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Short-term dynamics of food and nutritional security, poverty, and resilience – analyses of high-frequency household surveys in Uganda, Ethiopia, and Bangladesh

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Abstract

We conduct high-frequency panel surveys to investigate poverty dynamics, encompassing monetary and non-monetary dimensions, using various consumption and nutritional indicators. These surveys are carried out on random samples of rural households in Uganda, Ethiopia, and Bangladesh. Our findings reveal that a significant proportion of households in the lowest quartile in all three countries remain there after 2-3 months and even one year later. Our analysis using multinomial models suggests that natural shocks increase the likelihood of experiencing poverty in Ethiopia and facing food poverty in Uganda. Additionally, conflict-related shocks are strong predictors of chronic and transient monetary poverty in Uganda and escalate the probability of falling into food poverty in Ethiopia. We also observe substantial adverse effects of economic shocks on food poverty in both Uganda and Ethiopia. Furthermore, our results indicate that having a female head of household reduces the likelihood of escaping poverty by up to 14% in Ethiopia and Bangladesh while decreasing the probability of remaining non-poor by 21% and increasing the likelihood of being poor by 12% in Uganda. We recommend targeted interventions, such as investments in human capital, including education, safety nets, and financial policies that empower households to build their asset base, for instance, by acquiring livestock and promoting women empowerment. Such measures are crucial for reducing poverty and enhancing resilience in these communities.

JEL Codes: I32, Q18, 057

1. Introduction and research questions

The recent global challenges, such as climate change, conflicts, increases in commodity prices, and the COVID-19 pandemic, have highlighted the vulnerability of most low- and middle-income countries (LMIC) to shocks. These challenges have led to food and nutritional insecurity and increased poverty. For example, the COVID-19 pandemic led to a significant increase in global acute food insecurity, affecting 270 million people, and pushed nearly 100 million more people into extreme poverty in 2020 (Intergovernmental Panel on Climate Change, 2022). Furthermore, it is estimated that the pandemic has set back global progress in reducing multidimensional poverty index values by 3 to 10 years (Alkire et al., 2022). These shocks have posed significant setbacks to the progress made in poverty alleviation over the years (United Nations, 2020). If the current patterns persist, by 2030, around 7% of the global population (primarily in sub-Saharan Africa) will remain in extreme poverty, and only a third of the nations will have halved their domestic poverty rates (United Nations, 2023).

The persistence of chronic poverty is worsened by a combination of adversities and negative events, in addition to a lack of resilience (Baulch, 2011). Currently, a significant portion of the world's vulnerable population lacks sufficient social protection and alternative sources of income, leading to limited capacity for adaptation. For instance, only 8% of vulnerable individuals in LMICs received cash transfers as part of social protection, and in 2020, approximately 8.5% of children and 23% of older people benefited from social protection[1]. Globally, around 4 billion people, which is roughly half of the population, do not have access to social protection (United Nations, 2023), making them susceptible to falling into poverty or remaining impoverished, particularly when faced with multiple shocks. Hence, poverty eradication is and will continue to be a significant global challenge that requires sustained attention and action.

This study aims to examine the short-term fluctuations of food and nutritional security indicators and the dynamics of poverty and resilience at the household level. The research utilizes unique high-frequency surveys conducted in three developing countries - Uganda, Ethiopia, and Bangladesh. It builds upon previous research by using unique high-frequency surveys conducted in Uganda, Ethiopia, and Bangladesh, allowing for a more in-depth analysis than traditional low-frequency datasets. Previous studies have primarily focused on poverty dynamics using monetary measures (Baulch & Hoddinott, 2000; Muyanga et al., 2013; Radeny et al., 2012; Suri et al., 2008), with a few investigating poverty dynamics using non-monetary measures, such as undernourishment (Mishra & Ray, 2006) using low-frequency data. This study aims to contribute to the existing literature by focusing on monetary and non-monetary measures of poverty, particularly concerning consumption and undernourishment. Additionally, given that poverty is nonstationary, the research will delve into the drivers of short-term movements in and out of poverty and the factors influencing households to remain consistently nonpoor or poor. A comparative analysis across the three developing countries

[11] https://sdgs.un.org/goals/goal1

will be conducted to identify commonalities and differences in the variables of interest, with the aim of informing policy.

The three countries examined in this study are predominantly agrarian, with a significant portion of their land dedicated to agriculture, mainly practiced by rural inhabitants. Additionally, poverty levels remain high, with over 20% of the population living below the national poverty line in each country – a majority of whom are smallholder farmers in rural areas. In these contexts, agriculture and rural development play a pivotal role in the pursuit of Sustainable Development Goal Two (SDG2), which aims to "End hunger, achieve food security and improved nutrition, and promote sustainable agriculture." These efforts also align with the first SDG, which aims to eradicate poverty in all its forms everywhere. Policies focused on enhancing food and nutrition, reducing poverty, and investing in bolstering the resilience of rural households are essential for fostering sustainable development.

The main research questions addressed are,

1. What is the degree of short-term mobility across consumption and nutrition quartiles of households?
2. What are the drivers of households' poverty changes? Specifically, identify and analyze the worst cases that descended into poverty against a set of causes such as shocks, etc.

Our ultimate goal is to emphasize the policy areas that can enhance food and nutritional security, mitigate the impact of extreme poverty, and foster resilience in the short term. This includes focusing on social protection measures and other proactive measures etc.

2. Concept and methodologies

Study design

This study is unique due to the original high-frequency data at the household level. High-frequency panel datasets were conducted after 2-3 months for a span of one year. For Ethiopia, the surveys were conducted between the 2004 and 2005 Ethiopian calendar[2], Bangladesh from 2017 to 2018, and the latest surveys were done in Uganda between 2020 to 2021. The data collection timelines are shown in Table 1.

Table 1: Start dates, months, and years for the different rounds in all countries

Survey	Ethiopia	Bangladesh	Uganda
Round 1 (Baseline)	March 2004 EC	September 2017	22 June 2020
Round 2	June 2004 EC	1 November 2017	31 August 2020
Round 3	October 2005 EC	1 January 2018	14 December 2020
Round 4	January 2005 EC	1 March 2018	01 March 2021
Round 5		7 May 2018	10 May 2021
Round 6		10 July 2018	7th August 2021
Round 7		September 2018	

Study area

The total number of households sampled for Ethiopia was 450, Uganda (640), and Bangladesh (500). However, the sample size for Bangladesh consisted of households from municipalities, approximately 18% of the total sample, which was dropped and not included in the analysis to focus on only rural households for all countries.

Table 2: Districts sampled in countries of study.

