)	0.94 (0.004)	0.94 (0.004)	0.85 (0.006)	0.84 (0.007)
<i>Household head's characteristics</i>						
Age	46.0 (0.28)	47.5*** (0.27)	44.5 (0.25)	46.0*** (0.25)	42.6 (0.29)	45.2*** (0.28)
Sex (1=Female, 0= Male)	0.25 (0.008)	0.26 (0.008)	0.20 (0.006)	0.22 (0.007)	0.24 (0.008)	0.24 (0.008)
Marital status (1= Married, 0=else)	0.73 (0.008)	0.72 (0.008)	0.81 (0.006)	0.78*** (0.007)	0.76 (0.008)	0.76 (0.008)
Education level	2.2 (0.02)	2.2 (0.02)	2.4 (0.06)	2.4 (0.06)	5.6 (0.08)	5.6 (0.08)
<i>Key variables of interest</i>						
Consumption (local currency)	56825.7 (930.8)	64622.7*** (1042.8)	538.9 (10.3)	451.2*** (5.27)	14894.8 (295.7)	14621.8 (259.6)
Consumption (US Dollars)	[25.38]	[28.86]	[23.05]	[19.3]	[20.54]	[20.16]
Consumption RD	0.30 (0.005)	0.31 (0.005)	0.34 (0.005)	0.30*** (0.005)	0.30 (0.005)	0.31 (0.005)
Wealth index	-0.85 (0.049)	-0.81 (0.051)	-1.21 (0.030)	-1.03*** (0.023)	-0.55 (0.037)	-0.45* (0.041)
Wealth RD	0.73 (0.013)	0.79*** (0.014)	0.65 (0.01)	0.61** (0.01)	0.70 (0.012)	0.79*** (0.013)
Household has migrants (1=Yes, 0=No)	0.28 (0.008)	0.40*** (0.009)	0.18 (0.006)	0.17 (0.006)	0.12 (0.006)	0.24*** (0.008)
Number of migrants	0.45 (0.016)	0.63*** (0.018)	0.28 (0.012)	0.28 (0.013)	0.18 (0.01)	0.38*** (0.016)
<i>Observations</i>	3164	3164	3776	3776	3104	3104

Notes: Point estimates are the population weighted means. Standard errors are in parentheses.

For each country, the column with stars indicates the test of significance of mean differences between two waves. Significance level: * $p < .10$, ** $p < .05$, *** $p < .01$.

Consumption expenditure is monthly per-adult equivalent. For US dollar conversion, exchange rate as of Aug 23 2017 is 1 Tanzanian Shilling = 0.00045 USD; 1 Ethiopian Birr = 0.043 USD; and 1 Malawian Kwacha = 0.0014 USD

†Consumption relative deprivation (RD) is constructed using the log transformed values of consumption expenditures.

Table 3. Contd.... Summary statistics

	Nigeria		Uganda	
	Wave 1	Wave 2	Wave 1	Wave 2
<i>Household characteristics</i>				
Household size	5.89 (0.047)	6.42*** (0.049)	5.90 (0.069)	6.42*** (0.07)
Number of children, 0-14	2.47 (0.033)	2.58** (0.034)	2.69 (0.043)	2.84** (0.042)
Number of adults, 15-64	2.93 (0.027)	3.29*** (0.030)	2.75 (0.035)	2.87* (0.036)
Dependency Ratio	1.67 (0.042)	1.75 (0.045)	1.59 (0.051)	1.72 (0.055)
Rural residence (1=Yes, 0=No)	0.70 (0.007)	0.70 (0.007)	0.78 (0.008)	0.84*** (0.007)
<i>Household head's characteristics</i>				
Age	49.8 (0.23)	52.2*** (0.23)	44.2 (0.31)	44.9 (0.31)
Sex (1=Female, 0= Male)	0.15 (0.005)	0.15 (0.005)	0.28 (0.009)	0.31 (0.009)
Marital status (1= Married, 0=else)	0.81 (0.006)	0.78*** (0.006)	0.70 (0.009)	0.71 (0.009)
Education level	7.3 (0.09)	7.3 (0.09)	8.8 (0.09)	8.8 (0.09)
<i>Key variables of interest</i>				
Consumption (local currency)	8275.6 (105.7)	12262.2*** (291.5)	76675.0 (2034.4)	64842.3*** (1914.6)
Consumption (US Dollars)	[22.9]	[33.9]	[21.30]	[18.01]
Consumption RD	0.30 (0.005)	0.31** (0.005)	0.35 (0.006)	0.38*** (0.006)
Wealth index	-0.01 (0.036)	-0.06 (0.035)	0.031 (0.036)	-0.047 (0.036)
Wealth RD	0.68 (0.011)	0.68 (0.011)	0.70 (0.012)	0.69 (0.011)
Household has migrants (1=Yes, 0=No)	0.18 (0.006)	0.30*** (0.007)	0.51 (0.01)	0.59*** (0.009)
Number of migrants	0.33 (0.014)	0.58*** (0.018)	1.13 (0.032)	1.53*** (0.040)
<i>Observations</i>	4437	4437	2576	2576

