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The ambivalent links between internal migration and food security in Uganda

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ABSTRACT

This study examines the drivers for and consequences of internal migration to household food security in Uganda. Based on the Ugandan National Panel Surveys conducted between 2010/11 and 2015/16, we estimate differences in food energy adequacy of households receiving internal migrants from elsewhere. Besides food energy consumption, this study applies household food consumption score (FCS) and looks at vulnerability in terms of household's expenditures on food. This enables to explore (a) the extent to which food insecurity is driving internal migration, and (b) whether remittances can reduce food security of the remitter. We find that households are usually worse-off when migrants join the receiving family. This seems a departure from previous studies that tend to find welfare gains to internal migration, mostly due to changes in expenditures or dietary consumption without considering any thresholds for achieving food security. Based on these findings and responding to rising youth employment challenges associated with rapidly growing urban slums in Uganda, policies that simultaneously support employment creation in both urban and rural areas are urgently needed to enable better steering of the flow of voluntary migration and to help ensuring food security.

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Internal migration; remittances; food security; Uganda

1. Introduction

Africa is regarded as the fastest urbanizing region in the world. By2050, Africa's population is projected to double, with two-thirds of this growth being absorbed by urban areas (OECD/SWAC, 2020). Despite lack of homogeneity, recent literature associated urbanization with improved welfare (Beegle et al., 2011; De Brauw et al., 2018; Bryan et al., 2014; Gollin & Jedwab, 2016; Mensah & O'Sullivan, 2017). The reasoning for increased welfare with urbanization is based on focus on 'pull factors' to migration such as education and economic opportunities, people migrate to urban areas either temporarily or on long-term bases. However, also 'push factors' such as natural disasters, conflict, loss of livelihoods trigger rural-urban migration.

Internal migration is a complicated issue, as people move to both urban and rural areas, and the same households may be linked to two different locations. This is illustrated, for instance, by empirical studies conducted in Ethiopia (De Brauw et al.,

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2018) and Uganda (Mensah & O'Sullivan, 2017), showing that individual migrants are more likely to moving to rural areas than to urban ones. Regardless of the place of destination, internal migration has implications on food security in both places of origin and destination.

First, recent migrants are likely to start with lower productive assets such as land and financial capital. Hence, they are likely to produce less food. On the other hand, conditional on getting employment, migrants are likely to make higher incomes in their new environment than they would have in their place of origin (e.g. Beegle et al., 2011; Mensah & O'Sullivan, 2017), as earlier theories predict earnings differential is one of the key reasons for people migrating (Harris & Todaro, 1970; Lewis, 1954). The level of migrants' access to food, compared to their origin, would depend on the change in migrants' purchasing power, among others.

Second, migrants may send remittances to support source households. Doing so, however, reduces disposable income available to migrants' themselves and this may expose them to food insecurity (Crush & Tawodzera, 2017). There is limited research available that links remittances behaviour and food security of the remitter. Further, relatively few attention has been paid to the role of food insecurity as a potential core driver of migration, nor to the differentiating effects of migration on food security (Crush, 2013; Crush & Caesar, 2017).

Against this background, the main aim of this study is to examining links between internal migration and household food security in Uganda. The specific research questions are: (1) does internal migration improve migrant food security? (2) is migration to urban areas more important for improving food security than migration to rural areas? (3) does sending-back remittances reduce own food security? (4) is food insecurity a key driver of internal migration?

The remainder of this study is structured as follows: the methods are described in Section 2, including the construction of indicators and estimation strategies. Data and results are presented and discussed in Section 3, followed by concluding remarks in Section 4.

2. Methods

2.1. Data and construction of indicators

The research questions specified for this study are addressed by applying existing data, including the Uganda National Panel Surveys (UNPS) conducted between 2010/11 and 2015/16. The UNPS is a multi-purpose, nationally representative household survey program started in 2005/06 as part of the long-term Census and Household Survey Program (The Uganda Bureau of Statistics (UBS), 2016). In 2005/06, the survey covered 3,123 households distributed over 783 enumeration areas (EAs) in Uganda. The sample design was adjusted in the follow-up survey in 2009/10 to 'allow reliable estimates at the national, rural-urban and regional levels.' Further adjustments were made in the 2010/11 by introducing the concept of clusters[1] instead of EAs, that would allow tracking split-off households that fell outside the selected EAs but could still be reached and interviewed during subsequent surveys.

According to The Uganda Bureau of Statistics (UBS) (2016), about one-third of the initial sample was refreshed in 2013/14, which saw the inclusion of new households into the survey. The same sample was covered in the 2015/16 survey. Because the UNPS is no longer strictly panel, this study relies mainly on the 2010/11 and the 2015/16 waves. For ease of presentation, we refer to these two waves as baseline and endline surveys, respectively. In addition to having relatively larger sample sizes (at cross-section), it is believed that the time lapse between these two waves would help to better capture the recent socio-economic dynamics including migration and food security in Uganda. In particular, food security of households with at least one person moving in during the period 2011–2016 is compared with households with no additions. Comparisons are made across the years 2011–2016, and across the so-called migrant-sending and non-sending categories of households. In addition, the study uses the 2011/12 and 2013/14 waves to find out whether food insecurity persistence was a key driver of internal migration (Table A1). Table 1 presents the sample characteristics at baseline and end line.[2]

Households with incomplete information and those having extreme values based on the household's daily calorie consumption per adult male equivalent (AME)[3] were excluded from the analysis. The calorie consumption was used to establish the exclusion criteria[4] because it is one of the key variables of interest for linking household food security and migration.

The calorie consumption data were prepared as follows. First, local units of the food item were converted into grams or litres. Next, using the Food Consumption Table for Central and Eastern Uganda (Hotz et al., 2012), the calorie value of all foods consumed in the household was calculated. Using 2100 kcal per AME per day as the minimum food energy requirement, the prevalence of food energy shortfall was calculated. Beside the food energy shortfall, we use the food consumption score (FCS) and the share of expenditure on food over the total consumption expenditure as indicators of food insecurity or vulnerability to food insecurity.

The food consumption score, a composite measure that takes into account dietary diversity, food frequency, and the relative nutritional importance of different food groups was calculated following World Food Programme (WFP) (2008) (for detailed information on the methods, see World Food Programme (WFP), 2008, p. 8).[5] Based on the recommended cut-offs, household food security profiles were constructed as poor, borderline, and acceptable. For the purpose of this study, households with FSC below the acceptable level were considered food insecure. In

Table 1. Sample characteristics.

	UNPS 2010/2011		UNPS 2015/2016	
	N	%	N	%
Initial sample	2716	100	3305	100
Final sample[1]	2384	88	3005	91
Panel households	1322	56	1322	44
Households with at least one member who migrated-in for reasons other than marriage	693	29	273	9.1
Households with at least one member who migrated-out for work/economic reasons	288	12	270	8.9

[1]Final sample after data cleaning and were used for descriptive analysis

addition, the share of expenditures to food over total consumption expenditures was calculated to identify households vulnerable to food insecurity. Accordingly, households whose expenditure shares on food are greater than or equal to 70% were considered vulnerable to food insecurity, in line with Maxwell et al. (1999) and Smith et al. (2006).