Ethiopia (Woreda)	Bangladesh (districts)	Uganda (districts)
Arsi Negele	Gaibandha	Bududa
Adea	Kurigram	Kamwenge
Kombolcha	Lalmonirhat	Kisoro
Anchober	Nilphamari	Kole
Yilmana Densa	Rangpur	Kotido
Ofila		Lira
Gonder Zuria		Moroto
W/Azernet Berber		Sironko
Habru		

[2] This is equivalent to 2012/2013

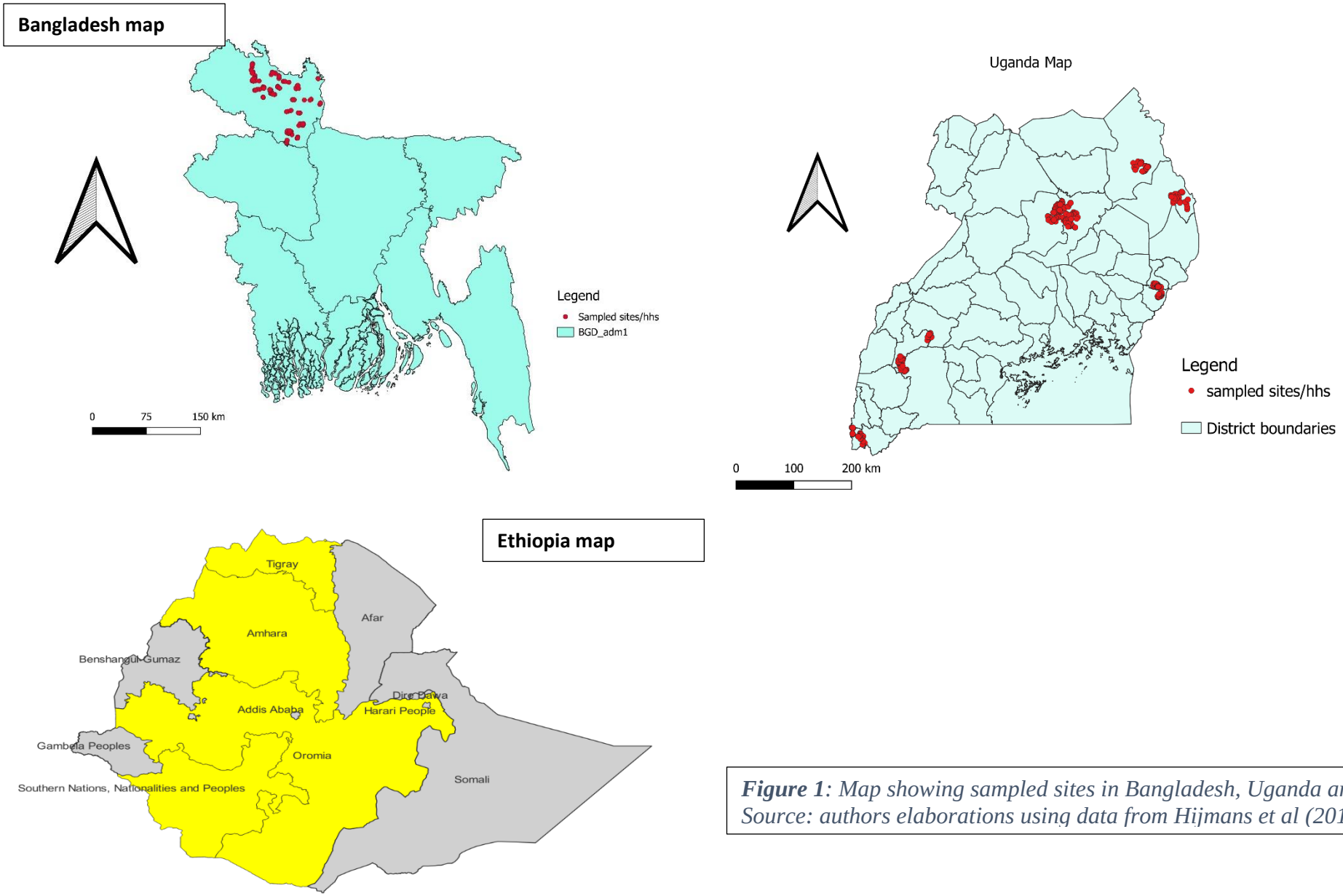

***Figure 1**: Map showing sampled sites in Bangladesh, Uganda and Ethiopia. Source: authors elaborations using data from Hijmans et al (2012)*

Sampling procedure, data collection, and data sources

This study uses primary panel datasets. The panel datasets were collected in collaboration between the Center for Development Research (ZEF) of the University of Bonn and partner organizations in Uganda (the College of Agricultural and Environmental Sciences (CAES) of Makerere University), Ethiopia (Ethiopian Economics Association/Ethiopian Economic Policy Research Institute (EEA/EEPRI)) and in Bangladesh (Bangladesh Agricultural University (BAU), Mymensingh). In Uganda, the sampling strategy was a multi-stage sampling strategy. The study was conducted in eight districts that were purposively selected based on the occurrence of either climate or price shocks in the recent past, namely, Kole, Lira, Kamwenge, Kisoro Kotido, Moroto, Sironko, and Bududa as shown in Table 2 and Figure 1. A sampling frame of each district's sub-counties, parishes, and villages was obtained from UBOS, and four sub-counties were randomly selected in each district. All parishes in the selected sub-counties qualified to participate in the study, while only 25 percent of the villages in each parish were randomly selected, excluding villages within town councils. The household sampling frame was collected by researchers at Makerere University in collaboration with community leaders, and a probability proportionate to size sampling strategy was used to select final households (80 households per district). Research ethics approval was obtained from the Makerere University School of Public Health Institutional Review Board (IRB).

The Ethiopian dataset covers urban and rural households in four major regions: Amhara, Oromiya, Tigray, and SNNPR. However, this study uses data from rural households only. The rural households are from nine woredas (districts), which include Azerinet from SNNPR; Ofila from Tigray; Ankober, Habru, Gonder Zuria, and Yilmana Densa from Amhara; and Kombolcha, Arsi Negele, and Adea from Oromia. In each kebele, which has approximately similar population sizes, a random sampling technique was employed to select 25 households per kebele.[3] Research ethics approval was obtained from the review board of the EEA/EEPRI.

The study in Bangladesh was conducted in the Rangpur division in Northern Bangladesh. 500 households and women and their index child were sampled from the Household Income and Expenditure Survey (HIES) 2010 in five districts: Rangpur, Gaibandha, Nilphamari, Lalmonirhat and Kurigram. The HIES sampling follows a two-stage stratified random sampling based on the population and housing census 2001. Research ethics approval was obtained from the review board of the BAU.

Data were collected through questionnaires, which were administered by trained and experienced enumerators through face-to-face interviews using the Computer-Assisted Personal Interviewing (CAPI) tool in Uganda and Bangladesh and using unassisted personal interviews in Ethiopia. Variables such as household size, consumption (food and non-food), income (wage and non-wage including safety nets, and remittances), and shocks, including health, were collected after every 2-3 months in each country, while education and other time-invariant variables were collected only in baseline survey or in both baseline and end line.[4]

[3] For more details on the sampling framework and the data, please refer to Matz et al. (2015).

[4] All respondents consented to the interviews that were in any case not intrusive.

Rainfall data was extracted from the Climate Hazards Group Infrared Precipitation with Stations (CHIRPS), while data on different nutrient weights were extracted from Tanzania, Uganda, Ethiopia, and Bangladesh food composition tables (FCT). Tanzania FCT was developed by Muhimbili University of Health and Allied Sciences in collaboration with Tanzania Food and Nutrition Centre and Harvard School of Public Health. Uganda FCT was from Harvest Plus, while Bangladesh and Ethiopia FCT were developed by the Institute of Nutrition and Food Science in the University of Dhaka, and the Ethiopian Health and Nutrition Research Institute respectively (Hotz et al., 2012; Lukmanji et al., 2008; Shaheen et al., 2013)

Data variables

Our main dependent variables are poverty-based measures. We adopt poverty definitions used by (Bhuyan et al., 2020) where monetary measures such as consumption per capita denote indirect poverty while nutritional indices measure direct poverty. Apart from food and consumption expenditure metrics, we explore short-term dynamics in calorie consumption of households and diet diversity. Depending on the type of metrics, our dependent variables are categorical variables developed from poverty transition matrices between 2 time periods (stay non-poor, stay poor, exit poverty, and descend into poverty). First, we start by grouping households as poor or non-poor. A household is identified as poor if it falls in the bottom 1st quartile (25% of households with the lowest total consumption (per adult equivalent[5]) in each round, and nonpoor if they are either in the 2nd, 3^{rd,} or 4th quartile. Total consumption consists of food and non-food consumption from different sources, including purchased food, own produce, and food received in kind. Regarding food poverty, a household is considered poor if calorie consumption per adult equivalent is below 2100 kcal/AE (Broussard & Tandon, 2010), and non-poor if their calorie consumption is above the poverty line. The household total consumption measure was for 2 months while calories and other nutrients were converted to daily amounts. Other variables, such as household diet diversity, were computed from the food consumption modules where different food elements consumed in the previous 7 days are grouped into 12 food groups (Swindale & Bilinsky, 2006; Kennedy et al., 2013).