Notes: Point estimates are the population weighted means. Standard errors are in parentheses. For each country, the column with stars indicates the test of significance of mean differences between two waves. Significance level: * $p < .10$, ** $p < .05$, *** $p < .01$.

Consumption expenditure is monthly per-adult equivalent. For US dollar conversion, exchange rate as of Aug 23 2017 is 1 Nigerian Naira = 0.0028 USD; and 1 Ugandan Shilling = 0.00028 USD

†Consumption relative deprivation (RD) is constructed using the log transformed values of consumption expenditures.

Table 4: Effects of Relative Deprivation of consumption on migration

	Dependent Variable: Number of migrants				
	Model: Panel fixed effects				
	Tanzania	Ethiopia	Malawi	Nigeria	Uganda
Consumption relative deprivation	0.26*	0.24***	0.11	0.26***	0.31*
	(0.14)	(0.09)	(0.10)	(0.093)	(0.16)
Log(Consumption)	0.35***	0.030	0.068	0.056*	0.44***
	(0.072)	(0.043)	(0.052)	(0.031)	(0.086)
Household size	0.16***	0.054***	0.11***	0.16***	0.74***
	(0.020)	(0.018)	(0.014)	(0.028)	(0.034)
Dependency Ratio	-0.012	-0.013**	-0.015**	0.024***	-0.023***
	(0.009)	(0.005)	(0.006)	(0.007)	(0.013)
Age of head	0.009**	0.003	0.007**	0.005*	0.031***
	(0.005)	(0.002)	(0.003)	(0.003)	(0.012)
Female head (1=Yes, 0=No)	-0.20	-0.001	-0.13	0.72***	0.25
	(0.13)	(0.085)	(0.080)	(0.21)	(0.21)
Married (1=Yes, 0=No)	-0.081	-0.013	-0.17**	-0.42***	-0.60***
	(0.088)	(0.052)	(0.069)	(0.089)	(0.22)
Rural residence (1=Yes, 0=No)	-0.13**	-	0.005	-0.093	-0.056
	(0.060)		(0.13)	(0.29)	(0.14)
Ag household (1=Yes,0= No)	0.066	-0.003	0.029	0.027	-0.091
	(0.086)	(0.039)	(0.059)	(0.069)	(0.071)
Constant	-4.53***	-0.33	-1.68*	-1.14***	-9.17***
	(0.88)	(0.32)	(0.56)	(0.33)	(1.27)
<i>Observations</i>	6322	7288	6206	8788	5139

Notes: Clustered standard errors are in parentheses. Level of significance * $p < .10$, ** $p < .05$, *** $p < .01$

Consumption relative deprivation (RD) is constructed using the log transformed values of consumption expenditures in local currency

Table 5: Effects of Relative Deprivation of consumption on migration (Quadratic)

Variables	Dependent Variable: Number of migrants, Model: Panel fixed effects				
	Tanzania	Ethiopia	Malawi	Nigeria	Uganda
Consumption relative deprivation	0.46** (0.19)	0.56*** (0.11)	0.27** (0.13)	0.39*** (0.099)	-0.21 (0.20)
Log (Consumption)	1.81* (1.07)	1.49*** (0.43)	1.35*** (0.51)	1.29*** (0.28)	-3.50*** (0.82)
Log (Consumption) squared	-0.063 (0.047)	-0.11*** (0.032)	-0.064** (0.025)	-0.068*** (0.015)	0.17*** (0.036)
Constant	-12.8** (6.03)	-5.29*** (1.46)	-7.40*** (2.55)	-6.67*** (1.26)	13.5** (4.84)
<i>Other statistics</i>					
R-squared	0.08	0.01	0.02	0.05	0.39
<i>Test: Log(Cons.) + Log(Cons)² = 0</i>					
P-values	0.09	0.0005	0.008	0.003	0.0002
<i>Marginal effects</i>					
25 th percentile	0.495	0.286	0.187	0.136	0.017
50 th percentile	0.443	0.199	0.132	0.088	0.187
Mean	0.434	0.194	0.125	0.087	0.207
75 th percentile	0.381	0.107	0.072	0.038	0.368
95 th percentile	0.273	-0.043	-0.039	-0.035	0.698
Observations	6323	7288	6206	8788	5139

Notes: Clustered standard errors are in parentheses. Level of significance * $p < .10$, ** $p < .05$, *** $p < .01$. Results is presented for key variables only. Other variables included in the model are household size, dependency ratio, age, gender, and marital status of the household head, and indicators for rural residence and agricultural household. Estimated coefficients on these variables are similar to the ones presented in Table 4.

