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Does relative deprivation induce migration?

Evidence from sub-Saharan Africa

by
Kashi Kafle
Rui Benfica
Paul Winters

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Table of contents

Abstract

This paper revisits the decades-old relative deprivation theory of migration. In contrast to the traditional view that portrays absolute income maximization as a driver of migration, 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. We find that a household's migration decision is based not only on its well-being status, but also on the relative position of the household in the well-being distribution of the local community. Relative deprivation of wealth was positively associated with migration and migration increased with the absolute level of wealth. These results are robust to alternative specifications including pooled data across the five countries, and the "migration-relative deprivation" relationship is amplified in rural, agricultural and male-headed households. Results imply a need to renew the discussion of relative deprivation as a cause of migration.

Introduction

Why do people migrate? Numerous pathways exist to explain people's inherent motive to migrate from one place to another 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 social inequality and poverty, and "pull factors" in the destination such as better economic opportunities and social safety, the migration literature overlooks the role of social inequality (relative deprivation) on migration. In this paper, we revisit the decades-old relative deprivation hypothesis of migration developed and tested in the context of Mexico-United States migration by Stark (1984), and Stark and Taylor (1989, 1991) and test it empirically in the context of sub-Saharan Africa – Tanzania, Ethiopia, Malawi, Nigeria and Uganda.

Traditional migration models are based on "pull" theories and predict that the main driver of migration is income or wage differentials between the point of origin and the 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 well-being. However, there is no conclusive evidence to support this as the sole, or even primary, motivation for migration because migration does not necessarily lead to relatively higher wage returns (Flippen 2013).[1] Proponents of "push" theories of migration argue that the propensity to migrate is not necessarily highest among the poorest communities; it is in fact highest in communities with the highest social inequality (Stark and Yitzhaki 1988; Stark 1984; Stark and Taylor 1991). As the long-standing debate on the relative importance of push versus pull theories of migration is still unsettled, policies to regulate or reduce internal or cross-country movement of people have not been effective. In this paper, we revisit the relative deprivation approach and initiate a new angle of discussion on migration research by considering simultaneously both "push" factors (relative deprivation) and "pull" factors (welfare function) of migration.

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 well-being status of other households around it as well as the feeling of the household members about their position within the local wealth distribution. It is in this sense that people from relatively more deprived households have higher incentive to migrate because migration occurs not only to maximize the expected income or wage,[2] 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).

1. Flippen (2013) notes that internal migration in the United States is dominated by north-south movement, even though the 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 with a much better social status in the south.
2. 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) argues that, as migration is a choice and people's choices are affected by their level of satisfaction or 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 both "push" and "pull" theories of migration may be at work simultaneously – that is, the migration decision is influenced by both income maximization and relative deprivation minimization at the same time. It has also been suggested in the literature that both absolute and relative deprivation need to be considered at the same time to better understand causes of migration because households make a migration decision by considering both their relative deprivation as well as their absolute levels of income or wealth (Czaika and de Haas 2011; Quinn 2006). For example, Quinn (2006) finds that while the relative deprivation approach performs better in an analysis of internal migration, the income or wage differential approach explains international migration better.

Stark (1984) was 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, 1991) in the context of Mexico-United States migration. Since Stark, Taylor and Yitzhaki's seminal work on relative deprivation and migration, this approach has been largely overlooked in the migration literature. Since the early 1990s, 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 landholding 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 within the United States in all directions except for south-to-north migration. Similarly, Czaika and de Hass (2011) use a 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 a lack of rigorous evidence on whether the relative deprivation-migration relationship persists over time and across countries. In our review of existing literature on migration, we found that the "relative deprivation-migration" relationship has not been explored in the context of sub-Saharan Africa (SSA). Since SSA has been in the centre of significant policy dialogue about migration in recent years and plenty of anecdotal evidence points to a rapid increase in internal and international migration from SSA, it is both timely and critical to assess the relative deprivation-migration relationship in the African context and better understand the causes of migration within and from the region. Examination of the relative deprivation-migration relationship is of importance in SSA because the region is characterized by persistent extreme poverty, a high proportion of working-age adults, a high rate of unemployment or underemployment, and a high degree of social inequality – factors that are believed to fuel migration flows. In addition, rapid urbanization is also considered a contributor to migration flows and there has also been significant debate about urbanization in SSA and whether it has been associated with industrialization and economic growth (Gollin, Jedwab and Vollrath 2016; Potts 2016).

While social inequality is believed to fuel emigration, there is evidence that migration further increases inequality in the sending community (Barham and Boucher 1998; Czaika and de 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) find mixed results in the case of Mexico-United States migration because migration increases inequality when the migrant network at the 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 (2011) suggest that even though rapid economic growth may initially halt migration, increased inequality due to "take-off" economic growth subsequently increases migration. 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 may therefore increase inequality. If appropriate policy interventions are not identified in time, the "migration-relative deprivation-migration" chain may increase rural-urban migration rapidly because inequality fuels migration and migration may increase inequality further.

That both social inequality and absolute poverty may incentivize people to migrate is an 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 a wealth space? Does the "relative deprivation-migration" relationship persist with changes in local context and across countries? To answer these questions, this analysis has three primary objectives. First, we estimate the effects of relative deprivation of consumption on migration. While our main focus is on relative deprivation, we also control for level of consumption because absolute poverty may affect migration at the same time. Second, we use an aggregate wealth index as a well-being 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 well-being status is often assessed using level of consumption, access to goods and services, and asset ownership. Lack of access to these services exacerbates a 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.

A key issue in migration research is the definition of migration itself. The migration literature is dominated by domestic and international labour migration, but there is no universal definition for it; the definition of migration seems to vary with country, context and the research question at 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 and 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 is considered migration. However, our primary interest is to examine the relationship between

all forms of movements – permanent or temporary migration, seasonal migration, labour or non-labour migration, voluntary or involuntary migration, distress migration, family reunification, etc. – and relative well-being of households in their respective communities. All newly born children and people who died in the last 12 months of the survey were excluded, but we consider movement for family reunification as well as marriage and divorce as migration. We would rather 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 resulting from marriage and divorce to consider it in a comparative analysis.