We constructed the indicator for migration (or household with migrant member) from two questions in the survey. The first is based on the household's report to having at least one member (aged 10 or older) who left the household in the 12 preceding months due to economic reasons. The second indicator is based on the household's reporting to have at least one member (aged 10 or older) who migrated-into the village and joined the family in the past 5 years for reasons other than marriage. Since information regarding the destination of out-migrants and their occupation is not known, the first indicator of migration is used only to find out the drivers of migration; whereas the second indicator is used to understand the relationship between household food security and migration.

2.2. Estimation strategies

We examine the links between household food security and migration by estimating regression models of the following form, adapted from Beegle et al. (2011):

$$\Delta FS_{ht,t-1} = \beta M_{ht} + X_{h,t-1}\lambda + \alpha_h + \varepsilon_{h,t} \quad (1)$$

where $\Delta FS_{ht,t-1}$ denotes the change in food security of the household h between$t$ and $t-1$, M_h is an indicator variable for migration that has occurred between t and $t-1$, X_h denotes a vector of household h's observable characteristics measured at time $t-1$ including age, gender, and education attainment of the household head, and place of residence being urban or rural. A key advantage of the above model is that it can control for initial differences in household characteristics denoted by the vector X_h. According to Beegle et al. (2011), this resolves a large number of possible sources of endogeneity which might have an impact on both the household food security and migration outcomes. Additional controls which may have a bearing on key variables of interest include household size, household's main livelihood activities, household's access to improved water source, and access to improved roads and public transport. α_h denotes region-fixed effects controlling for initial differences in food prices, economic opportunities and other unobservable factors, and ε_h is an error term. We estimate variants of this model to find out whether migration to urban areas was more important to improving food security than migration to rural areas; and whether sending back remittances was linked to food insecurity of the remitter.

To examine whether food insecurity was a driver of migration, we estimate:

$$M_{h,t} = \beta FS_{h,t-1} + X_{h,t-1}\theta + \alpha_h + u_{h,t} \quad (2)$$

where $FS_{h,t-1}$ denotes household food security status measured at the baseline (time $t-1$), other variables as defined before, and u_h is the error term. Alternatively, we define $FS_{h,t-1}$as food insecurity persistence, the number of times the household was food

insecure preceding the incidence of outmigration during the previous survey waves (i.e. 2010/11, 2011/12, 2013/14).

3. Descriptive statistics and results

3.1. Descriptive statistics

Table 2 provides the summary statistics of food energy availability per capita (in Kcal), the FCS, and the share of household food expenditure by migration status. Overall, the household dietary diversity proxied by FCS and the food energy availability have increased between 2010/11 and 2015/16 for both migrant and non-migrant households, but the quantity in food energy availability was on average substantially higher among non-migrant households than migrant ones. On the other hand, the share of household food expenditures over total consumption expenditures increased for migrant households while it declined for non-migrant ones between 2010/11 and 2015/16. By making comparisons for the same year and indicator, the share of non-migrant households that were either vulnerable to food insecurity or food insecure in terms of FCS was higher than the migrant ones. In contrast, in terms of the food energy shortfall (i.e. availability of food energy below 2100 kcal per-capita), the share of non-migrant households considered food insecure was smaller than that of migrant households, for both data points.

Further disaggregation of the data by place of residence reveals slightly different results (Figure 1). For the rural sample, the prevalence of food insecurity or vulnerability to food insecurity among migrant and non-migrant households in 2011 closely follows the corresponding year's national averages, i.e. migrant households were better-off in terms of FCS and vulnerability to food insecurity while non-migrant households were better-off in terms of the share of food energy shortfall. While the prevalence of food insecurity and vulnerability to food insecurity in 2016 also closely follow the full sample for the corresponding year, the percentage mean difference between migrant- and non-migrant households was statistically significant only for the FCS indicator.

Table 2. Description of household food availability, FCS and expenditure share on food.

	Non-migrant	Migrant	Mean difference
2015/16			
Food energy availability per-capita (kcal)	3980	3485	495***
Share of food expenditure	72	70	1.8**
FCS	56	61	−4.2***
Share of food energy deficient (%)	14	21	−6**
Share of food expenditure >70% (%)	61	51	10***
Low FCS (%)	22	13	9.2***
2010/11			
Food energy availability per-capita (kcal)	3430	3238	192**
Share of food expenditure	74	68	5.7**
FCS	51	58	−6.9***
Share of food energy deficient (%)	26.3	32.1	6***
Share of food expenditure >70% (%)	63	50	13***
Low FCS (%)	38	25	13***

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

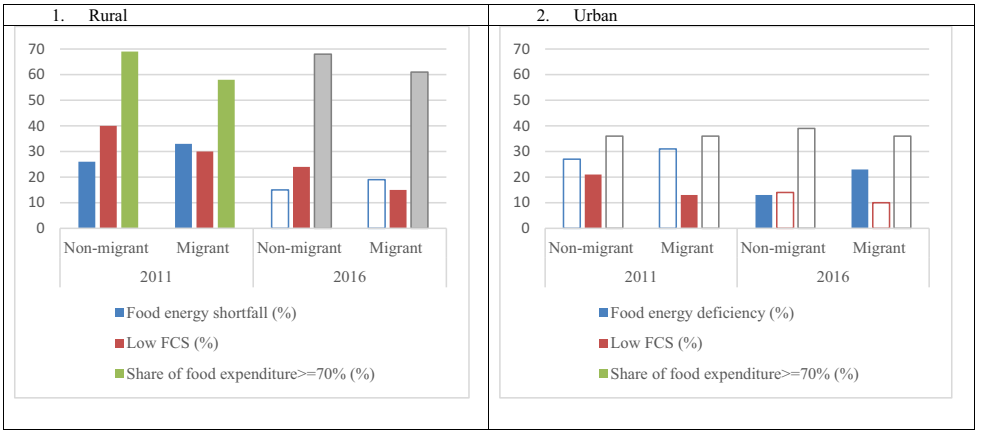

Figure 1. The prevalence of food insecurity among migrant and non-migrant households by current place of residence (rural/urban). Note: Colour fill indicates the percentage mean difference in the prevalence of food insecurity between migrant and non-migrant households during same year was statistically significant at $p < 0.05$.

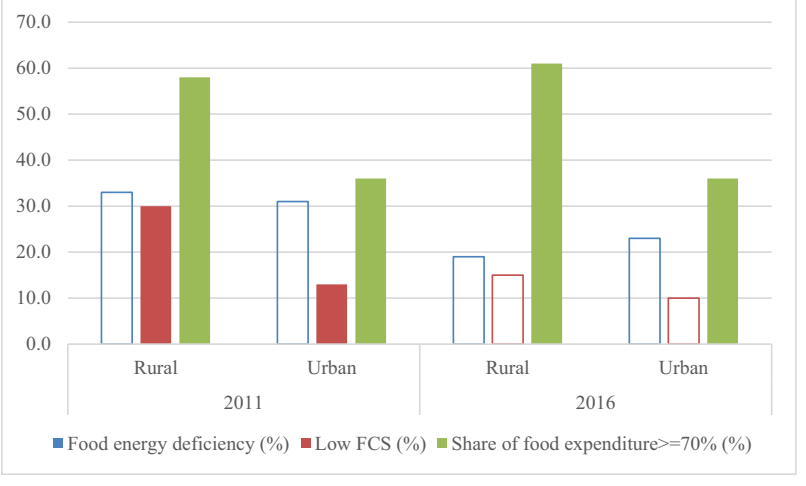

Figure 2. The prevalence of food insecurity among migrant households by rural/urban. Note: Colour fill indicates percentage mean difference in the prevalence of food insecurity between rural and urban migrants during same year was statistically significant at $p < 0.05$.

