# Did COVID-19 Market Disruptions Disrupt Food Security? Evidence from Households in Rural Liberia and Malawi*

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**Abstract**

We use data collected from panel phone surveys to quantify the effect of market disruptions due to COVID-19 lockdowns on food security of households in rural Liberia and Malawi. We estimate effects using two distinct empirical approaches: (a) an event study around the date of the lockdowns (March to July 2020), and (b) a difference-in-differences analysis comparing the lockdown period in 2020 to the same months in 2021, which helps us control for any seasonal effects. In both countries, market activity was severely disrupted and we observe declines in expenditures. However, we find no evidence of declines in food security.

*JEL Codes:* O12, O13, Q12

*Keywords:* COVID-19, market disruption, food security, Liberia, Malawi

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# 1 Introduction

Rural Africa has largely been an afterthought during the COVID-19 pandemic, due in part to relatively lower disease prevalence.[1] Yet while case counts are relatively modest, economic disruptions were nearly as intense as those in developed countries, at least near the beginning of the pandemic.[2] What was the impact of these lockdowns on the livelihoods of rural households?

This study takes place in rural Liberia and Malawi. Both countries implemented versions of lockdowns from roughly March 2020 to July 2020, though restrictions were more severe in Liberia (which ordered a full shelter-in-place for 3 months) than in Malawi (which did not impose shelter-in-place but still closed schools and placed restrictions on transportation and gatherings). Both countries restricted cross-border movement. In both countries, many services were disrupted, and we document large declines in market activity. We find that even in these rural areas, knowledge about the virus was high, that people were concerned about contracting the virus and changed their behavior consistent with health guidance, and that market disruptions were enforced.

The data used in this paper was collected as part of an ongoing evaluation of a large unconditional cash transfer (UCT) program, which takes place in 300 villages each in both countries. At the beginning of the project (in 2018), 20% of the sample (2 respondents per village, or about 600 total households) were selected to take part in monthly phone surveys that began well before the global onset of COVID-19 (November 2019 in Liberia and July 2019 in Malawi), and have continued for more than a year after the lockdowns were first implemented in both countries. The survey was conducted every 2 months for each household (with half of the sample interviewed each month). Because they are randomly selected, these respondents are representative of the approximately 32,000 households (with a total population of about 150,000) in these 600 villages.

The main outcome for this paper is food security, which we measured in a consistent fashion both before and after the pandemic. We use 3 measures which are recommended for use by organizations such as the FAO and USAID, and have been validated in several settings to meaningfully correlate

[1] At this writing, according to Worldometer, there have been about 8.6 million cases and 220,000 deaths in Africa (population 1.2 billion), and more than a third of these are in the country of South Africa. By contrast, North America has experienced approximately 57 million cases and nearly 1.1 million deaths (population 580 million), and Europe has experienced approximately 67 million cases and 1.3 million deaths (population 740 million).

[2] A map-visualization of the stringency of the lockdowns (as of May 2020, the height of restrictions), based on the University of Oxford's Government Response Tracker is available here: https://ourworldindata.org/grapher/covid-stringency-index?year=2020-05-01.

with food security.[3] These are (1) the household dietary diversity score (HDDS); (2) the food consumption score (FCS); and (3) the household hunger scale (HHS). In addition, the surveys include questions on income, labor supply, expenditures, transfers and other related outcomes, as well as a module on attitudes towards COVID, and resultant behavior changes, which was added in May 2020.

We use this data in two distinct empirical strategies to measure the impact of the lockdowns on food security in these areas. In the first, we use a similar methodology as several other studies of COVID, and use the time series from our survey data to measure the changes in food security immediately after the lockdowns were implemented, i.e., in an event study design.

In the second strategy, we take advantage of the distant vantage point of 18 months from when the lockdowns were first imposed, to measure the effects in a difference-in-differences framework. Specifically, we measure changes in food security in April-August of 2020 (relative to January-February 2020) and compare them against the difference between the same months in 2021. The advantage of this second design is that it can attempt to net out seasonal differences, which are likely important in this setting in which seasonality (due especially to the harvest cycle) will affect prices and food availability. Our identifying assumption is that the effects of the lockdown on food security and prices had dissipated by 2021, such that 2021 is a valid counterfactual.

Our main result, using both the empirical designs, is that while baseline food security is low,[4] we observe no evidence of a decline during the lockdown. We believe that these results stem in large part from these being mostly subsistence households - while we observe a decline in food expenditures and total expenditures, food security levels are preserved. This result is despite the fact that direct government support was non-existent: no households in our samples reported receiving any cash or food support from the government or an NGO during the lockdown.