Analysis framework

The first research question is descriptive in nature. Welfare variables are stratified into four equal categories to characterize the degree of inter-temporal poverty mobility across consumption and nutrition quartiles. The procedure is conducted separately for each round and each country, revealing the different welfare paths for each interviewed household. In this study, poverty mobility is tabulated using transition matrices. The values in each cell represent the probabilities of movement from a given to a final quartile, conditional on an initial quartile. The number of matrices computed depends on the rounds conducted in each country. Stratification of welfare measures and tabulation of transition matrices is a common practice

[5] Different weights were used depending on the sex and the age of each household member as previously used by Antonelli et al 2020 and Claro et al., 2010). Weights of children below 10 were similar for both girls and boys in the different age groups. 0.51 weight was used for children of both sexes aged 0-3 whereas those aged 4–6 and 7–10 weighted 0.71 and 0.78 equivalents. Women of all age groups 11- 50 were assigned a similar weight of 0.86 and the oldest ones had a weight of 0.75. Men belonging to age groups 11–14 weighted 0.98, ages 15–18 weighted 1.18, ages 19–50 weighted 1.14 and ages 51 onwards weighted 0.90, respectively.

in poverty mobility studies previously conducted (Block & Webb, 2001; Burke et al., 2007; Mishra & Ray, 2006; Muyanga et al., 2013; Suri et al., 2008).

Apart from stratification of continuous variables, i.e., nutritional measures, e.g., calorie intake, transition matrices are also based on binary poverty measure (food poor) as measured by the undernourishment measure, which considers the minimum calorie cut-off measure. We consider this binary measure since (Burke et al., 2007) highlights the limitation of using tercile or any measure of quantile, including quartiles, which forces equal numbers of sampled households in respective rounds of quantiles. He indicates that there might be shifts in the real level of household welfare measure over time that causes the entire distribution wealth to go up or down, but it's not detected if quantiles are used.

To address the second research question on factors facilitating household movements in different poverty paths, households are further grouped into four categories. These groups include households that were consistently in the poorest quartile (a), those consistently in the wealthiest and middle quartiles (Q2-4) (b), those that descended from top quartiles to bottom (c), and those that exited poverty, i.e., they moved from the bottom quartile to top or middle quartiles. A multinomial logit model, used for unordered categorical variables, is used for analysis to determine the correlates of all categories of poverty transitions (always poor, always nonpoor, exit into poverty, and descend into poverty). This model has been used widely in the study of poverty dynamics (Baulch & Dat, 2011; Baulch & Hoddinott, 2000; Fernández-Ramos et al., 2016; Suri et al., 2008). This model is specified as follows.

$$P_{ij} = \frac{e^{x'_{i\beta j}}}{\sum_{1=1}^{m} e^{x'_{i\beta l}}} \quad j = 1, 2, 3, 4 \ldots m$$

where P is poverty transition outcomes. Results 1, 2, and 3 are for Y, which is assumed to have more than 2 categories and is unordered.

The explanatory variables are defined by X, which consists of factors that lead people or households to fall into poverty, remain in poverty, and exit poverty. Factors such as negative shocks (droughts or floods) and other shocks. Data was collected on various types of shocks, which were later categorized into four major groups: health, conflict, natural, and economic. [6] Each of these variables was treated as a dummy variable in the analysis. Other variables include livestock value (measured in USD), whether a household received the loan, remittances, and if involved in wage labor. Some of these variables contribute to asset accumulation and improved returns to endowments, making people escape from chronic poverty (Baulch, 2011). Apart

[6] Health shocks consisted of serious illness or accident of the income earner and of any other household member, death of the income earner and any other household member while conflict shocks included conflict or violence, imprisonment, divorce and other marital problems such as dowry payment, theft of crop, livestock and other assets. With regards to covariate shocks, natural shocks consisted of all types of climate shocks, pest and diseases, fire and frost, economic shocks included death of livestock, changes in input and output prices, increase in food prices, lack of access to inputs, reduction in earnings of employed and loss of employment, loss of equipment and assets.

from the mentioned factors, we also control for household demographics, for example, household size, share of children and adults, age of the household head, occupation, education of the household head, highest education in the household, marital status, and gender of the household head.

We use baseline covariates collected in all countries for poverty dynamic analysis. A study by Suri et al. (2008) used independent variable values from the initial survey round in order to reduce endogeneity issues in the regressions. However, we also present a descriptive analysis of the characteristics of households based on their poverty transition status and FNS indicators considering two distinct waves and report if there are any significant differences in these characteristics.

3. Results

Descriptive statistics

Household head age was similar across all countries: 47 years in Bangladesh and 46 years in Ethiopia and Uganda, in the baseline data. However, only 6% of households were headed by females in Bangladesh compared to 16% of female-headed households in Ethiopia and Uganda. Most households in all countries were married – 92%, 85.3%, and 84.95 in Bangladesh, Ethiopia, and Uganda, respectively. Similarly, the household size and adult equivalent were higher in Uganda, with 5.7 household members and 4.8 adult equivalents, as shown in Table 3.

Outcome variables

Food consumption and household diet diversity were higher in Bangladesh for all rounds, followed by Ethiopia and Uganda, as shown in Table 3. Food consumption in Bangladesh was more than double the amount households in Uganda and Ethiopia consumed, with higher consumption levels in survey rounds conducted in R4, R6, and R7 compared to other rounds. Higher consumption levels were also recorded in R4 of Ethiopia and R1 of Uganda, mostly in harvesting and post-harvest months, while lower consumption levels in R5 and R1 of Uganda and Ethiopia were conducted during pre and growing seasons. The differences in diet diversity between countries were minimal, with more food groups consumed in R5 and R6 of Bangladesh surveys.

Non-food consumption was higher in Bangladesh, with high consumption rates in R1 and R7, followed by Ethiopia, where consumption rates were higher in R1 and R4. While the above two countries recorded higher non-food consumption in baseline and end-line surveys, Uganda's non-food consumption trend was vice versa, with lower amounts recorded in the baseline and end-line surveys, partly because of the COVID-19 lockdowns.

Calorie values were highest among Ethiopian households with 3113 kcal per day per adult equivalent, followed by Bangladesh and Uganda at 2469 and 2374 kcal per adult equivalent daily amounts. The values of Ethiopia are consistent with those of Worku et al. (2017), who reported an increase in average calories consumed to 3001 kcal per adult equivalent as compared to 1996 values. This is mainly because of the increased consumption of starchy staples, which are the main contributor to the total amount of calorie consumption. Indeed, further results show that the share of food staples out of total food consumption was higher in Ethiopia (52%) than in Uganda (41%) and Bangladesh (37%).

In terms of food poverty and undernourishment, the prevalence was higher in Uganda (58%), followed by Ethiopia (38%) and Bangladesh (24%). The value of the latter two countries is consistent with a study conducted by Broussard & Tandon (2016), where undernourishment rates based on the calorie cutoff of 2100kcal per adult equivalent per day was 21% for Bangladesh and 24.5 for the Rangpur division, where households in this study were sampled, while the prevalence in Ethiopia was 32.6% (Broussard & Tandon, 2016). Protein and iron intake estimates are presented in Table 3.