For the urban sample, migrant households were less food insecure than non-migrant households in terms of FCS in 2011; whereas non-migrant households were less food insecure in terms of food energy shortfall in 2016. In general, regardless of the households' migration status, Figure 1 shows that the prevalence of food insecurity and vulnerability to food insecurity among rural households was higher than that of urban households.

Figure 2 compares food insecurity and vulnerability to food insecurity among migrant households by place of residence over time. The data suggests that there was no statistically significant difference between rural and urban migrants in terms

of food energy shortfall neither in 2011 nor in 2016. However, in 2011 rural migrants had lower FCS than urban migrants. In addition, rural migrants were more vulnerable to food insecurity than urban ones both in 2011 and 2016. Whether this is signalling the relative advantages of migration to urban areas compared to migration to rural areas with regard to food security requires further examination. This is because – in addition to access to food – other socio-economic factors play a role in achieving household food security. For example food utilization, one dimension of food security, is influenced by the food environment, particularly through access to clean water and sanitation.

Remittances facilitate rural-urban linkages and the monetary and goods transfers may contribute to food security of the recipient household. Nonetheless, remittances can also reduce the remitter's purchasing power and potentially lead to food insecurity. This may be especially the case for migrant households involved in low skill, low return economic activities. To explore the possibility that sending back remittances may expose the remitter to food insecurity, Figure 3 compares the prevalence of food insecurity among remittance-sending and non-sending migrant households. According to Figure 3, the prevalence of food insecurity or vulnerability to food insecurity among remittance-sending households was smaller than non-sending ones.

The descriptive statistics presented above reveal the state of food (in)security among migrant and non-migrant households over time and place of residence. But these do not give sufficient information on whether food insecurity was the reason for migration or whether migration has contributed to improving food security. Such analysis would

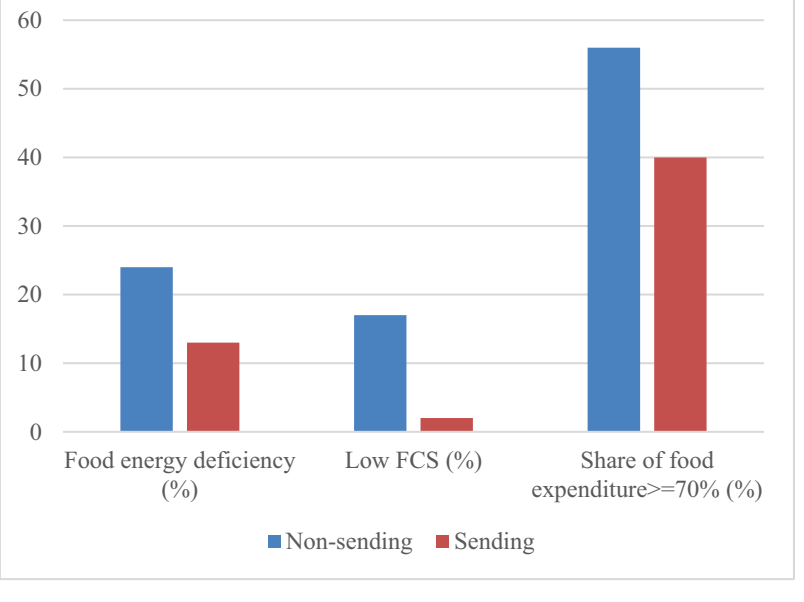

Figure 3. The prevalence of food insecurity among migrant households by remittance sending status in 2016. Note: Colour fill indicates percentage mean difference in the prevalence of food insecurity between remittance sending and non-sending migrant households was statistically significant at $p < 0.05$.

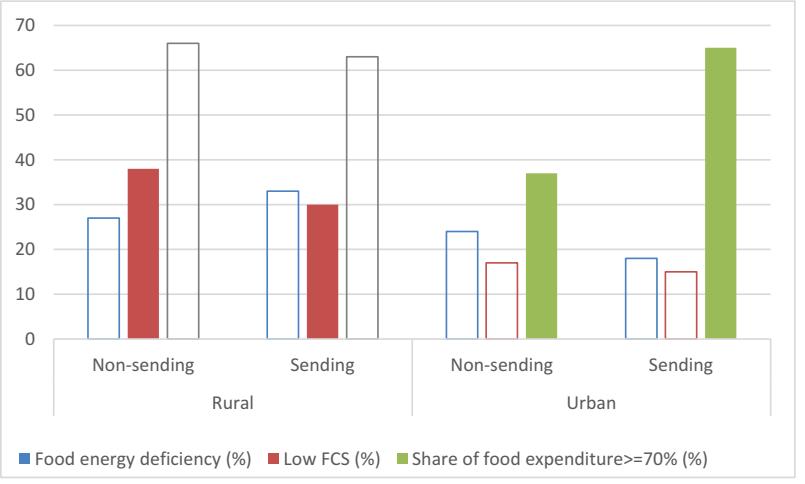

Figure 4. The share of migrant sending households as of 2016 by prevalence of food insecurity in 2011. Note: Colour fill indicates percentage mean difference in the prevalence of food insecurity between migrant sending and non-sending households within urban or rural location was statistically significant at $p < 0.05$.

require information regarding, among others, the food security situation of the household prior to migration and after migration had occurred. Figure 4 presents therefore the prevalence of household food insecurity in 2010/11 by out-migration status in the 12 months preceding the 2015/16 survey. For the rural sample, migrant-sending households seem to be less food insecure in terms of FCS than non-sending ones. For the urban sample, the share of migrant-sending households vulnerable to food insecurity was higher than non-sending ones. It is to be noted that panel data were available for only about one-third of the total sample; hence, these figures may not give a fully representative picture.

Based on data from the panel households, food security (measured by any of the three indicators) improved for 17% to 22% of households between 2010/11 and 2015/16 (Table 3); but, the share of non-migrant households that saw improvement in terms of the food energy availability was relatively higher than the corresponding share of non-migrant households. In contrast, food insecurity worsened amongst 9% to 21% of households during the same period (Table 3); and by comparison, the

Table 3. The change in household food security between 2010/11 and 2015/16, by migration status.