Consumption relative deprivation (RD) is constructed using the log transformed values of consumption expenditures in local currency

Table 6: Effects of Relative Deprivation of wealth on migration

	Dep. Variable: Number of migrants				
	Model: Panel fixed effects				
	Tanzania	Ethiopia	Malawi	Nigeria	Uganda
Wealth relative deprivation	0.20** (0.082)	0.052 (0.034)	0.23*** (0.045)	0.072* (0.037)	0.18*** (0.048)
Wealth index	0.11** (0.043)	0.014* (0.008)	0.080*** (0.018)	0.0005 (0.013)	0.22*** (0.021)
Household size	0.15*** (0.020)	0.058*** (0.017)	0.097*** (0.014)	0.17*** (0.026)	0.38*** (0.015)
Dependency Ratio	-0.013 (0.009)	-0.016*** (0.005)	-0.015*** (0.006)	0.024*** (0.0075)	-0.041*** (0.0080)
Age of head	0.013*** (0.005)	0.002 (0.002)	0.0055* (0.0029)	0.0061** (0.0028)	0.011*** (0.0021)
Female head (1=Yes, 0=No)	-0.21* (0.13)	-0.025 (0.081)	-0.13* (0.080)	0.74*** (0.22)	0.35*** (0.074)
Married (1=Yes, 0=No)	-0.12 (0.088)	-0.015 (0.049)	-0.17** (0.068)	-0.43*** (0.089)	-0.50*** (0.088)
Rural area (1=Yes, 0=No)	-0.10* (0.060)	-	-0.012 (0.13)	-0.10 (0.29)	0.037 (0.080)
Ag household (1=Yes,0=No)	0.059 (0.088)	-0.0001 (0.038)	0.039 (0.059)	0.021 (0.069)	-0.083 (0.051)
Constant	-0.81*** (0.28)	-0.077 (0.14)	-0.46*** (0.17)	-0.76*** (0.27)	-1.26*** (0.15)
Observations	6325	7497	6208	8772	5094

Notes: Clustered standard errors are in parentheses. Level of significance * $p < .10$, ** $p < .05$, *** $p < .01$

Relative deprivation of wealth is calculated using the aggregated asset index as a wealth variable. Asset groups are similar across countries but the specific asset variables differ. Table A1 in Appendix provides list of asset variables for each country.

Table 7. Effects of relative deprivation (RD) of consumption on migration across demographic groups

Variables	Rural	Urban	Female headed	Male headed	Fewer youth	More youth	Agricultural	Non-agricultural
<i>Tanzania:</i>								
Consumption RD	0.50* (0.29)	0.31 (0.36)	0.31 (0.25)	0.72** (0.34)	0.042 (0.23)	0.78** (0.33)	0.68*** (0.25)	0.031 (0.37)
Log (Consumption)	1.98 (1.88)	2.81 (1.80)	0.96 (1.32)	4.42** (1.89)	0.13 (1.18)	3.72** (1.68)	2.50 (1.69)	1.83 (1.69)
<i>Ethiopia:</i>								
Consumption RD	0.59*** (0.12)	0.82 (0.87)	0.35 (0.23)	0.68*** (0.13)	-0.21 (0.25)	0.93*** (0.16)	0.59*** (0.14)	-0.088 (0.36)
Log (Consumption)	1.68*** (0.46)	1.44 (2.51)	1.10 (0.69)	1.61*** (0.52)	0.17 (0.77)	2.15*** (0.64)	1.48*** (0.51)	-0.10 (1.18)
<i>Malawi:</i>								
Consumption RD	0.50*** (0.14)	-0.32 (0.31)	0.39 (0.26)	0.22 (0.15)	0.17 (0.18)	0.10 (0.19)	0.27* (0.15)	0.13 (0.35)
Log (Consumption)	2.41*** (0.70)	-1.51 (1.08)	3.49*** (1.15)	0.76 (0.59)	0.34 (0.70)	0.91 (0.88)	0.98 (0.66)	0.096 (1.16)
<i>Nigeria:</i>								
Consumption RD	0.33*** (0.12)	0.55*** (0.21)	1.13*** (0.25)	0.23** (0.11)	-0.022 (0.18)	0.37** (0.15)	0.49*** (0.12)	0.073 (0.24)
Log (Consumption)	0.85** (0.40)	1.89*** (0.73)	3.49*** (0.85)	0.57 (0.37)	0.98** (0.49)	0.62 (0.50)	1.32*** (0.43)	0.98 (0.60)
<i>Uganda:</i>								
Consumption RD	0.094 (0.20)	1.18*** (0.45)	0.074 (0.34)	0.48** (0.21)	0.27 (0.25)	0.46 (0.28)	0.21 (0.36)	0.62*** (0.23)
Log (Consumption)	0.27** (0.11)	1.15*** (0.22)	0.36** (0.18)	0.51*** (0.12)	0.27** (0.13)	0.53*** (0.15)	0.36* (0.20)	0.57*** (0.13)