Table 3: Descriptive statistics for Bangladesh, Uganda and Ethiopia

	Bangladesh							Uganda						Ethiopia			
	R1 (N=408)	R2 (N=398)	R3 (N=399)	R4 (N=400)	R5 (N=402)	R6 (N=399)	R7 (N=396)	R1 (N=638)	R2 (N=637)	R3 (N=633)	R4 (N=631)	R5 (N=626)	R 6 (N=623)	R1 (N=450)	R2 (N=448)	R3 (N=450)	R4 (450)
Month of survey	Sept	Nov	Jan	March	May	July	Sept	June	Sept[7]	Dec	March	May	Aug	March	June	Oct	Jan
Household size (*Number*) mean	4.41	4.41	4.42	4.40	4.48	4.49	4.49	5.76	6.05	5.75	5.60	5.26	5.62	5.16	5.27	5.37	5.42
sd	(1.53)	(1.53)	(1.52)	(1.51)	(1.57)	(1.57)	(1.57)	(2.63)	(2.60)	(2.63)	(2.53)	(2.39)	(2.54)	(2.12)	(2.15)	(2.22)	(2.19)
Adult equivalent (*Number*)	3.96	3.96	3.96	3.95	3.95	3.82	3.80	4.91	5.17	4.89	4.76	4.44	4.80	4.53	4.67	4.59	4.51
sd	(1.37)	(1.38)	(1.38)	(1.38)	(1.38)	(1.29)	(1.29)	(2.36)	(2.29)	(2.29)	(2.20)	(2.06)	(2.19)	(1.89)	(1.90)	(1.88)	(1.88)
HDDS (*counts*)	7.77	7.58	7.11	7.52	8.38	8.17	7.83	7.13	7.36	7.15	7.30	6.94	6.88	6.54	6.99	7.21	7.01
sd	(1.60)	(1.72)	(1.46)	(1.58)	(1.57)	(1.49)	(1.40)	(1.98)	(2.08)	(2.15)	(2.28)	(2.17)	(2.19)	(1.64)	(1.95)	(1.80)	(1.90)
Food consumption (*USD per Adult equiv in 2 months*)	67.2	65.3	64.9	64.7	60.5	83.0	82.5	36.6	33.0	33.8	34.7	32.9	31.7	38.6	44.1	42.2	58.9
sd	(56.6)	(54.0)	(56.9)	(64.9)	(48.0)	(54.9)	(54.1)	(33.5)	(29.2)	(32.5)	(34.3)	(31.7)	(35.5)	(40.5)	(34.1)	(34.5)	(61.9)
Nonfood consumption (*USD per Adult equiv in 2 months*)	46.1	22.2	27.0	27.4	24.4	31.2	48.6	8.54	13.5	16.6	18.4	23.5	13.3	16.6	9.52	10.7	16.8
sd	(112)	(37.1)	(48.2)	(30.3)	(32.5)	(31.9)	(91.2)	(12.2)	(31.4)	(29.0)	(45.8)	(66.8)	(29.7)	(43.0)	(12.6)	(13.6)	(26.6)
Total consumption (*USD per Adult equiv in 2 months*)	113.2	87.5	91.9	105.4	84.9	114.2	131.1	45.1	46.5	50.4	53.1	56.4	45.0	54.6	53.5	52.8	75.7
sd	(129.6)	(73.1)	(77.8)	(78.0)	(63.9)	(67.3)	(107)	(40.9)	(49.2)	(50.8)	(62.6)	(82.9)	(54.5)	(62.1)	(39.1)	(41.3)	(77.5)
Share of food in total consumption *(fraction*)	0.63	0.73	0.70	0.71	0.71	0.71	0.68	0.82	0.75	0.72	0.71	0.69	0.73	0.72	0.83	0.81	0.78
Daily calories (Kcal *per Adult equiv)*	2537	2352	2390	2435	2433	2621	2516	2554	2257	2391	2373	2419	2248	2492	3241	3092	3630
sd	(798)	(619)	(623)	(568)	(612)	(552)	(564)	(2027)	(1794)	(1756)	(1663)	(1704)	(1845)	(2122)	(1961)	(1878)	(2543)
Food poor (*calories <2100 adult equivalent*) 1= Yes)	0.24	0.31	0.29	0.25	0.24	0.15	0.19	0.54	0.62	0.57	0.55	0.57	0.63	0.54	0.34	0.36	0.29
Daily protein (grams/AE)[8]	54.5	51.5	50.4	52.1	55.0	57.6	58.4	63.6	62.9	65.8	65.9	64.6	62.4	61.2	78.1	70.5	79.6
	20.7	15.6	16.3	(15.3)	(15.8)	(14.7)	(16.1)	38.6	36.0	36.1	36.1	35.6	36.8	45.3	(44.5)	(42.4)	(46.1)
Daily Iron intake (mg/AE)	12.2	10.3	8.15	9.03	12.68	12.02	11.7	24.7	23.2	23.58	22.7	22.2	22.8	73	99	95	108
	(6.01)	(3.67)	(3.09)	(3.08)	(4.84)	(4.29)	(4.61)	(23.3)	(25.6)	(21.7)	(20.1)	(16.1)	(18.8)	(72)	(83)	(75)	(121)

[7] Since the start was 31st august, most households were interviewed in September

[8] https://ourworldindata.org/grapher/daily-per-capita-protein-supply

Shocks

Large heterogeneity exists in the types of shocks experienced by households across countries, as shown in Figures A1 and A2 of the appendix. Shocks were captured over five years in the baseline for all countries and over a 2–3-month recall period in the subsequent waves. For shocks experienced in the last five years, captured in R1 for all countries in Figure A1 (A), at least two-thirds of households in the three countries experienced any shock. In Uganda and Ethiopia, most households experienced a covariate shock, while the trend is different for Bangladesh, where more households experienced an idiosyncratic shock.

Economic shocks were prevalent in Ethiopia, with at least 20% of the households experiencing this shock every round. In contrast, conflict-related shocks were higher in Uganda, as shown in Figure A2. Health shocks were higher in Uganda and Bangladesh from R2 onwards. In general, covariate shocks were common in Uganda and Ethiopia, and the two countries experienced more shocks than Bangladesh. Covariate shocks include changes in prices (food, input, and output prices), climate shocks (droughts, floods, irregular rains, cyclones, landslides and erosion), and violence, while idiosyncratic shocks include health shocks (illness, accidents and death), theft, divorce, separation and dowry/marriage, loss of employment or reduction in earnings, imprisonment, forced contributions, division of property, crop and livestock pests and diseases. A similar grouping of covariate and idiosyncratic shocks and economic, health, natural, and conflict shocks have been used previously by Dercon et al. 2005 and Yilma et al. 2014. Both studies indicate that it is difficult to label a specific shock as purely covariate and idiosyncratic since many shocks lie in between, for instance, pests and diseases (Dercon et al., 2005).

Short term Transitions

Transition matrices examine the extent of movement in and out of poverty. Intertemporal mobility across quartiles in terms of total consumption and calorie intake are presented as computed[9]. However, Figure 2 represents only selected transitional matrices for survey rounds (1, 2, and 3) appearing in all the countries. The values represent probabilities of movement between quartiles, conditional on the initial quartile, and values along the diagonal represent the probabilities that a household would stay in its initial quartiles. Transition matrices were conducted only on households surveyed in all rounds in the respective country's surveys.