	Food security worsened (0/1)				Food security improved (0/1)			
	Total	Non-migrant	Migrant	Mean difference	Total	Non-migrant	Migrant	Mean difference
Food energy deficiency (%)	11.4	10.9	15.6	−4.9**	21.5	22.3	14.2	8**
Low FCS (%)	9.4	9.2	9.5	−0.0	22.6	22.9	19	3.9
Share of food expenditure≥70%(%)	20.7	20.6	21.2	−0.6	17.3	17.3	16.6	0

Note: ** indicates percentage mean difference between non-migrant and migrant households was statistically significant at $p < 0.05$.

share of migrant households more negatively affected in terms of food energy deficiency was higher than non-migrant households.

3.2. Econometric results

3.2.1. Food security and internal migration

As described in Table 3, household food security may have improved, gotten worse, or remained the same between 2010/11 and 2015/16. In this section, we examine whether the change in household food security was associated with the migration status of the household. Table 4 presents the marginal effects of the Probit estimations, controlling for exogenous characteristics of the household (panel A). Panel B includes additional covariates which were selected based on the literature on food security. All covariates were measured at the baseline (time $t-1$). According to Table 4, panel A, having at least one migrant who joined the family between t and $t-1$ appears to be negatively associated with the probability of the household food security being improved, where household food security was defined by the availability of adequate food energy per adult equivalent (column 1). Correspondingly, Column 4 suggests that one or more migrants joining the household increases the likelihood of the change in the household food security being worse.

When we consider the food consumption score (FCS) and the share of expenditure on food, there appears to be lack of a statistically significant relationship between migration status and the change in household food security over time. Results remain unchanged with the inclusion of more controls capturing the household's engagement in agriculture and non-agriculture enterprises, household's access to-public transport, tarmac road, improved water source, and the household size (Table 4, Panel B). Further, we re-run specifications corresponding to Table 4, after replacing the dummy variable for having at least one migrant by the number of migrant household members. However, the overall results remain unchanged, qualitatively (see Appendix, Table A2). Hence, the hypothesis that migration improves migrant food security is rejected, at least in terms of food energy availability. That is, in-migration does not seem to benefit the food security of the host family.

These results seem to deviate from the findings of previous studies which mostly report positive welfare gains from internal migration (e.g. Mensah & O'Sullivan, 2017; Beegle et al., 2011; Bryan et al., 2014,; De Brauw et al., 2018). Welfare in the aforementioned studies was defined as either the growth in per-capita consumption or improvement in dietary consumption. But these studies neither examined if the threshold for achieving household food security was met, nor did they specify which dimension of food security would be influenced. In order to check whether the deviation of our results from the aforementioned studies was not due to differences in the definition of welfare indicators, we regress the growth in per capita food energy availability (in similar spirit to the aforementioned studies), and also the growth in FCS and the growth in the share of food expenditure, on migration status, controlling for similar covariates as outlined in Table 4, panel A. The overall results remain unchanged qualitatively, suggesting that there was a negative and statistically significant relationship between the growth in food energy availability and migration status. However, we did not find a statistically strong relationship between

Table 4. The links between internal migration and changes in household food security (Dependent variable: 1 if there was improvement in the household food security between 2010/11 and 2015/16, 0 otherwise (columns 1–3); or, 1 if household food security got worse, 0 otherwise (columns 4–6))[6].

	Food security improved (0/1)			Food security worsened (0/1)		
	(1)	(2)	(3)	(4)	(5)	(6)
	Caloric	FCS score	Vulnerability	Caloric	FCS score	Vulnerability
VARIABLES	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx
Panel A						
Migrant (0/1)	−0.09***	−0.03	−0.01	0.08**	0.02	0.01
	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)
Age in years	−0.00	−0.00	0.00	0.00	−0.00	−0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Female head (0/1)	0.03	0.03	0.02	−0.02	−0.01	−0.02
	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)
Some primary (0/1)	0.07*	−0.03	0.02	−0.02	−0.03	−0.01
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)
Post-primary (0/1)	0.09*	−0.09***	0.02	−0.04*	−0.07***	−0.04
	(0.05)	(0.03)	(0.04)	(0.02)	(0.02)	(0.04)
Post-secondary (0/1)	0.07	−0.11***	−0.03	−0.03	−0.02	−0.00
	(0.06)	(0.04)	(0.04)	(0.03)	(0.03)	(0.05)
Urban (0/1)	0.01	−0.11***	−0.01	−0.04	−0.03	0.05
	(0.04)	(0.03)	(0.03)	(0.03)	(0.02)	(0.03)
Central region (0/1)[§]	−0.04	−0.15***	0.08	−0.06	−0.06*	0.04
	(0.06)	(0.05)	(0.06)	(0.04)	(0.03)	(0.06)
Eastern (0/1)	0.05	−0.10**	0.03	−0.01	−0.04	0.05
	(0.07)	(0.05)	(0.06)	(0.05)	(0.04)	(0.06)
Northern (0/1)	0.18**	−0.09*	−0.01	−0.05	−0.05	0.06
	(0.08)	(0.05)	(0.06)	(0.05)	(0.04)	(0.06)
Western (0/1)	−0.04	−0.14***	0.04	−0.01	−0.03	−0.04
	(0.06)	(0.05)	(0.06)	(0.06)	(0.04)	(0.05)
Panel B						
Migrant (0/1)	−0.09***	−0.03	−0.01	0.08**	0.02	0.00
	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)
Household size (AME[¥])	0.00	0.00	0.00	0.00	0.00	0.00
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)
Improved water source (0/1)	0.00	0.01	−0.01	−0.01	0.02	0.01
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)
Agriculture/livestock (0/1)	−0.10**	0.10***	0.01	−0.02	0.01	0.08**
	(0.05)	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)
Non-agriculture enterprise (0/1)	−0.02	−0.06***	−0.03	0.02	0.01	0.06***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Tarmac road (0/1)	0.12***	0.05	−0.05*	−0.02	−0.01	0.04
	(0.04)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)
Distance, public transport (km)	0.00	0.00	−0.00	−0.00	−0.00	−0.00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,294	1,294	1,294	1,294	1,294	1,294
Log Likelihood	−623.1	−660.5	−590.6	−447.1	−387.4	−638.3
Pseudo R^2	0.0709	0.0475	0.0171	0.0240	0.0250	0.0229

Notes: [§]The reference category is Kampala region. [¥]AME denotes adult male equivalent.
Marginal effects of Probit estimation in all columns. dy/dx for factor levels is the discrete change from the base level. Other covariates are fixed at their means. Standard errors are clustered at the enumeration area level, in parenthesis. *p < 0.10, **p < 0.05, ***p < 0.01.

migration and the growth in household FCS or the growth in the share of food expenditure (see Appendix, Table A3).

On the one hand, one of the likely explanations is that recent migrants may have limited access to productive resources such as land and financial capital. Hence, they

are likely to produce less food. On the other hand, urban areas may grow without a corresponding increase in industrialization, for example, due to urban bias in economic policies or as the result of rural poverty (Gollin & Jedwab, 2016; Jedwab & Vollrath, 2015). Hence, in cases of rural to urban migration, especially from farm households, migrants may face entry barriers such as skills and/or initial investments that inhibit their participation in better-paying nonfarm activities (Bezu & Barrett, 2012; Woldehanna & Oskam, 2001). This leaves recent migrants to take up low-paid and irregular employment in informal jobs that provide low incomes, and forcing them to live in poor housing conditions and informal settlements (World Bank, 2015). According to World Bank (2015), for example, as much as 80% of low-income earners in urban areas in Uganda live in marginal slums which are characterized by 'lack of basic waste management facilities, poor drainage and sewerage, unhealthy source of energy, lack of access to affordable and reliable sources of water and sanitation facilities' (p. 48). This implies food security, encompassing food availability, access, utilization, and stability (FAO, 2006) could be difficult to achieve as poor living conditions would negatively affect at least one dimension of food security.