Notes: Standard errors are in parentheses. Level of significance * $p < .10$, ** $p < .05$, *** $p < .01$.

In all countries, panel fixed effects model is used as estimating model and dependent variable is the number of migrants in the household.

The estimating model includes the following control covariates: household size, dependency ratio, age of head, indicator of female headship, indicator of married head, indicator of rural vs. urban residence, indicator for agricultural vs. non-agricultural households

Table 8. Effects of relative deprivation (RD) of wealth on migration across demographic groups and sector of activity

Variables	Rural	Urban	Female headed	Male headed	Fewer youth	More youth	Agricultural	Non-agricultural
<i>Tanzania:</i>								
Wealth RD	0.11 (0.12)	0.27* (0.15)	0.020 (0.13)	0.24** (0.099)	0.040 (0.088)	0.36*** (0.13)	0.11 (0.092)	0.27* (0.16)
Wealth Index	0.058 (0.043)	0.18** (0.089)	0.046 (0.056)	0.14*** (0.054)	0.059 (0.045)	0.14** (0.066)	0.065 (0.042)	0.13 (0.087)
<i>Ethiopia:</i>								
Wealth RD	0.084** (0.033)	-0.45** (0.20)	-0.002 (0.055)	0.072* (0.041)	-0.037 (0.048)	0.061 (0.048)	0.092** (0.038)	-0.12 (0.12)
Wealth Index	0.018** (0.008)	-0.075 (0.048)	0.018 (0.013)	0.016 (0.011)	0.004 (0.011)	0.012 (0.017)	0.017* (0.009)	0.002 (0.023)
<i>Malawi:</i>								
Wealth RD	0.30*** (0.074)	0.15*** (0.057)	0.31*** (0.100)	0.20*** (0.053)	0.15** (0.065)	0.21*** (0.077)	0.24*** (0.067)	0.22*** (0.078)
Wealth Index	0.085*** (0.029)	0.038 (0.026)	0.15*** (0.033)	0.058*** (0.020)	0.13*** (0.040)	0.047** (0.024)	0.082*** (0.026)	0.059* (0.033)
<i>Nigeria:</i>								
Wealth RD	0.12*** (0.042)	0.028 (0.07)	-0.006 (0.10)	0.11*** (0.038)	-0.022 (0.045)	0.19*** (0.054)	0.13*** (0.045)	-0.02 (0.066)
Wealth Index	0.005 (0.013)	-0.005 (0.032)	-0.050 (0.054)	0.008 (0.012)	-0.022 (0.027)	0.02 (0.015)	0.024 (0.017)	-0.037 (0.028)
<i>Uganda:</i>								
Wealth RD	0.12 (0.19)	0.35 (0.28)	0.15 (0.29)	0.072 (0.19)	0.011 (0.20)	-0.15 (0.22)	0.046 (0.33)	0.20 (0.19)
Wealth Index	0.16* (0.090)	0.095 (0.10)	0.043 (0.13)	0.082 (0.077)	-0.064 (0.094)	0.068 (0.087)	0.073 (0.17)	0.071 (0.081)

Notes: Standard errors are in parentheses. Level of significance * $p < .10$, ** $p < .05$, *** $p < .01$.

In all countries, panel fixed effects model is used as estimating model and dependent variable is the number of migrants in the household.