Results indicate that at least a third of the households in the bottom quartile remained in their original consumption quartile one year later. Uganda recorded a higher number of households (54%) remaining in the poorest consumption quartile in the final round, followed by Bangladesh (42%), and only 37% of households in Ethiopia remained in the bottom quartile, as shown in Figure 2. In all countries, 30% of the households initially in the second quartile remained in this quartile in the final round, while around 30-35% originally in the third quartile remained in the same quartile in the final round, and 38-50% initially in the uppermost quartile remained in that quartile in the final round, with a high probability in Uganda (50%) and Ethiopia (45%). A similar mobility trend is observed in the first and second rounds, where at

[9] We do not report all results because of space limitations.

least 50% of households originally in the poorest quartile in Bangladesh and Uganda remained in the same quartile in the second round.

In the subsequent rounds, a higher proportion of households originally in the poorest quartile in Bangladesh remained in this quartile between the fourth and sixth rounds (68%) and sixth and seventh rounds (67%). For Ethiopia, a higher proportion remained in the poorest quartile is observed in the transition matrix between round 2 and round 3 (47%), while for Uganda, it is between round 4 and round 5, and round 5 and round 6[10]. Most of these trends occurred in the transition matrix involving rounds that occurred during the lean season (round 4 of Bangladesh, round 2 of Ethiopia, and round 5 of Uganda. A similar mobility trend occurred in the caloric intake quartile even though the magnitude was lower.

Table 4 presents food poverty transition matrix estimates based on calorie cutoff. Results indicate that 33%, 36%, and 77% of households who were originally poor remained poor in the final round of surveys in Bangladesh, Ethiopia, and Uganda, respectively. At least 50% of non-poor households in the first round remained non-poor in the final round, with a high proportion of non-poor households in Bangladesh. A similar movement trend between rounds is observed, as reported in the total consumption and calorie mobilities.

[10] These results are not shown but available upon reasonable request

Figure 2: Quartile transition matrices for total consumption per adult equivalent

Table 4: Food poverty transition matrix

	Bangladesh			Ethiopia			Uganda		
	Round 7			**Round 4**			**Round 6**		
		Non-poor	Poor		Non-poor	Poor		Non-poor	Poor
Round 1	Non-poor	85	15	Non-poor	74	26	Non-poor	53	47
	Poor	67	33	Poor	64	36	Poor	23	77
		Round 2			**Round 2**			**Round 2**	
		Non-poor	Poor		Non-poor	Poor		Non-poor	Poor
Round 1	Non-poor	76	24	Non-poor	74	26	Non-poor	56	44
	Poor	49	51	Poor	59	41	Poor	23	77
		Round 3			**Round 3**			**Round 3**	
		Non-poor	Poor		Non-poor	Poor		Non-poor	Poor
Round 2	Non-poor	84	16	Non-poor	74	26	Non-poor	61	39
	Poor	41	59	Poor	44	56	Poor	31	69
		Round 4			**Round 4**			**Round 4**	
		Non-poor	Poor		Non-poor	Poor		Non-poor	Poor
Round 3	Non-poor	85	15	Non-poor	78	22	Non-poor	69	31
	Poor	52	48	Poor	52	48	Poor	28	72
		Round 5						**Round 5**	
		Non-poor	Poor					Non-poor	Poor
Round 4	Non-poor	89	11				Non-poor	65	35
	Poor	35	65				Poor	24	76
		Round 6						**Round 6**	
		Non-poor	Poor					Non-poor	Poor
Round 5	Non-poor	90	10				Non-poor	60	40
	Poor	73	27				Poor	19	81
		Round 7							
		Non-poor	Poor						
Round 6	Non-poor	87	13						
	Poor	46	54						

Empirical results

The marginal effects estimations of multinomial logit models (MNL) are shown in Tables 5, A1, and A2. Similar covariates are used in all estimations; the only difference is the consumption variables used for the welfare categories. The base category in MNL is the non-poor category; however, since the marginal effects output gives the probability of each outcome level independent of the base outcome, the interpretation is made without referring to the base category. Table 5 shows results of the determinants of welfare change in round 1 and final round defined by total consumption per adult equivalent.

In all countries, we find that the exposure to idiosyncratic or covariates shocks reduced the probability of being non-poor or exiting poverty. In both Bangladesh[11] and Uganda, a major covariate shock that affected all households, preceded the data collection. In Bangladesh, major flooding, and in Uganda, the COVID-19 pandemic and the national lockdown. Because all households were affected, these shocks cannot be represented in the empirical model. In Ethiopia, natural shocks reduce the probability of staying nonpoor and increase the probability of being poor. A similar effect is observed on health shocks, which are negatively associated with being non-poor and positively associated with descending into poverty. In Uganda, conflict-related shocks strongly predicted chronic poverty, descending into poverty and reducing the probability of staying non-poor. In Bangladesh, shocks have little and insignificant effect on household poverty dynamics. The effects of remittances, loans, and safety nets on poverty dynamics are minimal and mixed.

The association between the gender of the household head and the likelihood of exiting poverty is strong in Bangladesh and Ethiopia, while in Uganda, the gender of the household head is a great predictor of being non-poor and poor. In all cases, female-headed households are disadvantaged since being female reduces the probability of exiting poverty by up to 14%, reduces the probability of being non-poor by 21%, and increases the probability of being poor by 12%. Both the education of the household head and the education of any other household member are associated with a reduced probability of being poor and descending in poverty and the likelihood of remaining non-poor in Uganda. In Bangladesh, household education matters in increasing the probability of being non-poor, while in Ethiopia, higher household education reduces the probability of being poor. A larger share of children increases the probability of remaining poor in Uganda to a smaller extent, and a large share of adults reduces the probability of being non-poor in Uganda.

[11] In a separate estimation, we replaced natural shocks with rainfall z scores and extreme events relevant for Uganda and Bangladesh. Since it was not possible to have a common cutoff for z scores given huge differences in rainfall z scores, for the two countries, we added relevant rainfall shock for Uganda (low rainfall < -1 SD) and high rainfall (> 3SD) for Bangladesh as well as controlled for the z scores, and all other covariates previously included in the estimations. Results indicated that extremely high rainfall in Bangladesh significantly increased the probability of descending into poverty , while low rainfall in Uganda was associated with a reduced likelihood of staying non-poor.

An increase in productive assets such as livestock was associated with an increased likelihood of staying non-poor in both rounds in all countries, a reduced probability of being poor in Ethiopia and Uganda, and a reduced probability of descending into poverty in Bangladesh. These results are consistent with (Fernández-Ramos et al., 2016; Suri et al., 2008) and in contrast with (Baulch & Dat, 2011). Having a member involved in wage labor increased the likelihood of staying non-poor and decreased the probability of chronic poverty in Uganda, while in Ethiopia, it reduced the probability of falling into poverty.

Similar results are reported in the MNL estimation, consisting of dynamic poverty categories defined with alternative consumption variables (i.e., calories and food poverty) as shown in Table A2. Being a female household head increased the probability of chronic poverty by at least 30% and decreased the probability of being noon-poor by at least 20% in Ethiopia[12]. Human capital variables consistently increased the probability of remaining non-poor in all countries, while wage labor increased the probability of staying nonpoor in Ethiopia and Uganda. Household size increased the probability of staying poor in all countries, while the share of children decreased the likelihood of escaping poverty in Uganda. Considering the dynamic categories of food poverty, natural and economic shocks increased the probability of staying poor and significantly reduced the likelihood of escaping poverty in Uganda, while health and conflict shocks did not have an effect. Remittances increased the probability of staying non-poor in Uganda for food poverty, while safety nets increased the probability of exiting poverty and reduced the likelihood of descending into poverty in Ethiopia in the calorie and food poverty estimations.