Furthermore, recent literature suggests that Uganda has experienced a shift in production and employment patterns, away from tradable and high productive to non-tradable and low productive sectors which are often concentrated in urban areas (World Bank, 2015). The implication is that, due to entry barriers as described above, recent migrants are likely to work in low productive sectors that provide incomes which are below the amount necessary to satisfy the household's food energy requirements and achieve food security. The trend of the informal economy absorbing migrants is evident in Africa, with many countries experiencing a 'youth bulge' (Mueller et al., 2019) including Uganda (for example, in 2018 the percentage of Ugandans aged under 18 and between 18 and 30 year of age were 53.6% and 21%, respectively (The Uganda Bureau of Statistics (UBS), 2019)), and hence a mismatch between available job opportunities and the demand for jobs. This has implications on household's income-generating capacity. For example, the proportion of Ugandan youth (aged 18–30) who were not in employment nor education nor training was over 40% in 2018 (The Uganda Bureau of Statistics (UBS), 2019). Elsewhere in Africa studies show limited rural employment opportunities for youth, leading to a slow pace of rural poverty reduction in Senegal (Estruch et al., 2019); relatively few high-quality jobs for well-trained Malawians (Benson et al., 2019); and the absence of wage labour opportunities in rural Ethiopia (Schmidt & Woldeyes, 2019). In this context, migration may add more pressure on available resources of migrant-receiving households, possibly contributing to more food insecurity.

Among the covariates, access to tarmac roads and some level of education by the household head appear to increase the likelihood of improving food security (in terms of food energy availability) over time. However, different livelihood activities appear to have heterogeneous effects depending on the dimension of food security indicator (Table 4, Column 1). As shown in Table 4, the household's involvement in crop production or livestock activities appears to increase the likelihood of meeting FCS threshold for food security (column 2), but is negatively associated with the likelihood of food energy deficiency being improved (Column 1). Engagement in

non-agriculture enterprises seem to be negatively associated with the likelihood of improvement in food security, in terms of the food consumption score (Column 2).

3.2.2. Heterogeneous effects

As shown above in Figure 1, urban areas in general seem to be less food insecure than rural areas. To explore whether there were heterogenous food security effects of migration by place of residence, we interact the migration and the urban dummies and re-run regressions. According to Table 5, being an urban resident seems to be strongly correlated with improved FCS. However, the interaction term is not statistically significant suggesting that there is lack of strong association between the change in household food security (improvement or decline) and the place of migration being urban or rural. Hence, the hypothesis that migration to urban areas is more important for improving food security than migration to rural areas in Uganda has to be rejected.

Similarly, to examine if sending-back remittances would reduce own food security and whether remittance-sending migrants would be more negatively affected, we interact the migration and the remittances dummies and re-run regressions. Results in Table 6 do not show that the change in food security of remittance-senders in general or remittance-sending migrants, in particular, was negatively affected. If anything, columns 4 and 5 of Table 6 show that the remittances indicator and its interaction term are negative and statistically significant, potentially suggesting that those who remitted were already more food secure households. Some of the potential explanations are that: (1) the value of the remittances was rather insignificant compared to their earnings or consumption level; (2) remittance-senders were mainly food secure households, as suggested in Figure 3; (3) remittance-senders were far below subsistence that their food security status would not have changed had they not send. Unfortunately, we do not have full information on the total earnings and the total value of remittances to test any of these possibilities. But based on available data and results, the hypothesis that sending-back remittances reduces own food security seems to be rejected.

Table 5. Food insecurity and migration by location of migration.

	Food insecurity improved (0/1)			Food insecurity worsened (0/1)		
	(1)	(2)	(3)	(4)	(5)	(6)
	Caloric	FCS score	Vulnerability	Caloric	FCS score	Vulnerability
VARIABLES	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx
Migrant (0/1)	−0.07*	−0.03	−0.05	0.07	0.02	−0.00
	(0.04)	(0.04)	(0.03)	(0.04)	(0.04)	(0.04)
Urban	−0.04	−0.10***	0.00	−0.04	−0.03*	0.02
	(0.04)	(0.03)	(0.04)	(0.03)	(0.02)	(0.04)
Migrant x Urban	−0.06	0.02	0.13	0.02	0.01	0.00
	(0.07)	(0.09)	(0.10)	(0.06)	(0.06)	(0.07)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,294	1,294	1,294	1,294	1,294	1,294
Log Likelihood	−622.8	−660.5	−589.6	−447.0	−387.4	−638.3
Pseudo R^2	0.0713	0.0475	0.0188	0.0241	0.0250	0.0229

Notes: Marginal effects of Probit estimation in all columns. dy/dx for factor levels is the discrete change from the base level. Other controls are similar to those listed in Table 4. Standard errors are clustered at the enumeration area level, in parenthesis. *p < 0.10, **p < 0.05, ***p < 0.01.

Table 6. Remittance sending and food insecurity.

	Food insecurity improved (0/1)			Food insecurity worsened (0/1)		
	(1)	(2)	(3)	(4)	(5)	(6)
	Caloric	FCS score	Vulnerability	Caloric	FCS score	Vulnerability
VARIABLES	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx
Migrant (0/1)	−0.10***	−0.03	−0.01	0.08*	0.05	0.00
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Remittance (0/1)	−0.01	0.02	0.04	−0.04**	−0.02	−0.02
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)
Migrant x Remittance	0.06	0.03	−0.00	−0.02	−0.07**	−0.01
	(0.10)	(0.10)	(0.08)	(0.06)	(0.03)	(0.08)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,294	1,294	1,294	1,294	1,294	1,294
Log Likelihood	−622.9	−660.2	−589.6	−444.7	−384.8	−638.2
Pseudo R^2	0.0712	0.0479	0.0188	0.0291	0.0316	0.0232

Notes: Marginal effects of Probit estimation in all columns. dy/dx for factor levels is the discrete change from the base level. Other controls are similar to those listed in Table 4. Standard errors are clustered at the enumeration area level, in parenthesis. *p < 0.10, **p < 0.05, ***p < 0.01.

3.3. Correlates of internal migration: food insecurity as a driver of internal migration?

People migrate to new places in search of better opportunities or for survival. This section explores whether household food insecurity predicts out-migration, given other household characteristics and location fixed effects. Recall that the incidence of out-migration was defined as having at least one member (aged 10 or older) who left the household within a year preceding the 2015/16end line survey, because of economic reasons. We use the incidence of food insecurity at baseline (2010/11) as well as food insecurity persistence between the baseline and 1 year before the incidence of migration, in different specifications. Food insecurity persistence is defined as the number of times the household was food insecure during 2010/11, 2011/12, and 2013/14. Hence, the value of food insecurity persistence in a specific indicator may vary between 0 and 3 (Table A1).