The estimating model includes the following control covariates: household size, dependency ratio, age of head, indicator of female headship, indicator of married head, indicator of rural vs. urban residence, indicator for agricultural vs. non-agricultural households

Table 9: Effects of Relative Deprivation on migration in sub-Saharan Africa

	Dep. Variable: Number of migrants		
	(1)	(2)	(3)
Relative deprivation	0.15*** (0.050)	0.16*** (0.058)	0.089*** (0.020)
Log(Consumption, USD)	0.12*** (0.023)	0.13 (0.088)	-
Log(Consumption, USD) squared	-	-0.002 (0.013)	-
Asset index	-	-	0.016** (0.008)
Household size	0.22*** (0.012)	0.22*** (0.012)	0.21*** (0.011)
Dependency ratio	-0.002 (0.004)	-0.002 (0.004)	-0.003 (0.004)
Age of head	0.006*** (0.002)	0.006*** (0.002)	0.006*** (0.002)
Female head (1=Yes, 0=No)	0.032 (0.055)	0.032 (0.055)	0.028 (0.055)
Married (1=Yes, 0=No)	-0.22*** (0.039)	-0.22*** (0.039)	-0.22*** (0.039)
Rural residence (1=Yes, 0=No)	-0.033 (0.052)	-0.033 (0.052)	-0.040 (0.052)
Ag household (1=Yes,0= No)	-0.035 (0.030)	-0.035 (0.030)	-0.040 (0.030)
Constant	-1.12*** (0.13)	-1.14*** (0.19)	-0.77*** (0.11)
<i>Observations</i>	33741	33741	33898
R-squared	0.13	0.13	0.13

Notes: Clustered standard errors are in parentheses. Standard errors are clustered in the country-household level. Level of significance * $p < .10$, ** $p < .05$, *** $p < .01$

Results are based on the first two waves of LSMS-ISA data from Tanzania, Ethiopia, Malawi, Nigeria, and Uganda. Data is pooled together to form a country-household panel

Consumption relative deprivation (RD) is constructed using the log transformed values of consumption expenditures in US dollars.

Models 1 and 2 relate to the consumption space, but model 3 is on wealth space. Models 1 and 3 are estimated using linear fixed effects, but Model 2 is estimated with quadratic fixed effects.