The null result on food security that we estimate was not expected by the research team, and contrasts both with popular discourse and with most (though not all) of the rapidly emerging academic research around COVID-19. Because these countries are so poor and lack formal safety nets, many commentators initially expected devastating effects, warning of millions being pushed

[3]For more information, see the Tufts University's INDDEX project: https://inddex.nutrition.tufts.edu/data4diets/indicators.

[4]For example, in Liberia, 40% of households reported at baseline that a household member went to bed hungry in the past month, while in Malawi this percentage was 48%.

into poverty and even of imminent starvation (FAO et al. 2020, Laborde et al. 2020, Cardwell and Ghazalian 2020). These dire predictions were not just a phenomenon early on in the pandemic - many completed academic studies have generally found substantial negative effects. For example, Egger et al. (2021) construct a sample of 16 surveys in 9 countries in Africa, Asia, and Latin America, and find substantial declines in employment, income, and food security in all settings; Josephson et al. (2021) find evidence of a decline in food security using panel data in Nigeria, and speculate that similar effects must have come about in Ethiopia, Malawi, and Uganda. A number of other studies also show declines in food security in many developing countries (e.g. Mahmud and Riley 2021, Amare et al. 2021, Kansiime et al. 2021, Ahmed et al. 2021, Gupta et al. 2021).[5]

Why do our results differ so dramatically? It is of course entirely possible that the effect of the lockdowns were simply different in Liberia and Malawi. However, we conjecture that another possibility is that ours is one of the few studies to measure food security before and after the crisis, using internationally accredited measures, rather than retrospective questions about food security after the lockdowns had been implemented. It is possible that retrospective questions overstate the severity of the crisis on food security. Moreover, our measures also remain consistent in the survey modality through which they are measured (over the phone throughout), while many other studies use in-person measures from prior to the pandemic, and phone surveys thereafter.[6]

Finally, the rural setting of our study might have also been protective. Rural areas were less likely to be affected by the virus, because of low population density, remoteness from population centers, and reliance on farming (which can be practiced at social distance), and so COVID itself did not spread widely in rural Africa. Perhaps some of these factors also insulated households from lockdowns - while economic activity in urban population centers clearly declined, this may not have spilled over into more rural areas. In our samples, people earn very little income to start with (less than $10 per month), and we find no evidence of a decline in income in Liberia. While we find a modest decline in Malawi, this appears to be mostly seasonal. Similarly, while markets were restricted, they were nevertheless open, and the price of food changed only modestly.

While the majority of published research has shown negative effects of COVID-19 market restrictions, ours is not the only study to show more modest effects. Adjognon et al. (2021b) analyze

[5]See Picchioni et al. (2021) for a review of the evidence generated in the immediate aftermath of the pandemic.
[6]This specific challenge of change in survey length and modality for measuring the impacts of the pandemic using household surveys is also emphasized by Upton et al. (2021).

longitudinal data from 5 African countries, and find evidence supporting a worsening of food security in only 1 (Nigeria), leading them to conclude that a number of contextual factors, such as a terms of trade improvement in the case of Mali, and a bumper harvest in the case of Malawi, may have afforded protection from the pandemic, a finding that is mirrored in our work. Ceballos et al. (2020) find that impacts of lockdowns were linked with market integration levels – farmer incomes declined in remote areas where market integration was poorer, but consumption improved because more stocks were available locally. Adjognon et al. (2021a) provide evidence from Mali that while food security worsened nationally due to the pandemic, only urban households identified the pandemic as the reason behind the lower levels of food security, suggesting that seasonal changes in food availability are an important consideration in rural areas, and that all changes in rural food security are not necessarily attributable to the pandemic.

Our findings are also similar to Hirvonen et al. (2021) and to Lee et al. (2020), who find no worsening of food security in urban Addis Ababa and Delhi, respectively, despite a decrease in incomes; in the case of Delhi, however, this is driven by government-provided assistance. Unlike these papers, we do not observe a decline in income in our data, since our sample is made up largely of subsistence farmers. It is also worth noting that income declines will not necessarily lead to declines in food security as in the face of an income shock, households will likely reallocate expenditures from discretionary consumption towards essentials, such as food. For example, in the multi-country studies described in Egger et al. (2021), even though there are declines in food security, they are, by and large, much smaller in magnitude than the declines in income. Janssens et al. (2021) also make this nuanced point by showing that in the wake of the pandemic, poor households in rural Kenya were able to preserve their level of food expenditure by reallocating spending away from schooling and transportation, as well as by cutting back on informal risk-sharing and delaying repayment of loans. Therefore, the take-away from this set of papers should not be that poor households in developing countries have not been impacted by the pandemic, but simply that they have managed to preserve their *low* levels of food security during the pandemic, likely by cutting back on other expenditures.