This study makes a number of contributions to the migration literature. First, to the best of our knowledge, this is the first empirical study to examine the relationship between relative deprivation and migration in sub-Saharan Africa. Second, understanding the relative deprivation-migration nexus can help unpack the long-standing problem of rural out-migration and initiate a new angle of discussion among both policymakers and researchers. Third, 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. First, we describe the research methodology, including the computation of the measure of relative deprivation, description of the empirical model, and potential endogeneity concerns. Then, we describe the data, and present both descriptive and empirical results from the model. The paper closes with conclusions and policy implications.

Methodology

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, while deprivation is an increasing function of not having something one wants, sees someone else having it or sees it as feasible to have (Runciman 1966; Stark and Yitzhaki 1988). Given a household's well-being status, its deprivation is a function of the well-being 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 the number of households in the reference group with income of *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 people in the reference group who have at least *y*.

We closely follow Stark's (1984) definition of relative deprivation, but use consumption expenditure in lieu of income. 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 the other based on a multidimensional wealth index. 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 group at 15 but, on average, the reference groups have about 40 households each. In each case, the reference group is bigger than the survey enumeration area and smaller than a subdistrict or its equivalent administrative unit.

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, the measure of relative deprivation for a household *i* in a reference group *r* is defined as:

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

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:[3]

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

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 consumption level higher than Y_{ir} to the total consumption of all households in the reference area, and $F(Y_{ir})$ is the cumulative 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, landholding size and livestock ownership. We exclude agricultural tools and equipment because agricultural tools are endogenous and may not reflect the household's well-being.[4] Table 1 presents the details of asset variables used in each of the five countries considered. Asset variables were carefully chosen so that the wealth index was comparable across countries. However, due to lack of data, the set of asset variables used is not exactly the same across countries.

We used principal component analysis (PCA) to construct the wealth index. Following the literature, we kept 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 per cent of the variation in assets data in case of Uganda, 18.6 per cent in Nigeria, 19 per cent in Ethiopia, 21 per cent in Tanzania and 23 per cent in Malawi. To make the wealth index comparable across waves (rounds), we used a "pooled approach": we pooled the data across waves and used pooled mean and standard deviation to calculate appropriate weight for each asset variable. The pooled weight was then used to create the wave-specific wealth index.[5] 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.

3. See appendix A for details of mathematical derivation.
4. Kafle et al. (2016) argue that in agrarian settings, agricultural tools and equipment may constitute wealth and so can be included in a wealth index.
5. Practically, in STATA, we pooled the data across waves and run PCA command on the pooled data. Then we reshaped the data to get a wave-specific asset index.

Table 1: Asset variables used to create wealth index

Asset	Definition	Countries
Household durables		
Radio/cassette player	Number of radio/cassette players	All
TV/satellite dish	Number of TV/satellite dishes	All
Bicycle	Number of bicycles	All
Motorbike	Number of motorbikes	All
Car or large vehicle	Number of cars, trucks, etc.	All
Phone	Number of cell phones/fixed-line phones	All
Furniture	Number of couches, sofas, tables, etc.	All
Entertainment equipment	Number of DVDs, hi-fi system, etc.	All but Uganda
Bed	Number of mattresses, beds, blankets, etc.	All but Uganda
Sewing machine	Number of sewing machines	All but Uganda
Stove	Number of cooking stoves (all kinds)	All but Uganda
Refrigerator	Number of refrigerators	All but Uganda
Computer	Number of computers	All but Ethiopia
Iron/microwave	Number of irons, microwaves, etc.	Nigeria, Malawi, Tanzania
Air-conditioner/fan	Number of ACs, fans, etc.	Nigeria, Malawi, Tanzania
Generator/invertor	Number of generators, inverters	Uganda, Nigeria, Malawi
Washing machine	Number of washing machines	Nigeria, Malawi
Solar panel	Number of solar panels	Uganda, Malawi
Boat	Number of boats	Uganda, Tanzania
Water heater	Number of water heaters	Tanzania
Mitad	Number of mitads (all kinds)	Ethiopia
Weaving machine	Number of weaving machines	Ethiopia
Housing characteristics		
Home ownership	1 if homeowner; otherwise 0	All
Number of rooms	Number of rooms	All
Quality of roof material	1 if iron sheets, tiles, concrete; otherwise 0	All
Quality of wall material	1 if burnt bricks, concrete, iron, blocks; otherwise 0	All
Quality of floor material	1 if smoothed cement, tiles, wood; otherwise 0	All
Improved drinking water	1 if source is tap, tube well, boring and within 30 minutes round-trip; otherwise 0	All
Improved sanitation	1 if flush, covered pit, VIP and not shared with other households; otherwise 0	All
Access to electricity	Yes=1, 0=No	All
Improved cooking fuel	1 if natural gas, electricity, biogas; otherwise 0	All
Livestock		
Cattle	Number of dairy cattle, oxen, calves	All
Goat/sheep	Number of goats, sheep	All
Pig	Number of pigs	All but Ethiopia
Donkey	Number of donkeys, mules, horses, camels	All
Poultry	Number of chickens, turkeys, guinea fowl, etc.	All