Figures

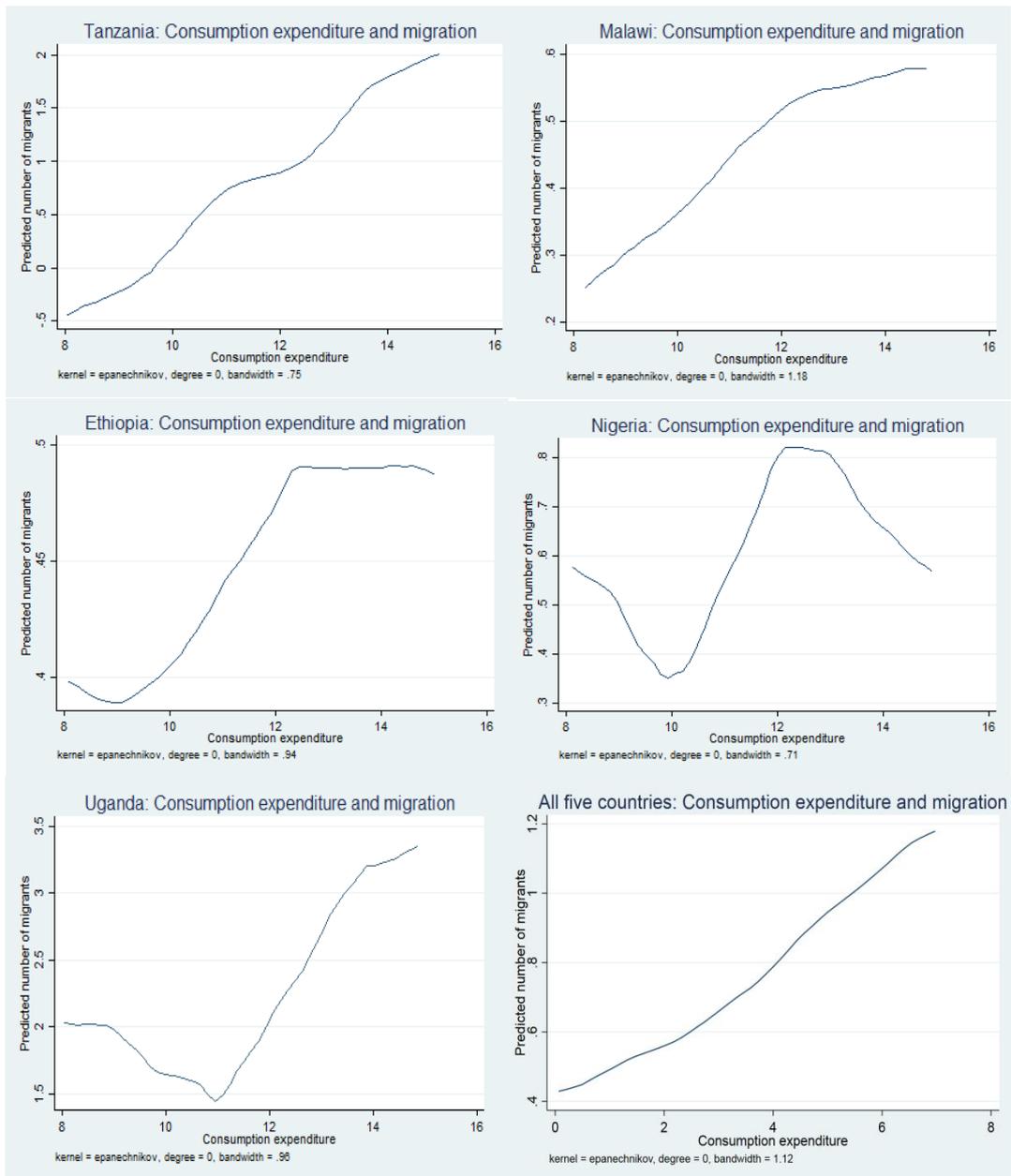


Figure 1. Relationship between consumption expenditure and number of migrants

Appendix

A1. Calculating relative deprivation measure

Multiple methods exist for constructing the measure of relative deprivation. We use Stark's (1984) approach to calculate relative deprivation. The following derivation is based on Stark (1984) and Yitzhaki (1979). Relative deprivation for household i in reference group r (RD_{ir}) is:

$$\begin{aligned} RD_{ir} &= \int_{Y_{ir}}^{Y_{hr}} [1 - F(x)]. dx \\ &= \int_0^{Y_h} [1 - F(x)]. dx - \int_0^{Y_i} [1 - F(x)]. dx \\ &= \int_0^{Y_i} F(x). dx - \int_0^{Y_h} F(x). dx + \int_0^{Y_h} dx - \int_0^{Y_i} dx \\ &= Y_i \cdot F(Y_i) - \mu \cdot \phi(Y_i) - Y_h \cdot F(Y_h) + \mu \cdot \phi(Y_h) + Y_h - Y_i \end{aligned}$$

$$\therefore RD_{ir} = \mu_r [1 - \phi(Y_{ir})] - Y_{ir} [1 - F(Y_{ir})]$$

where μ_r is the average level of income (expenditure) in reference area r , and $\phi(Y_{ir})$ is the proportion of total income (expenditures) of households in the reference area with level of income (expenditures) higher than Y_{ir} to the total income (expenditures) of households in the reference area. Similarly, $F(Y_{ir})$ is the cumulative distribution of income (expenditures) in the reference area.

An equivalent measure of relative deprivation developed by Yitzhaki (1979) is as follows

$$RD_{ir} = \frac{1}{N_r} \sum_j (Y_{jr} - Y_{ir}) \forall Y_{jr} > Y_{ir}$$

where N_r is the total number of individuals in the reference group, and Y_{ir} is the level of income (expenditure) for household i in the reference group r .

Table A1: Effects of Relative Deprivation (RD) of consumption on migration (Negative binomial model)

Dependent Variable: Number of migrants					
Model: Negative binomial					
	Tanzania	Ethiopia	Malawi	Nigeria	Uganda
Consumption relative deprivation	1.08*** (0.36)	0.25 (0.22)	0.39** (0.18)	0.78*** (0.12)	0.10 (0.10)
Log(Consumption)	4.32** (1.73)	0.17 (0.75)	1.89*** (0.72)	1.97*** (0.59)	0.78 (0.56)
Log(Consumption) squared	-0.16** (0.075)	-0.011 (0.056)	-0.080** (0.035)	-0.10*** (0.032)	-0.016 (0.025)
Household size	0.20*** (0.027)	0.17*** (0.050)	0.38*** (0.045)	0.25*** (0.046)	0.40*** (0.035)
Dependency Ratio	-0.070** (0.032)	-0.079*** (0.029)	-0.14*** (0.045)	0.017 (0.021)	-0.049* (0.026)
Age of head	0.016 (0.009)	0.011 (0.009)	0.019* (0.010)	0.011* (0.006)	0.006 (0.009)
Female head (1=Yes, 0=No)	-0.51** (0.26)	-0.045 (0.29)	-0.47* (0.25)	1.10*** (0.35)	0.40* (0.21)
Married (1=Yes, 0=No)	-0.15 (0.17)	-0.026 (0.19)	-0.48** (0.22)	-0.63*** (0.17)	-0.24 (0.21)
Rural residence (1=Yes, 0=No)	-0.31** (0.13)	-0.20** (0.097)	0.078 (0.33)	-0.35 (0.67)	-0.16 (0.18)
Ag household (1=Yes,0= No)	0.032 (0.15)	0.083 (0.15)	0.044 (0.16)	0.089 (0.16)	-0.077 (0.085)
Constant	4.55 (4.83)	-2.36 (2.56)	-12.7*** (3.74)	-11.9*** (2.74)	-8.00** (3.15)
<i>Other statistics</i>					
R-squared	0.05	0.02	0.02	0.05	0.39
<i>Observations</i>					
	6326	7288	6208	8780	5139