The rest of this paper is organized as follows. Section 2 describes the study context, Section 3 documents market disruptions in the study sample, Section 4 presents results, and Section 5 discusses possible explanations for the results and concludes.

## 2 Data and Study Context

This project is based on field work that has been ongoing in Liberia and Malawi since 2018 (Aggarwal et al. 2021). The design is nearly identical in both countries, with minor context-specific differences. In each country, we are evaluating the effect of UCTs which are being given out by the NGO GiveDirectly (henceforth, GD). The cash transfers average $500 at current exchange rate (not PPP), roughly equivalent to annual household expenditures. The treatment is randomized at the village level: in treatment villages, all households receive cash, while control villages receive nothing. Transfers are made via mobile money; since pre-existing mobile money usage is low, beneficiaries are given the option to buy cell phones.

The study areas were chosen by GD and USAID based on poverty levels, cell phone coverage, and proximity to roads. In Liberia, the project takes place in 6 districts in Bong and Nimba counties; in Malawi, it takes place in Chiradzulu and Machinga districts in the Southern Region. In Liberia, the project was phased in over 2 years: a first wave (90 villages in Bong county only) was enrolled in early 2019, while a second wave (210 villages in both the counties) began enrolling in early 2020. However, due to COVID-related disruptions, many villages were not enrolled until late August. In Malawi, all villages were enrolled in 2019. A map of study locations, with pins of the study villages and markets, is included as Figure A2. Figure A1 has a timeline of project activities.

We drew a sample using information provided by GD. To select villages, GD visited each village considered for study inclusion, where GD field staff marked each habitation structure with a GPS pin. We randomly selected 10 households from this list of GPS pins, and targeted female heads of households for surveys (because intimate partner violence is a key outcome in our main study).

In total, 600 villages were sampled (300 in each country), and we attempted to enroll 10 households per village in the data collection study. Where possible, treatment intensity was varied by geographic location (the smallest level of governance above the village), and stratified by TA in Malawi and district/clan in Liberia.[7]

[7] In this paper, we do not report effects of the cash transfers on food security during COVID. This is because transfers were disrupted by COVID in the 2nd wave of data collection in Liberia, which form the bulk of our phone study sample in that country.

## 2.1 Households phone surveys

Our ongoing evaluation was designed to measure the time-varying effects of cash transfers. We randomly selected 2 households per village to receive cell phones (worth $10-15), and enumerators have been calling them every 2 months for approximately 2 years. The sample was drawn such that 1 household per village is called in even-numbered months, and the other in odd-numbered months (so we have 1 household per village per month, and a panel for every household at 2-month frequency). These surveys were wrapped up in August 2021 for Malawi and are still ongoing as of this writing (November 2021) for Liberia.[8]

Our main outcome is food security, but the phone survey also included questions on income, expenditures, transfers, savings, and related outcomes. We have 3 measures of food security: (1) the household dietary diversity score (HDDS), which groups foods into 12 categories, and the enumerator queries the respondent about each individual category, recording whether at least one food item in each category was consumed in the past 24 hours;[9] (2) the food consumption score (FCS), which is similar to HDDS but measures frequency of consumption rather than just indicators for 9 food groups (over the past 7 days), and ranges from 0-112;[10] and (3) the household hunger scale (HHS) is based on a series of 6 questions such as "In the past 4 weeks (30 days), was there ever no food to eat of any kind in your house because of lack of resources to get food?" and "In the past 4 weeks (30 days), did you or any household member go to sleep at night hungry because there was not enough food?" This score ranges from 0-6.[11]

Shortly after the lockdowns began, we redesigned our phone surveys to include modules geared towards measuring the impact of the unfolding crisis. These surveys started in May 2020 after IRB approvals. First, we asked a series of questions about knowledge, attitudes and behavior changes around COVID. Second, we added modules to retrospectively measure outcomes that had not been measured previously. Specifically, we added questions on spousal labor income as well as business outcomes. To construct a comparison month, we measured these month-by-month from February

[8]The household phone surveys for Liberia Wave 1 began in October 2018, and were wrapped up just before the lockdowns were implemented. Wave 2 began surveying in November 2019. Therefore, to study the effects of the COVID-19 disruptions in Liberia, we use the Wave 2 sample only.
[9]These survey questions were based on guidance in FAO (2013).
[10]These survey questions were based on guidance in WFP (2008).
[11]These survey questions were based on guidance in Ballard et al. (2011).