Apart from poverty dynamics in the initial and final wave, we also studied poverty dynamics between each country's 1st and 2nd rounds. Results in Table A1 display relatively similar results as reported, where education, female head, sex of household head, marital status, livestock, natural shocks, and conflict shocks were the main determinants of poverty mobility.

[12] Results not shown due to space limitations but available upon request

Table 5: Multinomial logit models result of total consumption transitions – round 1 & final rounds (Marginal effects)

	Bangladesh (N=384)				Ethiopia (N=404)				Uganda (N=618)			
	Non-poor	Poor	Exit poverty	Descend poverty	Non-poor	Poor	Exit poverty	Descend poverty	Non-poor	Poor	Exit poverty	Descend poverty
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Age in years (log)	0.053	-0.001	-0.002	-0.049	-0.101	0.133*	-0.118	0.086	-0.061	0.103**	-0.024	-0.018
	(0.103)	(0.075)	(0.081)	(0.077)	(0.105)	(0.074)	(0.080)	(0.082)	(0.067)	(0.045)	(0.059)	(0.048)
Female head	0.190	0.016	-0.114**	-0.092	0.144	-0.019	-0.138***	0.013	-0.204***	0.116***	0.009	0.080
	(0.148)	(0.114)	(0.054)	(0.076)	(0.095)	(0.058)	(0.050)	(0.080)	(0.073)	(0.041)	(0.054)	(0.055)
Household size	0.016	0.019	-0.006	-0.029*	-0.078***	0.045***	0.036***	-0.002	-0.039***	0.024***	0.025***	-0.010*
	(0.020)	(0.012)	(0.016)	(0.018)	(0.015)	(0.009)	(0.011)	(0.012)	(0.006)	(0.005)	(0.005)	(0.006)
Share of children	-0.246	0.209	0.008	0.029	-0.168	0.104	-0.149	0.213	-0.185	0.262*	-0.152	0.075
	(0.230)	(0.191)	(0.180)	(0.166)	(0.225)	(0.163)	(0.169)	(0.174)	(0.150)	(0.152)	(0.126)	(0.118)
Share of adults	0.039	0.062	-0.044	-0.056	-0.069	0.164	-0.158	0.062	-0.300**	0.235	-0.032	0.096
	(0.212)	(0.187)	(0.169)	(0.152)	(0.188)	(0.145)	(0.145)	(0.147)	(0.139)	(0.146)	(0.115)	(0.107)
Head education	0.022***	-0.002	-0.008	-0.012*	0.009	0.006	-0.008	-0.008	0.017***	-0.018***	-0.002	0.002
	(0.007)	(0.005)	(0.006)	(0.006)	(0.010)	(0.006)	(0.008)	(0.008)	(0.005)	(0.005)	(0.005)	(0.005)
Highest education	0.002	-0.002	-0.001	0.001	0.009	-0.014**	0.004	0.001	0.025***	-0.009***	-0.004	-0.011***
	(0.008)	(0.006)	(0.007)	(0.006)	(0.009)	(0.005)	(0.007)	(0.007)	(0.006)	(0.003)	(0.005)	(0.005)
Single (*base - married*)	0.316***	-0.106***	-0.139***	-0.072	-0.103	-0.076***	0.344	-0.165***	0.295***	-0.158***	-0.006	-0.131***
	(0.080)	(0.017)	(0.018)	(0.079)	(0.235)	(0.013)	(0.233)	(0.022)	(0.059)	(0.013)	(0.059)	(0.015)
Widowed	-0.274	0.061	0.186	0.026	-0.369***	0.155	0.328**	-0.114**	0.232***	-0.114***	-0.048	-0.070**
	(0.192)	(0.144)	(0.235)	(0.178)	(0.101)	(0.140)	(0.159)	(0.046)	(0.058)	(0.025)	(0.045)	(0.034)
Divorced	-	-	-	-	-0.319***	0.087	0.282	-0.050	0.064	-0.158***	0.225	-0.131***
					(0.116)	(0.135)	(0.184)	(0.078)	(0.237)	(0.013)	(0.237)	(0.015)
Separated	-0.617***	-0.106***	-0.139***	0.861***	-0.172	-0.076 ***	-0.134***	0.381	0.302***	-0.158***	-0.122***	-0.022
	(0.025)	(0.017)	(0.018)	(0.019)	(0.336)	(0.013)	(0.017)	(0.336)	(0.074)	(0.013)	(0.014)	(0.074)
Wage labor	-0.046	0.044	0.038	-0.037	0.085	-0.014	0.011	-0.082*	0.093**	-0.117**	0.014	0.011
	(0.047)	(0.032)	(0.036)	(0.036)	(0.053)	(0.033)	(0.039)	(0.045)	(0.042)	(0.046)	(0.034)	(0.039)
Savings & credit	-0.038	-0.024	0.030	0.031	0.089	-0.029	-0.088*	0.028	0.039	-0.079***	0.033	0.007
	(0.049)	(0.035)	(0.037)	(0.037)	(0.058)	(0.038)	(0.048)	(0.042)	(0.030)	(0.024)	(0.025)	(0.025)
Livestock value (log)	0.025***	-0.008	-0.007	-0.010*	0.027*	-0.015**	0.004	-0.016*	0.031***	-0.009**	-0.019***	-0.003
	(0.008)	(0.006)	(0.006)	(0.006	(0.014)	(0.007)	(0.012)	(0.010)	(0.006)	(0.004)	(0.005)	(0.005)
Natural shock	0.028	-0.002	0.001	-0.027	-0.109**	0.056*	-0.010	0.062	-0.028	0.032	-0.007	0.003
	(0.061)	(0.041)	(0.047)	(0.050)	(0.051)	(0.032)	(0.038)	(0.040)	(0.037)	(0.027)	(0.031)	(0.030)
Health shock	-0.074	0.018	0.043	0.014	-0.125*	-0.040	0.021	0.143***	0.052	-0.004	-0.020	-0.028
	(0.047)	(0.032)	(0.036)	(0.036)	(0.072)	(0.045)	(0.060)	(0.045)	(0.033)	(0.024)	(0.029)	(0.028)

Conflict shock	0.089*	-0.042	0.022	-0.069*	1.366	0.256	-1.907	0.285	-0.113***	0.070***	-0.017	0.061**
	(0.050)	(0.036)	(0.038)	(0.042)	(76.995)	(17.656)	(114.914)	(20.264)	(0.033)	(0.022)	(0.029)	(0.025)
Economic shock	-0.004	-0.061	0.059	0.006	0.025	0.002	0.006	-0.033	0.087*	-0.087*	-0.001	0.001
	(0.085)	(0.070)	(0.059)	(0.060)	(0.642)	(0.034)	(0.042)	(0.042)	(0.049)	(0.046)	(0.039)	(0.042)
Received loan	0.008	0.014	0.041	-0.064	-0.022	-0.001	-0.057	0.080*	-0.039	-0.015	0.078	-0.024
	(0.065)	(0.043)	(0.045)	(0.057)	(0.068)	(0.042)	(0.058)	(0.046)	(0.088)	(0.082)	(0.063)	(0.095)
Remittances	0.047	0.005	-0.040	-0.012	0.148*	-0.024	-0.079	-0.046	0.048	-0.018	-0.047	0.018
	(0.064)	(0.044)	(0.053)	(0.050)	(0.088)	(0.054)	(0.079)	(0.065)	(0.068)	(0.066)	(0.062)	(0.058)

Conclusion and policy-related findings

In this study, we revisit the association of shocks on short-term consumption patterns and the movement in and out of poverty using high-frequency data collection from rural areas in three LDCs, Bangladesh, Ethiopia, and Uganda. We identified significant fluctuation in welfare outcomes over the course of the 1-year study period but limited opportunities for households to exit poverty from detailed transitional matrices. Furthermore, we studied factors influencing transient and persistent poverty dynamics. Multinomial estimates showed that education and livestock increased the likelihood of staying non-poor in all countries, and wage labor and remittances increased the probability of staying non-poor in Uganda and Ethiopia, respectively. On the other hand, increases in household size, number of children, age, and natural and conflict shocks increased the probability of staying poor in some countries. Furthermore, health and conflict shocks increased the likelihood of descending into monetary-based poverty, while economic, natural, and conflict shocks increased the probability of persistent food-related poverty and reduced the likelihood of exiting non-monetary poverty. Membership in savings and credit groups reduced poverty in Uganda. Investments in physical, human, financial, and social capital are recommended to ensure food and nutritional security, reduce poverty, and increase the resilience of households against negative shocks and vulnerabilities.