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

Empirical model

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

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

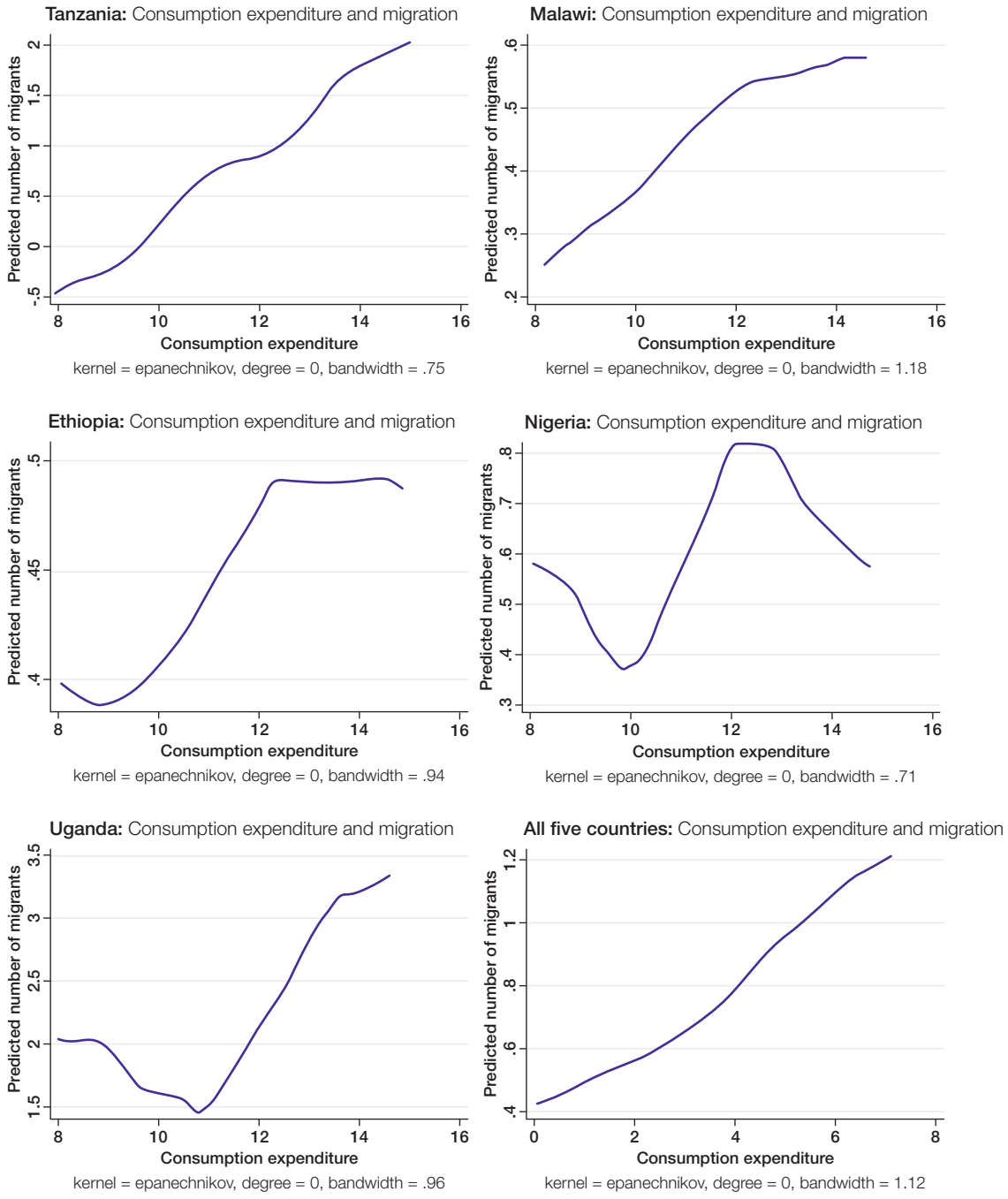
where i indicates a household, r indicates a reference group, t is current survey period, M_{it} is number of migrants from household i in time t, RD_{irt} is relative deprivation of household i in the reference group r during time t, and C_{it} is the logarithm of consumption expenditure per adult equivalent. 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 used 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 used a simple graphical approach to determine whether migration was nonlinear on consumption or wealth. We ran equation (3) in both consumption and wealth space and obtained the estimated coefficients on each variable. We calculated the predicted number of migrants keeping all variables constant but letting the consumption (wealth) variable vary in a range from 0 to 100. A random-number generator was used to pick a random value of consumption for each household from the range. The predicted number of migrants was plotted against the randomly generated consumption (wealth) variable using local polynomial fit. We examined 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 the relation to migration is nonlinear for consumption but linear for wealth. Except for the case of Uganda, where the number of migrants sharply decreases at first before it jumps up, the "migration-consumption" relationship is consistent with quadratic functional form. We estimated both linear and quadratic models, but our preferred model was 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 calculated 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 effect of consumption (C_{it}) is independent of α_1 because relative deprivation depends on consumption of the reference group only (C_{irt}).

Figure 1: Relationship between consumption expenditure and number of migrants



Endogeneity

It is no secret that migration is an endogenous phenomenon, more so when we examine the relationship between consumption and migration. We identified simultaneity and reverse causality as two potential sources of endogeneity. First, migration and consumption decisions can occur at the same time, that is, 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, another potential source of endogeneity arises from reverse causality between migration and relative deprivation – migration during the previous period increases current inequality (relative deprivation), which may further increase migration. In this analysis, we ran two alternative model specifications to assess whether endogeneity influences our results. We argue that endogeneity is less of a concern if results from these alternative specifications are consistent with the main results (results from equation 4). In this analysis, our main results were consistent with the results from the alternative specifications.

First, we ran a "lagged regression model," effectively regressing endline migration on baseline variables (equation 5). As lagged consumption is expected to be exogenous for current migration, this approach addresses the potential endogeneity due to simultaneity.

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

Alternatively, we used a multidimensional well-being index (MWI)[6] as an instrument for consumption and ran two-stage least squares (2SLS) with panel fixed effects. The MWI is a weighted index of access to and quality of education, health, and living standard indicators (see appendix table A3 for details). MWI serves as a valid instrument because we believe that the effects of MWI on number of migrants is primarily mediated through relative deprivation or consumption and the index itself has little to no direct effect on migration. In our data, the MWI was highly correlated with consumption expenditure, but not correlated with the outcome variable (number of migrants per household). Specifically, the correlation coefficient between consumption expenditure and MWI was at least 0.30 and statistically significantly different from 0 in each of the five cases (countries) considered, but the correlation coefficient between MWI and number of migrants was close to 0 (as low as -0.04 in Tanzania and as high as 0.06 in Ethiopia).