2020 to May 2020 in the May and June 2020 round of the surveys,[12] and for the month preceding the survey during survey rounds thereafter. While we administered the redesigned surveys to everyone in the phone survey sample, this paper reports results only for the GD control group in order to be able to abstract away from any protective benefits afforded by the cash transfers.

Table A1 shows attrition from the household phone surveys. Completion rates range from 50%-79% in Liberia and are higher, 79%-97%, in Malawi. This is because the cellular network is stronger in rural Malawi, and because of a technical issue with the SIM cards provided as part of the cash transfer. In general, completion rates trend downwards, as respondents change phone numbers or decide to opt out of the surveys. However, there is no break in completion around the COVID lockdown period (March - July 2020). Furthermore, in order to allay concerns about our results being driven by attrition, we re-run all our regressions by including only those households who are present in the data for that calendar month in both years. We find no qualitative difference in any of our findings when we restrict our sample in this manner.

### 2.2 Summary statistics

Table 1 presents summary statistics from our baseline survey. Because we want this paper to be able to speak to the average lockdown experience, we focus our analysis only on the cash transfer control groups and present statistics for that group only.

From Panel A, the vast majority of the sample is female (since we targeted female heads), and the average respondent is 40 years old. Most respondents are married and the average household has 4-5 members. Panel B shows data on income, expenditures, and assets. The sample universally earns income from farming, and only 24-29% report having a business. The average household spends about US $44-53 per month, i.e., less than $0.40 per day per capita.

The average household has about $225 in assets in Liberia and $1,300 in Malawi, but the majority of this is in the form of land and housing. Other non-land assets (durable goods, livestock and financial assets) are only $10 in Liberia, and just over $80 in Malawi. Financial assets are almost non-existent: cash savings is less than $10 in each country, and outstanding household debt is similarly sized; in fact, household net financial wealth is negative in Malawi and only $2.70 in Liberia.

[12] Recall that only half the phone survey sample was interviewed each month.

Panel C documents food security. While our main results will show indices as described above, we present some intuitive components of those indices here, since they are more understandable. We find that 40-44% of respondents report skipping a meal in the past month because there was not enough food, and about a quarter experienced no food for an entire day.[13]

[13] In Table A8, we use data from publicly available large-scale household surveys for both countries - the 2016 wave of the HIES for Liberia and the 2019 wave of the LSMS for Malawi - to show that while our sample is selected in very specific ways (as described in section 2 and is not meant to be fully representative, these households are still fairly representative of not just the study areas, but also of the rural populations in their respective countries, in general.

Table 1: Household Summary Statistics

| | Liberia | | Malawi | |
|---|---|---|---|---|
| | Mean | SD | Mean | SD |
| **Panel A: Demographics** | | | | |
| =1 if female | 0.76 | | 0.95 | |
| Age | 41.81 | 15.18 | 38.69 | 14.22 |
| =1 if currently married or has partner | 0.83 | | 0.67 | |
| Years of education | 3.24 | 3.72 | 4.90 | 3.42 |
| Number of household members | 4.76 | 2.33 | 4.76 | 2.15 |
| **Panel B: Income, expenditure, and assets** | | | | |
| =1 planted any crop in most recent agriculture season | 0.96 | | 0.99 | |
| *Sources of income*[a] | | | | |
| =1 if sold any harvest | 0.72 | | 0.53 | |
| =1 if owns a business enterprise | 0.24 | | 0.29 | |
| =1 if worked as casual labor | 0.23 | | 0.36 | |
| =1 if earned other labor income | 0.06 | | 0.02 | |
| Household monthly expenditure | 53.05 | 44.57 | 43.98 | 54.97 |
| Household food expenditure | 21.90 | 16.60 | 14.75 | 15.01 |
| =1 if respondent has access to mobile phone[b] | 0.24 | | 0.29 | |
| =1 if house owned | 0.65 | | 0.85 | |
| =1 if house has thatch roof | 0.20 | | 0.52 | |
| Total value of land and housing | 227.81 | 377.52 | 1,316.55 | 2,035.92 |
| Total net value of durable goods, livestock, and financial asset | 12.28 | 36.90 | 80.01 | 118.65 |
| Total value of physical assets | 9.57 | 31.55 | 83.65 | 118.21 |
| Net value of financial assets | 2.70 | 19.43 | -3.64 | 14.36 |
| Savings | 6.57 | 15.68 | 3.91 | 8.94 |
| Outstanding household debt | 3.87 | 11.98 | 7.55 | 15.31 |
| **Panel C: Food security** | | | | |
| *For any household member in the past month:* | | | | |
| =1 if skipped a meal | 0.34 | | 0.38 | |
| =1 if went to sleep hungry | 0.29 | | 0.46 | |
| =1 if had no food for an entire day | 0.15 | | 0.28 | |
| Observations | 206 | | 297 | |