The results of our study paint a stark picture of the vulnerability of rural households in all study countries to covariate shocks, particularly those related to weather, economics, and conflicts. These shocks significantly heighten the risk of households descending into poverty and chronic poverty. When these shocks strike, households are often faced with direct loss or destruction of productive assets, such as in the case of floods or conflicts. In addition, households may also experience indirect asset loss when they are forced to sell assets to cope with the effects of the shocks. This can have long-term implications for these households, further limiting their ability to escape poverty (Doss et al., 2018). Assets are useful in serving as collateral for obtaining loans that may help affected households absorb shocks by accessing credit to smooth consumption (Glewwe & Hall, 1998). Our research underscores the crucial role of assets in poverty and resilience. Households lacking assets or those that have depleted their assets are more vulnerable to becoming poor. This highlights the need for policies and interventions that focus on asset building and protection to enhance household resilience and reduce poverty.

Multinomial estimates show a positive association between livestock and an increased likelihood of staying non-poor in both rounds in all countries. An increase in livestock reduces the probability of being poor in Ethiopia and Uganda and reduces the probability of descending into poverty in Bangladesh. Therefore, policies that enhance access to credit and insurance should be designed to help households cope and recover from a shock without disposing of their productive assets since this exacerbates poverty and increases the likelihood of descending into poverty. One of the insurance programs implemented in East Africa, including Ethiopia, to strengthen pastoralists' resilience and economic viability by safeguarding the loss of livestock due to drought is Index-based livestock insurance (IBLI). Microfinance institutions are also important in enabling households to acquire assets.

We find that safety nets in Ethiopia reduce transitory poverty (i.e reduce the probability of staying in poverty and increase the probability of exiting poverty)[13]. This underscores the importance of safety nets since they were originally designed as protective measures against transitory shock-induced poverty (Béné et al., 2012). Ethiopia is one of the countries in SSA that have one of the largest productive safety net programs, implemented by the governments not only to respond to short-term shocks experienced in the country but also to reduce chronic food insecurity, targeting populations residing in areas highly affected by climate shocks. The PSNP was initiated in 2004, and over time, it has increased poor households' resilience to shocks due to the numerous components, such as the provision of food and cash transfers and access to social services such as health and education and risk financing mechanisms (World Bank 2013).

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[13] Results not presented but available upon request.

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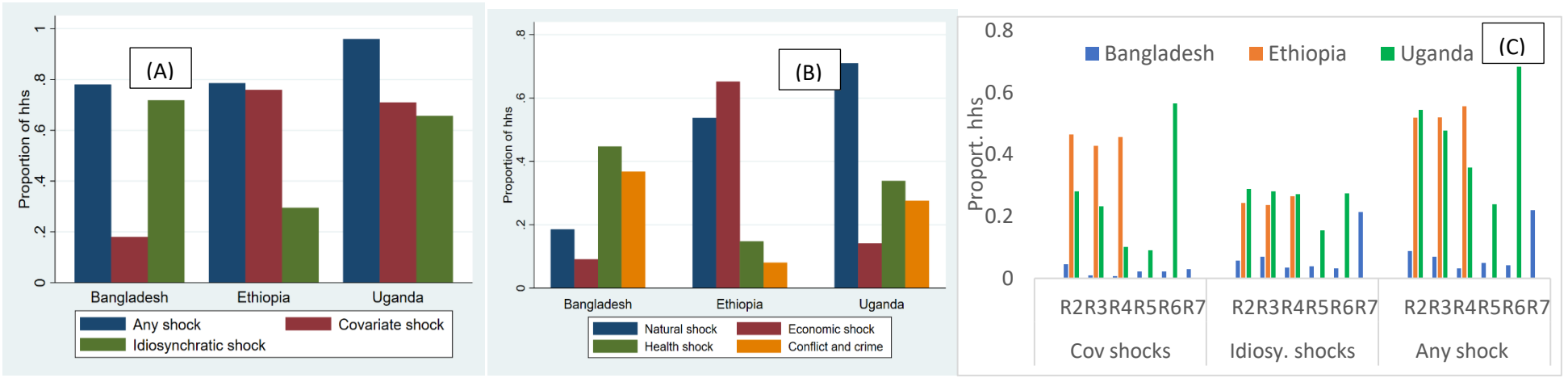

Figure A1: Types of shocks experienced in the countries[14] for Round 1 (A&B), and R2-R7 (C)

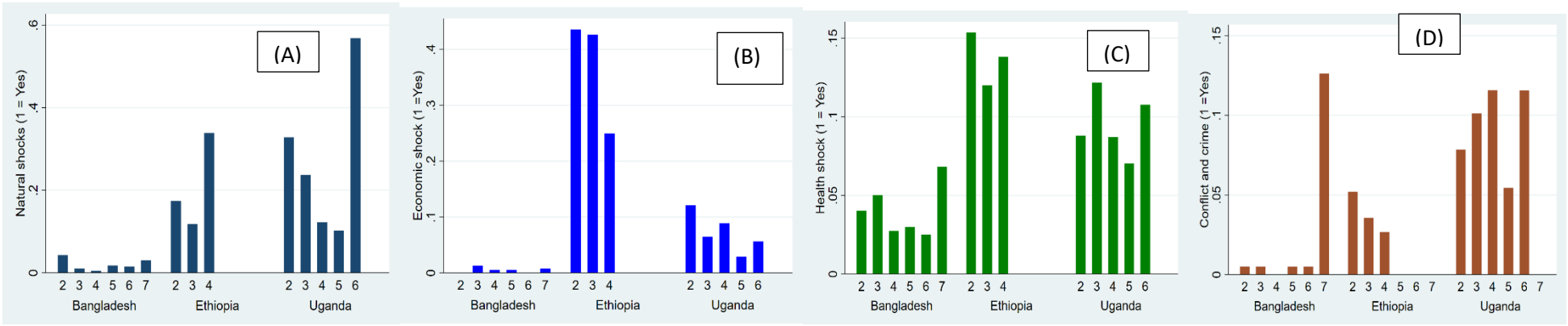

Figure A2: Natural, Economic, Health, and Conflict-related shocks in all countries from R2 to R7

[14] NB- recall period for first wave was 5 years in all countries. From R2 onwards recall for Uganda and Bangladesh is 2 months and Ethiopia 3 months

Table A1: Multinomial logit models result of total consumption transitions – round 1 & round 2 (Marginal effects)