6. We created the multidimensional well-being index using Oxford Poverty and Human Development Initiative's (OPHI) approach (Alkire and Foster 2011). We adopted the OPHI approach but used different variables due to data limitation. Table A2 in the appendix provides the details.

Data

The data for this analysis came 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.[7] Multiple rounds of data were available for each country. However, since more than two rounds of data were not available for all five countries, this analysis used only the data from the first two waves. The sample size and the period of coverage 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 was away from the household in the previous 12 months. Even though migration information is at the individual level, other relevant information is available only at the household level. Therefore, this study assesses the "migration-relative deprivation" relationship at the household level. Table 2 presents the details of cross-sectional sample size, attrition rates, and panel sample sizes for all five countries. Four of the datasets maintain a fairly low attrition rate at or below 5 per cent, with a slightly higher rate for Uganda. A quick examination of the attrition pattern shows that attrition occurs at random because no significant difference exists between migration rate of the attrited and remaining samples.

Table 2: Sample size and attrition

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

Notes: [a] All but the Ethiopian sample are nationally representative. In the 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.

[b] 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.

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

Results

Descriptive results

Summary statistics are presented in table 3. We present a summary of demographic characteristics, well-being variables, relative deprivation and migration information for each of the five countries considered in this analysis. We performed *t*-test on the difference of mean estimates between the two waves. The average household size was between five and six in each of five countries considered and had increased over time by less than one individual (statistically significantly). Both the number of children (ages 0-14) and number of economically active adults (ages 15-64) in each country were between two and three, and both numbers increased over time, although this was statistically significant only in the 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 adults over the age of 65; an observation consistent with the existing body of literature on demographic patterns in Africa (de Brauw, Mueller and Lee 2014). The dependency ratio for each country was more than 1.5 and increased over time, although not significantly (except in Ethiopia). On average, household heads were aged in their mid- to late 40s in all five countries considered. Although household head's age increased 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 also change over time, albeit not significantly (except for marital status in Ethiopia and Nigeria).

The last section of table 3 presents the key 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 was at about the same level in all countries (about US$20-US$25 equivalent per adult/month), but growth in consumption differed. In Ethiopia, Malawi and Uganda, real consumption decreased over time, but Tanzania and Nigeria experienced significant consumption increases. However, relative deprivation of consumption increased in all countries except Ethiopia.[8] This implies that increases in absolute consumption do not necessarily lead to a decrease in relative deprivation because, for example, consumption growth that favours households above (below) the poverty line increases (decreases) the relative deprivation of households at or below the poverty line. The wealth index showed less variation than consumption over time: it significantly increased in Ethiopia and Malawi, but no significant changes were observed in the other countries. Likewise, changes in the relative deprivation of wealth were not consistent across countries: it increased in Tanzania and Malawi, decreased in Ethiopia, but remained constant in Nigeria and Uganda.

8. No statistically significant difference observed for Tanzania and Malawi.

Table 3: Summary statistics of model variables

	Tanzania		Ethiopia		Malawi	
	Wave 1	Wave 2	Wave 1	Wave 2	Wave 1	Wave 2
Household characteristics						
Household size	5.09	5.25**	5.13	5.78***	4.79	5.24***
	(0.050)	(0.051)	(0.037)	(0.039)	(0.040)	(0.041)
Number of children, 0-14	2.34	2.34	2.43	2.41	2.29	2.45***
	(0.034)	(0.034)	(0.028)	(0.028)	(0.029)	(0.030)
Number of adults, 15-64	2.64	2.70	2.50	2.51	2.33	2.57***
	(0.029)	(0.029)	(0.021)	(0.021)	(0.022)	(0.024)
Dependency ratio	1.65	1.70	1.56	1.97***	1.79	1.68
	(0.051)	(0.053)	(0.039)	(0.044)	(0.054)	(0.048)
Rural residence (1=Yes, 0=No)	0.74	0.71***	0.94	0.94	0.85	0.84
	(0.008)	(0.008)	(0.004)	(0.004)	(0.006)	(0.007)
Household head's characteristics						
Age	46.0	47.5***	44.5	46.0***	42.6	45.2***
	(0.28)	(0.27)	(0.25)	(0.25)	(0.29)	(0.28)
Sex (1=Female, 0=Male)	0.25	0.26	0.20	0.22	0.24	0.24
	(0.008)	(0.008)	(0.006)	(0.007)	(0.008)	(0.008)
Marital status (1=Married,	0.73	0.72	0.81	0.78***	0.76	0.76
0=Other)	(0.008)	(0.008)	(0.006)	(0.007)	(0.008)	(0.008)
Key variables of interest						
Consumption (local currency)	56825.7	64622.7***	538.9	451.2***	14894.8	14621.8
	(930.8)	(1042.8)	(10.3)	(5.27)	(295.7)	(259.6)
Consumption (US dollars)	[25.38]	[28.86]	[23.05]	[19.3]	[20.54]	[20.16]
Consumption RD[a]	0.30	0.31	0.34	0.30***	0.30	0.31
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Wealth index	-0.85	-0.81	-1.21	-1.03***	-0.55	-0.45*
	(0.049)	(0.051)	(0.030)	(0.023)	(0.037)	(0.041)
Wealth RD	0.73	0.79***	0.65	0.61**	0.70	0.79***
	(0.013)	(0.014)	(0.01)	(0.01)	(0.012)	(0.013)
Household has migrants	0.28	0.40***	0.18	0.17	0.12	0.24***
(1=Yes, 0=No)	(0.008)	(0.009)	(0.006)	(0.006)	(0.006)	(0.008)
Number of migrants	0.45	0.63***	0.28	0.28	0.18	0.38***
	(0.016)	(0.018)	(0.012)	(0.013)	(0.01)	(0.016)
Number of observations	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 asterisks indicates the test of significance of mean differences between two waves. Significance levels: * P < 0.10, ** P < 0.05, *** P < 0.01.