Table 7 presents the estimates of a linear probability model linking household food insecurity and outmigration of at least one household member as described in equation 2. Columns 1–3 and columns 4–6, respectively, refer to estimates corresponding to the incidence of food insecurity at the baseline and the food insecurity persistence over time, in a given indicator. Given covariates, household food insecurity does not appear to be a statistically strong driver of outmigration, regardless of how food insecurity was defined. It is possible that these results may not give a fully representative picture due to sample attrition and for the fact that migration is not a random process. Nonetheless, food insecurity could be temporal and hence households may use other coping strategies than engaging in outmigration. This is because migration is in itself risky especially to those who are close to subsistence and a potential failed migration is very costly (Bryan et al., 2014). Further, even if food insecurity could lead to outmigration, it is possible that the indicators used in this study may not fully capture this linkage since the reference period was 7 days for FCS and food energy availability, and 30 days for the food expenditure shares.

Table 7. Correlates of internal migration.

	Incidence of food insecurity			Food insecurity persistence		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Food calorie-deficient (0/1)	0.022					
	(0.021)					
FCS-poor/borderline (0/1)		−0.029				
		(0.019)				
Food expenditure >70% (0/1)			0.008			
			(0.020)			
No. of times calorie-deficient, 2010–2014				0.011		
				(0.011)		
No. of times FCS-poor/borderline, 2010–2014					−0.004	
					(0.011)	
No. of times food expenditure>70%, 2010–2014						−0.007
						(0.010)
Networks (No. of outmigrants from same village)	0.026*	0.024*	0.026*	0.026*	0.025*	0.025*
	(0.014)	(0.013)	(0.014)	(0.014)	(0.013)	(0.014)
Age of head in years	0.000	0.000	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Female head (0/1)	−0.005	−0.003	−0.004	−0.005	−0.004	−0.004
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Some primary, of head (0/1)	−0.003	−0.008	−0.005	−0.003	−0.006	−0.004
	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Post-primary (0/1)	0.026	0.018	0.026	0.028	0.023	0.024
	(0.034)	(0.035)	(0.034)	(0.034)	(0.035)	(0.034)
Post-secondary (0/1)	−0.031	−0.041	−0.031	−0.030	−0.035	−0.035
	(0.037)	(0.036)	(0.037)	(0.037)	(0.037)	(0.038)
Urban (0/1)	−0.004	−0.008	−0.002	−0.004	−0.005	−0.007
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.023)
Central region (0/1)	0.065*	0.059	0.061	0.066*	0.061	0.064*
	(0.038)	(0.037)	(0.037)	(0.038)	(0.038)	(0.037)
Eastern (0/1)	0.086**	0.085**	0.083**	0.086**	0.086**	0.091**
	(0.037)	(0.037)	(0.037)	(0.037)	(0.037)	(0.037)
Northern (0/1)	0.079**	0.083**	0.080**	0.081**	0.083**	0.089**
	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)
Western (0/1)	0.025	0.024	0.020	0.026	0.023	0.029
	(0.039)	(0.038)	(0.039)	(0.039)	(0.038)	(0.038)
Constant	0.030	0.053	0.035	0.027	0.042	0.045
	(0.054)	(0.054)	(0.052)	(0.054)	(0.054)	(0.054)
Observations	1,322	1,322	1,322	1,322	1,322	1,322
R-squared	0.013	0.013	0.012	0.012	0.012	0.012

Standard errors are clustered at the enumeration area level, in parenthesis.*p < 0.1, **p < 0.05, ***p < 0.01.
Note: Colour fill indicates the percentage mean difference in the prevalence of food insecurity between migrant and non-migrant households during the same year was statistically significant at p < 0.05.

Hence, further attempt was made using an indicator that captures the stability of food availability in the household in the 12 months preceding the survey. Food insecurity was defined to exist if there was a situation where the household did not have enough food during the reference period. Nonetheless, results remain unchanged (results not reported, but available), suggesting that food insecurity was not strongly linked to internal migration in Uganda.

With respect to the controls, migrant network appears to be strongly associated with outmigration, in all specifications. Migrant network was defined as the number of households from the same village who at the baseline had a member that out-migrated permanently. Compared to Kampala region, households in Eastern, Western, and Central region were more likely to have an outmigrant. Age, gender and education status of the household

head, and the location of residence being urban at the baseline did not appear to be strongly correlated with outmigration of one or more household members.

4. Concluding remarks

Our study on the drivers and consequences of internal migration for food security uses both diet quantity and diet quality measures of food insecurity, in addition to the share of food expenditures capturing vulnerability to food insecurity in order to better understand the links between internal migration and food security in Uganda. Descriptive statistics suggest that food security has improved for both migrant and non-migrants households between 2010/11 and 2015/16. Yet, the share of non-migrant households considered food secure in terms of food energy availability was greater than that of migrant households, whereas migrant households were more food secure in terms of FCS and food expenditure shares. Further, there appears to be hardly any difference in food security between urban and rural migrants. Unlike previous studies, our econometric analyses do not find major welfare gains due to internal migration in Uganda. In fact, results show that when at least one migrant joined a family during the period of 2011–2016, the probability of adequate food energy in the household decreased. That is, on the one hand, in-migration does not seem to benefit the food security of the host family. On the other hand, food insecurity does not show to be a statistically strong driver of internal migration, nor do remittances reduce food security of the remitter.

The econometric analyses of this study however may not give a fully representative picture due to some level of sample attrition for the panel data analysis and the obvious problem of migration selection. We try to control for the latter through careful comparison to several relevant co-variates. Nonetheless, the descriptive statistics involving cross-sectional data (i.e. surveys from 2010/11 to 2015/16) with more representative observations appear to provide an ambivalent signal about the potential link between internal migration and household food security in Uganda. This is possible because some of the food security indicators used in this study, for example dietary diversity or FCS, capture specific dimensions of food security and are likely to change very slowly over time (because of preferences). Further, household dietary diversity score and food security measured by energy intake may not always correspond (Hirvonen et al., 2016). This calls for further research about the influence of spatial and temporal changes in the food environment on household food preferences and food security. Data observing individuals and households over time and place, disaggregated by occupation and remittances behaviour is needed to better understand the role of rural-urban linkages and food systems dynamics on food security. Based on findings of this study and given the rising pressures associated with rapidly growing urban slums and internal migration in Uganda, and in view of the 'youth bulge' that Uganda is experiencing, policies that simultaneously create employment in both urban and rural areas are urgently needed to assist in steering the flow of voluntary migration and help to ensure food security.