	Bangladesh				Ethiopia				Uganda			
	Non-poor	Poor	Exit	Descend	Non-poor	Poor	Exit	Descend	Non-poor	Poor	Exit	Descend
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Wage labor	-0.070	0.012	0.069**	-0.012	0.067	0.002	0.002	-0.071	0.060	-0.132***	0.014	0.058*
	(0.048)	(0.035)	(0.034)	(0.034)	(0.054)	(0.031)	(0.040)	(0.045)	(0.047)	(0.051)	(0.034)	(0.033)
Savings & credit	-0.027	-0.012	0.019	0.020	0.113*	-0.079*	-0.047	0.013	0.030	-0.053**	0.011	0.011
	(0.051)	(0.037)	(0.035)	(0.035)	(0.059)	(0.041)	(0.047)	(0.043)	(0.033)	(0.025)	(0.025)	(0.026)
Livestock (log)	0.024***	-0.014**	-0.001	-0.008	0.017	-0.016**	0.003	-0.004	0.037***	-0.011***	-0.017***	-0.008*
	(0.008)	(0.006)	(0.006)	(0.006)	(0.014)	(0.007)	(0.011)	(0.011)	(0.007)	(0.004)	(0.005)	(0.005)
Natural shock	0.011	-0.057	0.035	0.011	-0.119**	0.071**	-0.024	0.072**	-0.030	0.007	0.013	0.010
	(0.062)	(0.051)	(0.039)	(0.043)	(0.051)	(0.031)	(0.038)	(0.040)	(0.041)	(0.030)	(0.032)	(0.031)
Economic shock	-0.041	-0.026	0.035	0.032	-0.017	-0.018	0.025	0.010	0.106**	-0.064	-0.018	-0.024
	(0.084)	(0.063)	(0.057)	(0.053)	(0.054)	(0.033)	(0.042)	(0.042)	(0.053)	(0.046)	(0.041)	(0.044)
Health shock	-0.104**	0.022	0.033	0.049	-0.057	-0.038	-0.005	0.099**	0.011	-0.025	-0.003	0.017
	(0.047)	(0.035)	(0.033)	(0.034)	(0.072)	(0.048)	(0.059)	(0.046)	(0.036)	(0.027)	(0.028)	(0.028)
Conflict shock	0.009	-0.062	0.035	0.017	0.161*	-0.096	-0.137	0.072	-0.084**	0.054**	-0.002	0.032
	(0.052)	(0.040)	(0.035)	(0.036)	(0.097)	(0.076)	(0.097)	(0.055)	(0.037)	(0.025)	(0.029)	(0.028)
Remittances	0.026	-0.023	-0.007	0.004	0.058	-0.074	-0.036	0.052	0.103	-0.131	0.027	0.001
	(0.066)	(0.050)	(0.046)	(0.045)	(0.085)	(0.062)	(0.073)	(0.055)	(0.079)	(0.089)	(0.058)	(0.060)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table A2: Multinomial logit models result of calorie transitions – round 1 & final rounds (Marginal effects A), and food poverty transitions (B)

	Bangladesh				Ethiopia				Uganda			
	Non-poor	poor	Exit poverty	Descend poverty	Non-poor	poor	Exit poverty	Descend poverty	Non-poor	poor	Exit poverty	Descend poverty
Wage labor	-0.079	0.030	0.019	0.029	0.160***	-0.025	-0.036	-0.099**	0.068	-0.055	0.058*	-0.070
	(0.051)	(0.031)	(0.038)	(0.036)	(0.055)	(0.032)	(0.041)	(0.048)	(0.048)	(0.041)	(0.033)	(0.046)
Savings & credit	0.028	0.000	-0.039	0.012	0.006	0.009	-0.061	0.046	0.070**	-0.061**	-0.002	-0.007
	(0.053)	(0.032)	(0.041)	(0.036)	(0.059)	(0.030)	(0.046)	(0.044)	(0.034)	(0.026)	(0.027)	(0.028)
Livestock value (log)	0.008	-0.002	0.009	-0.016***	-0.005	-0.009	0.032**	-0.017*	0.038**	-0.008*	-0.029***	-0.002
	(0.009)	(0.006)	(0.007)	(0.006)	(0.016)	(0.007)	(0.014)	(0.010)	(0.007)	(0.004)	(0.005)	(0.005)
Natural shock	0.067	0.026	0.006	-0.099	-0.070	0.052*	0.006	0.012	-0.030	0.002	0.017	0.012
	(0.065)	(0.035)	(0.046)	(0.055)	(0.054)	(0.029)	(0.040)	(0.042)	(0.042)	(0.029)	(0.034)	(0.033)
Health shock	0.030	-0.029	0.045	-0.045	0.091	0.051	-0.225**	0.084*	0.002	0.007	-0.023	0.014
	(0.051)	(0.031)	(0.037)	(0.037)	(0.094)	(0.033)	(0.100)	(0.051)	(0.038)	(0.026)	(0.030)	(0.030)
Conflict shock	0.004	0.043	-0.057	0.010	0.019	0.004	-0.135	0.112**	-0.144***	0.038	0.021	0.085***
	(0.053)	(0.032)	(0.039)	(0.038)	(0.103)	(0.043)	(0.104)	(0.057	(0.037)	(0.025)	(0.030)	(0.028)
Economic shock	-0.034	0.032	0.001	0.001	0.108*	-0.039	0.001	-0.070	0.030	-0.019	0.004	-0.016
	(0.087)	(0.048)	(0.065)	(0.063)	(0.056)	(0.029)	(0.043)	(0.043)	(0.052)	(0.040)	(0.040)	(0.046)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
B Food Poverty transitions												
Wage labor	-0.097**	0.046*	0.023	0.027	0.151***	-0.150***	0.014	-0.016	0.077**	-0.070	0.029	-0.035
	(0.049)	(0.027)	(0.039)	(0.033)	(0.049)	(0.048)	(0.050)	(0.038)	(0.038)	(0.048)	(0.032)	(0.044)
Savings & credit	0.029	0.006	-0.033	-0.001	-0.018	-0.008	-0.005	0.031	0.037	-0.093***	0.029	0.027
	(0.052)	(0.027)	(0.042)	(0.034)	(0.057)	(0.046)	(0.053)	(0.039)	(0.032)	(0.036)	(0.026)	(0.033)
Livestock value (log)	0.005	0.004	0.003	-0.011**	0.005	-0.020**	0.018	-0.003	0.032***	-0.026***	-0.004	-0.002
	(0.009)	(0.005)	(0.007)	(0.006)	(0.014)	(0.010)	(0.014)	(0.009)	(0.008)	(0.008)	(0.006)	(0.007)
Natural shock	0.088	0.012	0.004	-0.105*	-0.036	0.044	0.004	-0.011	-0.051	0.188***	-0.058*	-0.079**
	(0.067)	(0.032)	(0.047)	(0.057)	(0.051)	(0.042)	(0.049)	(0.037)	(0.037)	(0.043)	(0.030)	(0.037)
Health shock	-0.045	0.035	0.005	0.005	0.163***	-0.134***	-0.064	0.035	-0.027	-0.021	0.025	0.023
	(0.084)	(0.042)	(0.065)	(0.056)	(0.054)	(0.041)	(0.051)	(0.039)	(0.044)	(0.052)	(0.034)	(0.046)
Conflict shock	0.016	-0.042	0.034	-0.008	0.115	0.104*	-0.305***	0.085**	-0.015	0.024	0.005	-0.014
	(0.050)	(0.028)	(0.038)	(0.033)	(0.073)	(0.054)	(0.091)	(0.040)	(0.035)	(0.040)	(0.029)	(0.036)
Economic shock	0.008	0.024	-0.034	0.002	0.007	0.032	-0.127	0.088*	-0.104**	0.135***	-0.061*	0.029
	(0.052)	(0.028)	(0.040)	(0.035)	(0.088)	(0.065)	(0.104)	(0.046)	(0.041)	(0.041)	(0.035)	(0.037)