Consumption expenditure is monthly per-adult equivalent. For US dollar conversion, exchange rate as of 23 August 2017 is 1 Tanzanian shilling = US$0.00045; 1 Ethiopian birr = US$0.043; 1 Malawian kwacha = US$0.0014.

[a] Consumption relative deprivation (RD) is constructed using the log-transformed values of consumption expenditures.

Table 3: Summary statistics of model variables (cont.)

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

Notes: Point estimates are the population weighted means. Standard errors are in parentheses. For each country, the column with asterisks indicates the test of significance of mean differences between two waves. Significance levels: * P < 0.10, ** P < 0.05, *** P < 0.01.

Consumption expenditure is monthly per-adult equivalent. For US dollar conversion, exchange rate as of 23 August 2017 is 1 Nigerian naira = US$0.0028; and 1 Ugandan shilling = US$0.00028.

[a] Consumption relative deprivation (RD) is constructed using the log-transformed values of consumption expenditures.

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 and relative deprivation of wealth is about 0.70. 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 (correlation coefficient = 0.6).

In general, migration has increased over time. The proportion of households with at least one migrant in the baseline survey ranged from 12 per cent in Malawi to 51 per cent in Uganda. The relatively low level of migration prevalence in sub-Saharan Africa is also evident in the literature. As de Brauw, Mueller and Lee (2014) note, historically, sub-Saharan Africa has had a slow rate of rural-urban migration. On average, the net migration was only about 1.7 per cent per annum during 1990 to 2000. In fact, de Brauw, Mueller and Lee 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 households with migrants increased over time in all countries. As a consequence, in all five 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 the endline survey are independent of migration variables in the baseline period; therefore a migrant household (individual) in the baseline may not necessarily be a migrant household by the endline.

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 increased with income (proxied by consumption in this analysis), although not statistically significantly in Ethiopia and Malawi. A positive and significant coefficient for the relative deprivation variable indicates that even though migration increased with consumption level, it increased more among the relatively more consumption-deprived households. In all five countries, an increase in relative deprivation – the feeling of deprivation of a household compared to other households in its neighbourhood – increased 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 their feeling of relative deprivation in the place of origin. Positive coefficients on both relative deprivation and consumption indicate that as relative deprivation of consumption induces migration, level of consumption amplifies the effects of relative deprivation.

Other control variables also had the expected effects. Larger households had increased incidence of migration, but the dependency ratio had the reverse effect. Even though migration increased with household size, any increase in the number of dependents (children and seniors) reduced migration, except in Nigeria, where the dependency ratio held a significantly positive relationship with the number of migrants. Female-headed households seemed to have fewer migrants but the relationship was not consistent across countries: it was negative in Tanzania, Ethiopia and Malawi, but positive in Nigeria and Uganda. Households with married heads also appeared to have fewer migrants but the relationship was exactly the opposite in Tanzania.

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***	0.45**
	(0.14)	(0.09)	(0.10)	(0.095)	(0.18)
Log (consumption)	0.35***	0.030	0.068	0.06*	0.51***
	(0.072)	(0.043)	(0.052)	(0.034)	(0.098)
Household size	0.15***	0.054***	0.11***	0.16***	0.77***
	(0.018)	(0.018)	(0.014)	(0.027)	(0.034)
Dependency ratio	-0.013	-0.013**	-0.015**	0.024***	-0.073***
	(0.009)	(0.005)	(0.006)	(0.007)	(0.018)
Age of head	0.008*	0.003	0.007**	0.005*	0.031***
	(0.005)	(0.002)	(0.003)	(0.003)	(0.012)
Female head (1=Yes, 0=No)	-0.23*	-0.001	-0.13	0.72***	0.26
	(0.12)	(0.085)	(0.080)	(0.21)	(0.20)
Married (1=Yes, 0=No)	0.038*	-0.013	-0.17**	-0.41***	-0.60***
	(0.022)	(0.052)	(0.069)	(0.089)	(0.22)
Rural residence (1=Yes, 0=No)	-0.12**	–	0.005	-0.11	-0.048
	(0.060)		(0.13)	(0.29)	(0.14)
Agricultural household (1=Yes, 0=No)	0.066	-0.003	0.029	0.024	-0.089
	(0.086)	(0.039)	(0.059)	(0.069)	(0.070)
Constant	-4.50***	-0.33	-1.68*	-1.19***	-9.99***
	(0.85)	(0.32)	(0.56)	(0.36)	(1.41)
Other statistics					
R^2	0.08	0.02	0.02	0.05	0.39
Number of observations	6323	7288	6208	8780	5139

Notes: Clustered standard errors are in parentheses. Levels of significance: * P < 0.10, ** P < 0.05, *** P < 0.01.
Consumption relative deprivation (RD) is constructed using the log-transformed values of consumption expenditures in local currency.

Among other variables, age of household head had a consistent positive effect on migration, indicating that increased 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 had no effects on migration except in Tanzania, where rural households had fewer migrants compared with urban households. Even though the effects of characteristics of household heads and other demographics were more or less consistent across the 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 how complicated cross-country analysis is. 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 the local currency of each country.

Table 5: Effects of relative deprivation of consumption on migration (quadratic)

Variable	Dependent variable: Number of migrants Model: Panel fixed effects				
	Tanzania	Ethiopia	Malawi	Nigeria	Uganda
Consumption relative deprivation	0.46**	0.56***	0.27**	0.36***	-0.20
	(0.19)	(0.11)	(0.13)	(0.10)	(0.23)
Log (consumption)	1.88*	1.49***	1.35***	0.97***	-3.51***
	(1.05)	(0.43)	(0.51)	(0.33)	(0.93)
(Log [consumption])^2	-0.067	-0.11***	-0.064**	-0.049**	0.17***
	(0.046)	(0.032)	(0.025)	(0.018)	(0.040)
Constant	-13.2**	-5.29***	-7.39***	-5.31***	13.5**
	(5.97)	(1.46)	(2.55)	(1.54)	(5.68)
Other statistics					
R^2	0.08	0.01	0.02	0.05	0.39
Test: log(cons) + (log[cons])^2 =0					
P values	0.09	0.0005	0.008	0.003	0.0002
Marginal effects					
25th percentile	0.495	0.286	0.187	0.136	0.017
50th percentile	0.443	0.199	0.132	0.088	0.187
Mean	0.434	0.194	0.125	0.087	0.207
75th percentile	0.381	0.107	0.072	0.038	0.368
95th percentile	0.273	-0.043	-0.039	-0.035	0.699
Number of observations	6323	7288	6208	8780	5139

Notes: Clustered standard errors are in parentheses. Levels of significance: * P < 0.10, ** P < 0.05, *** P < 0.01.
Consumption relative deprivation (RD) is constructed using the log-transformed values of consumption expenditures in local currency.
cons = consumption.