Notes: Clustered standard errors are in parentheses. Level of significance * $p < .10$, ** $p < .05$, *** $p < .01$

Relative deprivation (RD) of consumption is constructed using the log transformed values of consumption expenditures in local currency

Table A2: Effects of Relative Deprivation (RD) of wealth on migration (Negative binomial model)

Dependent Variable: Number of migrants					
Model: Negative binomial					
	Tanzania	Ethiopia	Malawi	Nigeria	Uganda
Wealth relative deprivation	-0.007 (0.084)	-0.016 (0.051)	0.043 (0.037)	0.096*** (0.037)	0.14*** (0.038)
Wealth index	-1.47*** (0.24)	0.074*** (0.017)	0.072*** (0.011)	0.050*** (0.014)	0.15*** (0.016)
Household size	0.16*** (0.027)	0.15*** (0.049)	0.35*** (0.045)	0.28*** (0.045)	0.34*** (0.033)
Dependency Ratio	-0.085** (0.034)	-0.079*** (0.028)	-0.13*** (0.043)	0.018 (0.021)	-0.041 (0.025)
Age of head	0.014 (0.0096)	0.0072 (0.0085)	0.018* (0.010)	0.015** (0.0063)	0.0035 (0.0094)
Female head (1=Yes, 0=No)	-0.53** (0.26)	-0.12 (0.28)	-0.44* (0.26)	1.25*** (0.33)	0.45** (0.21)
Married (1=Yes, 0=No)	-0.14 (0.18)	-0.01 (0.19)	-0.49** (0.22)	-0.67*** (0.17)	-0.21 (0.21)
Rural residence (1=Yes, 0=No)	-0.19 (0.12)	-0.019 (0.11)	0.091 (0.33)	-0.37 (0.71)	-0.081 (0.18)
Ag household (1=Yes,0= No)	0.073 (0.15)	0.085 (0.15)	0.047 (0.16)	0.078 (0.16)	-0.047 (0.084)
Constant	-0.82*** (0.19)	-1.84*** (0.16)	-1.75*** (0.19)	-2.50*** (0.14)	-1.44*** (0.11)
<i>Other statistics</i>					
R-squared	0.08	0.02	0.02	0.05	0.39
<i>Observations</i>					
	6325	7497	6208	8774	5094

Notes: Clustered standard errors are in parentheses. Level of significance * $p < .10$, ** $p < .05$, *** $p < .01$

Table A3: Effects of Relative Deprivation of consumption on migration (Lagged regression results)

Dependent Variable: Number of migrants					
Model: OLS					
	Tanzania	Ethiopia	Malawi	Nigeria	Uganda
Consumption relative deprivation	0.26** (0.12)	-0.50*** (0.100)	0.018 (0.095)	0.55*** (0.085)	0.53*** (0.19)
Log(Consumption)	-0.087 (0.70)	-1.42*** (0.38)	-0.36 (0.39)	1.41*** (0.36)	-0.19 (1.15)
Log(Consumption) ²	0.012 (0.032)	0.099*** (0.029)	0.025 (0.020)	-0.070*** (0.020)	0.042 (0.051)
Household size	0.079*** (0.009)	0.018*** (0.006)	0.045*** (0.008)	0.10*** (0.010)	0.38*** (0.020)
Dependency Ratio	-0.0071 (0.006)	-0.012*** (0.004)	-0.003 (0.005)	-0.052*** (0.005)	-0.066*** (0.014)
Age of head	-0.004*** (0.001)	0.003*** (0.001)	-0.0005 (0.001)	0.015*** (0.001)	0.016*** (0.0028)
Female head (1=Yes, 0=No)	-0.014 (0.062)	-0.007 (0.033)	0.18*** (0.061)	-0.038 (0.057)	0.47*** (0.11)
Married (1=Yes, 0=No)	-0.064 (0.068)	0.004 (0.036)	0.13** (0.059)	-0.24*** (0.053)	-0.49*** (0.12)
Rural residence (1=Yes, 0=No)	-0.036 (0.060)	-0.057 (0.049)	-0.15*** (0.058)	-0.021 (0.048)	-0.047 (0.11)
Ag household (1=Yes,0= No)	0.18*** (0.063)	-0.023 (0.028)	-0.15*** (0.052)	-0.13** (0.052)	-0.11 (0.081)
Constant	-0.24 (3.95)	5.23*** (1.24)	1.40 (1.96)	-7.63*** (1.59)	-4.56 (6.46)
<i>Observations</i>	3161	3665	3104	4422	2520