Notes

1. A cluster represents a group of households that are within a particular geographical area up to parish level.
2. Descriptive statistics of the sample used for multivariate analysis is in the appendix, Table A1.
3. We defined one consumer unit as a proportion of the energy requirements of an adult male, 20–30 years, referred to as an adult male equivalent (1 AME). All other age and gender groups received an AME value by dividing their energy requirement (assuming moderate activity level) by the energy requirement of 1 AME. The total household size in AME was calculated as the sum of the AMEs for each individual household member.
4. In this study, an observation was considered an outlier if the value was outside the upper and lower limits in the boxplot distribution, following Cox (2009). The upper limit was set at the value of the upper quartile plus 1.5 times the inter quartile range; and, the lower limit was set at the value of the lower quartile minus 1.5 times the interquartile range.
5. First, different food items consumed over 7 days were categorized into 9 main groups. Total score is then calculated, having assigned different weights for each food group according to their relative nutritional importance. These food groups (corresponding weight in parenthesis) include: cereals, starchy tubers and roots (2); Pulses: legumes and nuts (3); Vegetables (including green leaves) (1); Fruits (1); Meat and fish: beef, goat, poultry, pork, eggs and fish (4); Milk: milk, yogurt and other diary (4); Sugar: sugar and sugar products, honey (0.5); Oil: oils, fats and butter (0.5); and, Condiments (0).
6. The '0 otherwise'for the two dependent variables include food security 'stayed the same or got worse' (columns 1–3) and 'stayed the same or improved' (columns 4–6), respectively. Further regressions were run by considering only the 'stayed the same' in the reference category. However, results did not change qualitatively.

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Disclosure statement

The authors declare that they have no conflict of interest.

References

Beegle, K., Dercon, S., & de Weerdt, J. (2011). Migration and economic mobility in tanzania: evidence from a tracking survey. *Review of Economics and Statistics*, *93*(3), 1010–1033. https://doi.org/10.1162/REST_a_00105

Benson, T., Erman, A., & Baulch, B. (2019). Change and rigidity in youth employment patterns in Malawi. In V. Mueller & J. Thurlow (Eds.), *Youth and jobs in Rural Africa: Beyond stylized facts* (pp. 137–171). Oxford University Press, IFPRI.

Bezu, S., & Barrett, C. (2012). Employment dynamics in the rural nonfarm sector in Ethiopia: Do the poor have time on their side? *Journal of Development Studies*, *48*(9), 1223–1240. https://doi.org/10.1080/00220388.2012.671476

Bryan, G., Chowdhury, S., & Mobarak, A. M. (2014). Under-investment in a profitable technology: The case of seasonal migration in Bangladesh. *Econometrica: Journal of the Econometric Society*, *82*(5), 1671–1748. https://doi.org/10.3982/ECTA10489

Cox, N. J. (2009). Speaking Stata: Creating and varying box plots. *The Stata Journal*, *9*(3), 478–496. https://doi.org/10.1177/1536867X0900900309

Crush, J. (2013). Linking food security, migration and development. *International Migration*, *51*(5), 61–75. https://doi.org/10.1111/imig.12097

Crush, J., & Caesar, M. (2017). Introduction: Cultivating the migration-food security nexus. *International Migration*, *55*(4), 10–17. https://doi.org/10.1111/imig.12360

Crush, J., & Tawodzera, G. (2017). South-South migration and urban food security: Zimbabwean migrants in South African Cities. *International Migration*, *55*(4), 88–102. https://doi.org/10.1111/imig.12346

de Brauw, A., Mueller, V., & Woldehanna, T. (2018). Does internal migration improve overall well-being in Ethiopia? *Journal of African Economies*, *27*(3), 347–365. https://doi.org/10.1093/jae/ejx026

Estruch, E., Van Dijck, L., Schwebel, D., & Randriamamonjy, J. (2019). Youth mobility and its role in structural transformation in Senegal. In V. Mueller & J. Thurlow (Eds.), *Youth and jobs in Rural Africa: Beyond stylized facts* (pp. 251–276). Oxford University Press, IFPRI.

FAO. (2006). *Food security. Policy brief, issue 2*. Rome.

Gollin, D., & Jedwab, R. (2016). Urbanization with and without industrialization. *Journal of Economic Growth*, *21*(1), 35–70. https://doi.org/10.1007/s10887-015-9121-4

Harris, J., & Todaro, M. (1970). Migration, unemployment and development: A two-sector analysis. *The American Economic Review*, *60*(1), 126–142. Retrieved November 15, 2020, from http://www.jstor.org/stable/1807860

Hirvonen, K., Taffesse, A. S., & Hassen, I. W. (2016). Seasonality and household diets in Ethiopia. *Public Health Nutrition*, *19*(10), 1723–1730. https://doi.org/10.1017/S1368980015003237

Hotz, C., Lubowa, A., Sison, C., Moursi, M., & Loechl, C. (2012). *A food composition table for central and Eastern Uganda* (HarvestPlus Technical Monograph 9). International Food Policy Research Institute (IFPRI) and International Center for Tropical Agriculture (CIAT).

Jedwab, R., & Vollrath, D. (2015). Urbanization without growth in historical perspective. *Explorations in Economic History*, *58*, 1–21. https://doi.org/10.1016/j.eeh.2015.09.002

Lewis, W. A. (1954). Economic development with unlimited supplies of labour. *The Manchester School*, *22*(2), 139–191. https://doi.org/10.1111/j.1467-9957.1954.tb00021.x

Maxwell, D. G., Clement, A., Levin, C. E., Armar-Klemesu, M., Zakariah, S., & Lamptey, G. M. (1999). Alternative food-security indicators: Revisiting the frequency and severity of "coping strategies. *Food Policy*, *24*(4), 411–429. https://doi.org/10.1016/S0306-9192(99)00051-2

Mensah, E., & O'Sullivan, M. (2017). Moving out and up: Panel data evidence on migration and poverty in Uganda. *Policy Research Working Paper 8186*. World Bank Group.

Mueller, V., Thurlow, J., Rosenbach, G., & Masias, I. (2019). Africa's rural youth in the global context. In V. Mueller & J. Thurlow (Eds.), *Youth and jobs in Rural Africa: Beyond stylized facts* (pp. 1–21). Oxford University Press, IFPRI.

OECD/SWAC. (2020). *Africa's urbanisation dynamics 2020: Africapolis, mapping a new urban geography* (West African Studies). OECD Publishing. https://doi.org/10.1787/b6bccb81-en.

Schmidt, E., & Woldeyes, F. B. (2019). Rural youth and employment in Ethiopia. In V. Mueller & J. Thurlow (Eds.), *Youth and jobs in Rural Africa: Beyond stylized facts* (pp. 109–136). Oxford University Press, International Food Policy Research Institute.

Smith, L., Alderman, H., & Aduayom, D. (2006). *Food insecurity in Sub-Saharan Africa: New estimates from household expenditure surveys* (Research Report 146). IFPRI.

The Uganda Bureau of Statistics (UBS). (2016). *The Uganda National Panel Survey (UNPS) 2015/2016* (Basic Information Document (BID)). Kampala.

The Uganda Bureau of Statistics (UBS). (2019). *The 2018 statistical abstract*. Kampala. Retrieved February 20, 2020, from https://www.ubos.org/wp-content/uploads/publications/05_2019STATISTICAL_ABSTRACT_2018.pdf

Woldehanna, T., & Oskam, A. (2001). Income diversification and entry barriers: Evidence from Tigray Region of Northern Ethiopia. *Food Policy*, *26*(4), 351–365. https://doi.org/10.1016/S0306-9192(01)00009-4

World Bank. (2015). *The growth challenge: Can Ugandan cities get to work?* (Report No. 94622). Uganda Economic Update 5th Edition.