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 smoothing between consumption and predicted number of migrants in each case shows a nonlinear relationship and the nonlinearity is consistent with a quadratic functional form in all cases except Uganda. The Ugandan case is unique in that, at first, the number of migrants decreased with increasing consumption but then it increased at an increasing rate for most of the relevant income range – migration is nonlinear in consumption but the relationship is not quadratic. Hence, our preferred model is linear for Uganda and quadratic for the other four countries. Results confirm that an increase in relative deprivation of consumption increased migration in the sub-Saharan African countries included in this study. One unit increase in relative deprivation of consumption increased the number of migrants by at least 0.27 individuals (Malawi) and up to 0.56 individuals (Ethiopia). Similarly, a 1 per cent increase in consumption per adult equivalent increased the number of migrants by at least 0.97 units (Nigeria) up to 1.88 individuals (Tanzania). However, the negative coefficient on the quadratic term indicates that the rate of increase in the number of migrants decreased with decreasing level of consumption.

Table 6: Effects of relative deprivation (RD) of consumption on migration across demographic groups

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

Notes: Standard errors are in parentheses. Levels of significance: * P < 0.10, ** P < 0.05, *** P < 0.01.
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 versus urban residence, indicator for agricultural versus non-agricultural households.

Since the effects of level of consumption and the square of consumption 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 computed the marginal effects of consumption by differentiating equation (4) with respect to log-transformed consumption and used 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 was largest among the poorest group in all countries except Uganda. In the other four countries, the positive effect became smaller with consumption and even became negative at the 95th percentile in Ethiopia and Nigeria. This finding is consistent with the 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 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 versus urban, agricultural versus non-agricultural, male-headed versus female-headed households, and finally households with more than the local average number of youth versus households with fewer youth. The results are based on our preferred estimated model – that is, panel fixed effects (linear) for Uganda and panel fixed effects with quadratic term for the other four countries. Results show that, in general, relative deprivation of consumption had larger positive effects on migration among rural households, male-headed households, households with more youth (number of youth aged 15-24 is greater than the median number of youth) and agricultural households. This finding is more or less consistent across countries with one exception: relative deprivation had greater positive effects among urban and non-agricultural households in Uganda. However, as the subgroups "rural household" and "agricultural household" are not mutually exclusive, inferences should be made with caution. For example, the identical pattern of results on rural versus urban and agricultural versus non-agricultural households indicate that a part of the "agricultural effect" may be captured by the "rural effect".

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 increased the number of migrants. One unit increase in relative deprivation of wealth increased the number of migrants in the range of 0.05 units (Ethiopia) to 0.23 units (Malawi). Similarly, the effects of wealth index on migration are also consistent with the effects of consumption on migration. An increase of one point in the aggregated wealth index increased the number of migrants in the range of 0.01 units (Ethiopia) to 0.21 units (Uganda). These increases are relatively small in magnitude. Since the variable of interest is some function of a weighted index, we did not attempt to interpret the magnitude of effects but rather focused 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 increased with household size and age of head, but decreased with the dependency ratio (except Nigeria), households with a married head (except Tanzania), and female-headed households (except Nigeria and Uganda). These results are consistent across countries and confirm our findings in the consumption space.

Next, we broke down the sample into various groups and assessed 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 with the consumption space results in table 6. As in the consumption space, relative deprivation of wealth had a larger positive effect on migration among rural households, male-headed households, households with more youth and agricultural households. In spite of some exceptions, the results hold consistently across countries; relative deprivation of wealth had no effect whatsoever on migration and had greater positive effects among urban and agricultural households in Tanzania.

Table 7: Effects of relative deprivation of wealth on migration

	Dependent variable: Number of migrants Model: Panel fixed effects				
	Tanzania	**Ethiopia**	**Malawi**	**Nigeria**	**Uganda**
Wealth relative deprivation	0.21**	0.052	0.23***	0.091**	0.21***
	(0.081)	(0.034)	(0.045)	(0.035)	(0.051)
Wealth index	0.11***	0.014*	0.079***	0.003	0.21***
	(0.042)	(0.008)	(0.018)	(0.013)	(0.022)
Household size	0.14***	0.058***	0.11***	0.17***	0.42***
	(0.017)	(0.017)	(0.014)	(0.025)	(0.015)
Dependency ratio	-0.014	-0.016***	-0.019***	0.001	-0.10***
	(0.009)	(0.005)	(0.006)	(0.008)	(0.011)
Age of head	0.012**	0.002	0.006*	0.007***	0.013***
	(0.005)	(0.002)	(0.003)	(0.003)	(0.002)
Female head (1=Yes, 0=No)	-0.22*	-0.025	-0.14*	0.75***	0.35***
	(0.12)	(0.081)	(0.080)	(0.22)	(0.073)
Married (1=Yes, 0=No)	0.041*	-0.015	-0.17**	-0.44***	-0.51***
	(0.022)	(0.049)	(0.068)	(0.089)	(0.088)
Rural residence (1=Yes, 0=No)	-0.10*	-	-0.011	-0.13	0.038
	(0.060)		(0.13)	(0.29)	(0.078)
Agricultural household (1=Yes, 0=No)	0.060	-0.0001	0.038	0.015	-0.076
	(0.088)	(0.038)	(0.059)	(0.069)	(0.051)
Constant	-0.92***	-0.077	-0.47***	-0.75***	-1.29***
	(0.27)	(0.14)	(0.17)	(0.27)	(0.15)
Other statistics					
R^2	0.06	0.02	0.05	0.05	0.40
Number of observations	6322	7497	6208	8774	5094

Notes: Clustered standard errors are in parentheses. Levels of significance: * P < 0.10, ** P < 0.05, *** P < 0.01.
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 the appendix provides a list of asset variables for each country.