Notes: Clustered standard errors are in parentheses. Level of significance * $p < .10$, ** $p < .05$, *** $p < .01$

Consumption relative deprivation (RD) is constructed using the log transformed values of consumption expenditures in local currency

Table A4: Effects of Relative Deprivation of consumption on migration (HTIV results)

Variables	Dependent Variable: Number of migrants, Model: Hausman Taylor IV (HTIV)				
	Tanzania	Ethiopia	Malawi	Nigeria	Uganda
Consumption relative deprivation	0.60** (0.17)	0.54** (0.12)	0.27** (0.12)	0.45** (0.075)	-0.52** (0.17)
Log (Consumption)	2.29** (0.90)	1.44** (0.37)	1.45** (0.50)	1.36** (0.29)	-4.95** (0.76)
Log (Consumption) squared	-0.082** (0.040)	-0.10** (0.028)	-0.070** (0.025)	-0.070** (0.016)	0.23** (0.033)
Constant	-14.8** (5.12)	-4.98** (1.31)	-7.76** (2.55)	-7.54** (1.32)	25.01** (4.39)
<i>Other statistics</i>					
<i>Test: Log(Cons.) + Log(Cons)² = 0</i>					
P-values	0.01	0.001	0.004	0.000	0.000
<i>Marginal effects</i>					
25 th percentile	0.595	0.273	0.205	0.193	-0.219
50 th percentile	0.526	0.188	0.144	0.121	0.009
Mean	0.515	0.183	0.136	0.121	0.035
75 th percentile	0.444	0.099	0.078	0.049	0.251
95 th percentile	0.303	-0.047	-0.044	-0.059	0.697
Observations	6322	7288	6206	8778	5049

Notes: Clustered standard errors are in parentheses. Level of significance * $p < .10$, ** $p < .05$, *** $p < .01$

Consumption relative deprivation (RD) is constructed using the log transformed values of consumption expenditures in local currency

Table A5: Effects of Relative Deprivation of wealth on migration (HTIV results)

	Dep. Variable: Number of migrants Model: Hausman Taylor IV (HTIV)				
	Tanzania	Ethiopia	Malawi	Nigeria	Uganda
Wealth relative deprivation	0.14*** (0.046)	0.051 (0.035)	0.23*** (0.039)	0.073* (0.038)	0.21*** (0.051)
Wealth index	0.073*** (0.022)	0.014* (0.011)	0.073*** (0.015)	0.002 (0.012)	0.21*** (0.022)
Household size	0.089*** (0.0053)	0.039*** (0.004)	0.050*** (0.005)	0.085*** (0.004)	0.42*** (0.011)
Dependency Ratio	-0.024*** (0.0067)	-0.015*** (0.0036)	-0.009** (0.005)	-0.002 (0.005)	-0.04*** (0.014)
Head's level of education	-0.28** (0.14)	0.013 (0.018)	-0.019 (0.018)	0.063*** (0.015)	-0.019 (0.042)
Age of head	-0.0026 (0.0016)	0.0029* (0.0016)	-0.001 (0.0015)	0.015*** (0.002)	0.009*** (0.0028)
Female head (1=Yes, 0=No)	-0.12 (0.075)	0.0079 (0.044)	0.0030 (0.047)	0.081 (0.064)	0.34*** (0.098)
Married head (1=Yes, 0=No)	-0.061 (0.049)	-0.025 (0.031)	0.026 (0.040)	-0.35*** (0.047)	-0.52*** (0.091)
Rural residence (1=Yes, 0=No)	-0.081 (0.054)	-0.051 (0.074)	0.076 (0.069)	0.014 (0.049)	-0.13 (0.12)
Ag household (1=Yes,0= No)	0.090 (0.063)	0.0005 (0.037)	-0.020 (0.032)	0.050 (0.048)	-0.095* (0.052)
Constant	0.75* (0.41)	0.044 (0.21)	0.023 (0.22)	-1.16*** (0.23)	-1.30*** (0.48)
Observations	6321	7497	6206	8772	5005

Notes: Clustered standard errors are in parentheses. Level of significance * $p < .10$, ** $p < .05$, *** $p < .01$

Relative deprivation of wealth is calculated using the aggregated asset index as a wealth variable. Asset groups are similar across countries but the specific asset variables differ. Table A1 in Appendix provides list of asset variables for each country.