World Food Programme (WFP). (2008). *Food consumption analysis: Calculation and use of the food consumption score in food security analysis* (Technical Guide Sheet Version 1). Rome: United Nations World Food Programme.

Appendix

Table A1. Descriptive statistics of socio-economic characteristics.

Variable	Obs	Mean	Std. Dev.	Min	Max
Age of household head in years	1,322	46.9	14.6	15	99
Female head (0/1)	1,322	0.32	0.46	0	1
Education of head: Some primary (0/1)	1,322	0.55	0.50	0	1
Post-primary up to complete secondary (0/1)	1,322	0.20	0.40	0	1
Post-secondary (0/1)	1,322	0.07	0.26	0	1
Household size in adult male equivalent	1,322	4.12	2.05	0.4	17.2
No. of household members out-migrated in last 12 months	1,322	0.14	0.40	0	3
No. of times calorie-deficient, 2010–2014	1,322	0.61	0.78	0	3
No. of times FCS-poor/borderline, 2010–2014	1,322	0.78	0.92	0	3
No. of times food expenditure>70%, 2010–2014	1,322	1.89	0.98	0	3
No. of times of food shortage, 2010–2014	1,322	0.67	0.85	0	3
Remittance sending (0/1)	1,322	0.23	0.42	0	1
Networks (No. of outmigrants from same village)	1,322	0.61	0.95	0	6
Improved water source (0/1)	1,299	0.77	0.42	0	1
Household participated in agriculture/livestock (0/1)	1,322	0.87	0.34	0	1
Household participated in non-agriculture enterprise (0/1)	1,322	0.50	0.50	0	1
Tarmac road (0/1)	1,294	0.26	0.44	0	1
Distance to nearest public transport (km)	1,294	2.93	4.21	0	40
Urban (0/1)	1,322	0.19	0.39	0	1

Table A2. The links between internal migration and food security. (Dependent variable: 1 improvement in the household food security, 0 otherwise; or, 1 if household food security got worse, 0 otherwise)

	Food security improved (0/1)			Food security worsened (0/1)		
	(1)	(2)	(3)	(4)	(5)	(6)
	Caloric	FCS score	Vulnerability	Caloric	FCS score	Vulnerability
VARIABLES	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx
Panel A						
No. of migrants	−0.07**	−0.02	0.00	0.04***	0.01	0.00
	(0.03)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)
Age in years	−0.00	−0.00	0.00	0.00	−0.00	−0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Female head (0/1)	0.03	0.03	0.02	−0.02	−0.01	−0.02
	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)
Some primary (0/1)	0.07*	−0.03	0.02	−0.02	−0.03	−0.01
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)
Post-primary (0/1)	0.09*	−0.09***	0.02	−0.04*	−0.07***	−0.04
	(0.05)	(0.03)	(0.04)	(0.02)	(0.02)	(0.04)
Post-secondary (0/1)	0.07	−0.11***	−0.03	−0.03	−0.02	−0.01
	(0.06)	(0.04)	(0.04)	(0.03)	(0.03)	(0.05)
Urban (0/1)	0.00	−0.11***	−0.01	−0.04	−0.03	0.05
	(0.04)	(0.03)	(0.03)	(0.03)	(0.02)	(0.03)
Central region (0/1)	−0.04	−0.15***	0.08	−0.06	−0.06*	0.04
	(0.06)	(0.05)	(0.06)	(0.04)	(0.03)	(0.06)
Eastern (0/1)	0.05	−0.10**	0.04	−0.01	−0.04	0.05
	(0.07)	(0.05)	(0.06)	(0.05)	(0.04)	(0.06)
Northern (0/1)	0.18**	−0.09*	−0.01	−0.05	−0.05	0.06
	(0.08)	(0.05)	(0.06)	(0.05)	(0.04)	(0.06)
Western (0/1)	−0.04	−0.14***	0.04	−0.01	−0.03	−0.04
	(0.06)	(0.05)	(0.06)	(0.06)	(0.04)	(0.05)
Panel B						
No. of migrants	−0.07***	−0.02	0.00	0.04***	0.01	0.00
	(0.03)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)
Household size (AME$^{\forall}$)	0.00	0.00	0.00	0.00	0.00	0.00
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)
Improved water source (0/1)	0.00	0.01	−0.01	−0.01	0.02	0.01
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)
Agriculture/livestock (0/1)	−0.10**	0.10***	0.01	−0.02	0.01	0.08**
	(0.05)	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)
Non-agriculture enterprise (0/1)	−0.02	−0.06***	−0.03	0.02	0.01	0.06***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Tarmac road (0/1)	0.12***	0.05	−0.05*	−0.02	−0.01	0.04
	(0.04)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)
Distance, public transport (km)	0.00	0.00	−0.00	−0.00	−0.00	−0.00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,294	1,294	1,294	1,294	1,294	1,294
Log Likelihood	−622.2	−660.4	−590.7	−446.7	−387.3	−638.3
Pseudo R^2	0.0723	0.0476	0.0170	0.0248	0.0252	0.0229

Standard errors are clustered at the enumeration area level, in parenthesis. *p < 0.10, **p < 0.05, ***p < 0.01.

Table A3. The links between internal migration and the growth in- food energy availability, food consumption score, and the share of food expenditure.

	(1)	(2)	(3)
VARIABLES	Growth in calorie	Growth in FCS	Growth in foodEXPshare
Migrant (0/1)	−0.242***	−0.060	0.027
	(0.069)	(0.040)	(0.031)
Age in years	0.002	0.001	−0.001
	(0.002)	(0.001)	(0.001)
Female head (0/1)	0.117**	0.042	0.012
	(0.052)	(0.032)	(0.021)
Some primary (0/1)	0.045	0.013	−0.031
	(0.061)	(0.044)	(0.025)
Post-primary (0/1)	0.088	0.020	−0.005
	(0.073)	(0.051)	(0.031)
Post-secondary (0/1)	0.041	−0.192***	0.074*
	(0.093)	(0.069)	(0.041)
Urban (0/1)	0.052	−0.022	−0.013
	(0.078)	(0.034)	(0.028)
Central region (0/1)	0.054	−0.012	−0.054
	(0.111)	(0.086)	(0.064)
Eastern (0/1)	0.006	0.014	−0.059
	(0.123)	(0.088)	(0.063)
Northern (0/1)	0.223*	0.004	0.004
	(0.131)	(0.087)	(0.063)
Western (0/1)	−0.013	0.006	−0.086
	(0.119)	(0.086)	(0.065)
Constant	−0.075	0.054	0.105
	(0.148)	(0.096)	(0.078)
Observations	1,294	1,294	1,294
R-squared	0.026	0.019	0.022

Standard errors are clustered at the enumeration area level, in parenthesis. *p < 0.10, **p < 0.05, ***p < 0.01.