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

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

Notes: Standard errors are in parentheses. Levels of significance: * P < 0.10, ** P < 0.05, *** P < 0.01.
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 versus urban residence, indicator for agricultural versus non-agricultural households.

Robustness check

Our finding that relative deprivation of consumption-induced migration is robust across five countries in sub-Saharan Africa. The finding is also robust regarding the use of a wealth index as a well-being variable in lieu of consumption. Relative deprivation of wealth also had consistent positive effects on migration in all five countries considered. We took two approaches to assess the robustness of our findings.

First, we estimated the "relative deprivation-migration" relationship using a quasi-maximum likelihood estimator (QMLE). Given that our dependent variable is a count variable and the data are over-dispersed, we used a pooled negative binomial model. To make the estimates as close to the fixed-effects as possible, we adopted the Chamberlin-Mundlak approach: we estimated 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 congruent 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.

Second, we pooled the data from all five countries together and estimated the "relative deprivation-migration" relationship with the metadata. Pooling the data across countries may create cross-variable inconsistencies and incomparability,[9] but our results add to the literature that the "migration-relative deprivation" relationship holds in both individual countries and the 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 played an important role in a household's migration decision. Specifically, one unit increase in the relative deprivation of consumption increased the number of migrants by 0.16 and the same increase in the relative deprivation of wealth increased the number of migrants by 0.9. Consistent with the intra-country results, migration increased with consumption but at a decreasing rate, but this was not statistically significant. Overall, these results imply that the finding that relative deprivation induces migration is valid both internally within a country and externally in a region.

9. The main concern was the inconsistencies in local currencies across countries. We used the market exchange rate as of 21 November 2017 and converted all local currencies to US dollars. Another concern was use of sample weights; however, our regression analysis did not use sample weight either in intra-country analysis or in pooled analysis. Other demographic variables were more or less similar.

Table 9: Effects of relative deprivation on migration in sub-Saharan Africa

	Dependent variable: Number of migrants		
	Model 1	Model 2	Model 3
Relative deprivation	0.15***	0.16***	0.089***
	(0.050)	(0.058)	(0.020)
Log (consumption, US$)	0.12***	0.13	-
	(0.023)	(0.088)	
(Log [consumption, US$])^2	-	-0.002	-
		(0.013)	
Asset index	-	-	0.016**
			(0.008)
Household size	0.22***	0.22***	0.21***
	(0.012)	(0.012)	(0.011)
Dependency ratio	-0.002	-0.002	-0.003
	(0.004)	(0.004)	(0.004)
Age of head	0.006***	0.006***	0.006***
	(0.002)	(0.002)	(0.002)
Female head (1=Yes, 0=No)	0.032	0.032	0.028
	(0.055)	(0.055)	(0.055)
Married (1=Yes, 0=No)	-0.22***	-0.22***	-0.22***
	(0.039)	(0.039)	(0.039)
Rural residence (1=Yes, 0=No)	-0.033	-0.033	-0.040
	(0.052)	(0.052)	(0.052)
Agricultural household (1=Yes, 0=No)	-0.035	-0.035	-0.040
	(0.030)	(0.030)	(0.030)
Constant	-1.12***	-1.14***	-0.77***
	(0.13)	(0.19)	(0.11)
Number of observations	33741	33741	33898
R^2	0.13	0.13	0.13

Notes: Clustered standard errors are in parentheses. Standard errors are clustered in the country-household level. Levels of significance: * P < 0.10, ** P < 0.05, *** P < 0.01.
Results are based on the first two waves of LSMS-ISA data from Tanzania, Ethiopia, Malawi, Nigeria and Uganda. Data are 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; model 3 is on wealth space. Models 1 and 3 are estimated using linear fixed effects; model 2 is estimated with quadratic fixed effects.

Conclusions and policy implications

In this paper, 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 tested empirically whether households also make migration decisions to minimize their relative deprivation resulting from social inequality in the community in which they reside. We used both consumption and an aggregated asset index as well-being measures and examined 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 12 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 estimated the effects of both relative deprivation and absolute consumption or wealth on the number of migrants per household. We found that relative deprivation induced migration: the more relatively deprived a household was, the more likely it was to have more migrants. Migration increased with the level of consumption but at a decreasing rate, indicating that the average number of migrants was higher in poorer communities than in richer communities. Except in the case of Uganda, the marginal effect of consumption on number of migrants decreased with income percentiles and even became negative at the 95th percentile. For example, in Ethiopia, a 1 per cent increase in consumption for households at or below the first quintile of consumption distribution increased the number of migrants by 0.28, but a 1 per cent increase in consumption of households in the fifth quintile decreased the number of migrants by 0.043.

Taking the decreasing marginal effects of consumption and positive effects of relative deprivation on migration together, it can be inferred that the net effects of consumption on migration are positive for poor and relatively deprived households. For households at the upper levels of well-being distribution, increase in income may have zero or negative effects on migration. The "relative deprivation-migration" relationship consistently held in the wealth space too. Relative deprivation of wealth was positively associated with migration and migration increased with the absolute level of wealth. When demographic subgroups were considered, the effect of relative deprivation on migration was amplified 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 was not the same in the consumption space and wealth space, the direction and the level of significance of the estimated effects were the same across both spaces.

Our findings have multiple policy implications. First, there is a need for renewed discussion on the 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 reducing social inequality stand a better chance of success 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 the 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 question (or questions) on 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 the case of Uganda and the post-harvest questionnaire in Nigeria.

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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:

$$RD_{ir} = \int_{y_{ir}}^{y_{hr}} [1-F(x)].dx$$

$$= \int_{0}^{y_h} [1-F(x)].dx - \int_{0}^{y_i} [1-F(x)].dx$$

$$= \int_{0}^{y_i} F(x).dx - \int_{0}^{y_h} F(x).dx + \int_{0}^{y_h} dx - \int_{0}^{y_i} dx$$

$$= Y_i.F(Y_i) - \mu.\phi(Y_i) - Y_h.F(Y_h) + \mu.\phi(Y_h) + Y_h - Y_i$$

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

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 RD	1.08***	0.25	0.39**	0.78***	0.10
	(0.36)	(0.22)	(0.18)	(0.12)	(0.10)
Log (consumption)	4.32**	0.17	1.89***	1.97***	0.78
	(1.73)	(0.75)	(0.72)	(0.59)	(0.56)
(Log [consumption])^2	-0.16**	-0.011	-0.080**	-0.10***	-0.016
	(0.075)	(0.056)	(0.035)	(0.032)	(0.025)
Household size	0.20***	0.17***	0.38***	0.25***	0.40***
	(0.027)	(0.050)	(0.045)	(0.046)	(0.035)
Dependency ratio	-0.070**	-0.079***	-0.14***	0.017	-0.049*
	(0.032)	(0.029)	(0.045)	(0.021)	(0.026)
Age of head	0.016	0.011	0.019*	0.011*	0.006
	(0.009)	(0.009)	(0.010)	(0.006)	(0.009)
Female head (1=Yes, 0=No)	-0.51**	-0.045	-0.47*	1.10***	0.40*
	(0.26)	(0.29)	(0.25)	(0.35)	(0.21)
Married (1=Yes, 0=No)	-0.15	-0.026	-0.48**	-0.63***	-0.24
	(0.17)	(0.19)	(0.22)	(0.17)	(0.21)
Rural residence (1=Yes, 0=No)	-0.31**	-0.20**	0.078	-0.35	-0.16
	(0.13)	(0.097)	(0.33)	(0.67)	(0.18)
Agricultural household (1=Yes, 0=No)	0.032	0.083	0.044	0.089	-0.077
	(0.15)	(0.15)	(0.16)	(0.16)	(0.085)
Constant	4.55	-2.36	-12.7***	-11.9***	-8.00**
	(4.83)	(2.56)	(3.74)	(2.74)	(3.15)
Other statistics					
R^2	0.05	0.02	0.02	0.05	0.39
Number of observations	6326	7288	6208	8780	5139

Notes: Clustered standard errors are in parentheses. Levels of significance: * P < 0.10, ** P < 0.05, *** P < 0.01.
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 RD	-0.007	-0.016	0.043	0.096***	0.14***
	(0.084)	(0.051)	(0.037)	(0.037)	(0.038)
Wealth index	-1.47***	0.074***	0.072***	0.050***	0.15***
	(0.24)	(0.017)	(0.011)	(0.014)	(0.016)
Household size	0.16***	0.15***	0.35***	0.28***	0.34***
	(0.027)	(0.049)	(0.045)	(0.045)	(0.033)
Dependency ratio	-0.085**	-0.079***	-0.13***	0.018	-0.041
	(0.034)	(0.028)	(0.043)	(0.021)	(0.025)
Age of head	0.014	0.0072	0.018*	0.015**	0.0035
	(0.0096)	(0.0085)	(0.010)	(0.0063)	(0.0094)
Female head (1=Yes, 0=No)	-0.53**	-0.12	-0.44*	1.25***	0.45**
	(0.26)	(0.28)	(0.26)	(0.33)	(0.21)
Married (1=Yes, 0=No)	-0.14	-0.01	-0.49**	-0.67***	-0.21
	(0.18)	(0.19)	(0.22)	(0.17)	(0.21)
Rural residence (1=Yes, 0=No)	-0.19	-0.019	0.091	-0.37	-0.081
	(0.12)	(0.11)	(0.33)	(0.71)	(0.18)
Agricultural household (1=Yes, 0=No)	0.073	0.085	0.047	0.078	-0.047
	(0.15)	(0.15)	(0.16)	(0.16)	(0.084)
Constant	-0.82***	-1.84***	-1.75***	-2.50***	-1.44***
	(0.19)	(0.16)	(0.19)	(0.14)	(0.11)
Other statistics					
R^2	0.08	0.02	0.02	0.05	0.39
Number of observations	6325	7497	6208	8774	5094

Notes: Clustered standard errors are in parentheses. Levels of significance: * P < 0.10, ** P < 0.05, *** P < 0.01.

Table A3: The dimensions, indicators, deprivation cut-offs and weights of the multidimensional well-being index (MWI)

Well-being dimension	Indicator	Deprivation criteria	Weight
Education (1/3)	Years of schooling	No household member aged 10 or older has completed five years of schooling	1/6
	School attendance	Any school-aged child is not attending school up to class 8	1/6
Health (1/3)	Improved sanitation	The household's sanitation facility is not improved (according to MDG guidelines), or it is improved but shared with other households	1/6
	Nutrition	Any child aged 5 or younger is stunted, wasted or underweight	1/6
Living standard (1/3)	Electricity	The household has no electricity	1/15
	Improved drinking water	The household does not have access to improved drinking water (according to MDG guidelines) or safe drinking water is more than a 30-minute round-trip walk from home	1/15
	Flooring	The household has a dirt, sand, dung or other (unspecified) type of floor	1/15
	Cooking fuel	The household cooks with dung, wood or charcoal	1/15
	Asset ownership	The household does not own more than one radio, TV, telephone, bike, motorbike or refrigerator, and does not own a car or truck	1/15

Notes: All binary indicators are recorded such that 1 indicates poverty/deprivation and 0 indicates well-being. We closely follow the approach developed by Alkire and Foster (2011) for a measure of multidimensional poverty index. However, in this study, we flip the values of indicators (1 to 0 and vice versa) so that the poverty index becomes a well-being index.

MDG = Millennium Development Goal.

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