Note: Outcomes from the baseline surveys conducted in November - December 2019 for Liberia Wave-2 and April - July 2018 for Malawi. Sample includes GiveDirectly control households only and excludes Wave 1 for Liberia. All monetary values are in USD and Winsorized at the 99th percentile. Exchange rates used for calculation are 733 Malawian Kwacha (MWK) = 1 USD and 198 Liberian Dollars (LRD) = 1 USD (May 14, 2020).

[a] These are not mutually exclusive. A person might have income from multiple sources.

[b] This was measured before we provided a mobile phone.

# 3 Documenting Market Disruptions in Liberia and Malawi

Liberia's response to COVID was typical for Africa. Following the first case on March 16, 2020, the country immediately banned entry from countries with more than 200 cases, closed schools,

and restricted public transportation. On March 21, the government announced a state of national health emergency, placing restrictions on all gathering places, including markets. On March 24, Montserrado and Margibi counties (including the capital) were ordered to shelter in place. Overland borders were closed. On April 8, the shelter-in-place was extended to the counties of Nimba, and Grand Kru, and to the entire country on April 24. Restrictions were removed on July 22.

Malawi's response was more atypical, due to a legal challenge upheld by the country's High Court. The government announced a "state of disaster" on March 20, 2020, which mandated school closures, restrictions on public gatherings and on travel. On April 1, the border with Mozambique closed. On April 14, the government announced a country-wide lockdown (due to start on April 18), but this order was challenged and was overturned by the High Court on April 19. Without a country-wide lockdown, Malawi's response was one of the weakest in Africa, scoring 57/100 (compared to 88/100 for Liberia) on the Oxford COVID-19 Government Response Tracker.[14]

As of this writing, Liberia has had about 6,000 cases and 300 deaths (population of about 5 million), while the corresponding numbers in Malawi are 62,000 and 2,300 (with a population of about 18 million). New cases and deaths have largely petered out by this time.

### 3.1 Descriptive evidence on disruptions

Table 2 documents that lockdown measures by the government during March-July 2020 disrupted overall economic activity. Panel A shows that in Liberia, all activities were almost universally restricted. The extent of disruptions is much smaller in Malawi, but nevertheless schools, religious centers and public transportation were restricted or closed.

Panel B summarizes self-reported behavior changes. Almost everyone in both countries reports that they stopped shaking hands, started washing hands more frequently, and followed social distancing norms. A significant fraction of people reported limiting travel and wearing masks.[15]

Panel C presents economic disruptions as reported by food vendors. Again, the disruption is felt more strongly in Liberia, where 98 percent of vendors reporting that they are closed or reduced

[14] See https://www.bsg.ox.ac.uk/research/research-projects/coronavirus-government-response-tracker.

[15] Table A2 shows a few other selected indicators. Respondents are universally aware of the virus, and levels of concern about it are quite high (this is true even in Malawi where public health measures were more muted). Respondents overwhelmingly trust information coming from the government, and take the virus as a serious threat. However, from Panel C, no households in Malawi reported any assistance to cope with the crisis (we did not collect this data for Liberia).

business hours, relative to 25 percent in Malawi. Vendors report difficulty sourcing supplies, and report that the cost of stocking the same bundle of supplies as they did in February would cost 38% more in Liberia and 23% more in Malawi. Table A3 shows statistics on income losses, using retrospective data. We find large reductions in profits in Liberia, declining to almost zero by May 2020, and smaller but still substantial losses in Malawi of about 40% in April and 20% in June.

Table 2: Disruptions

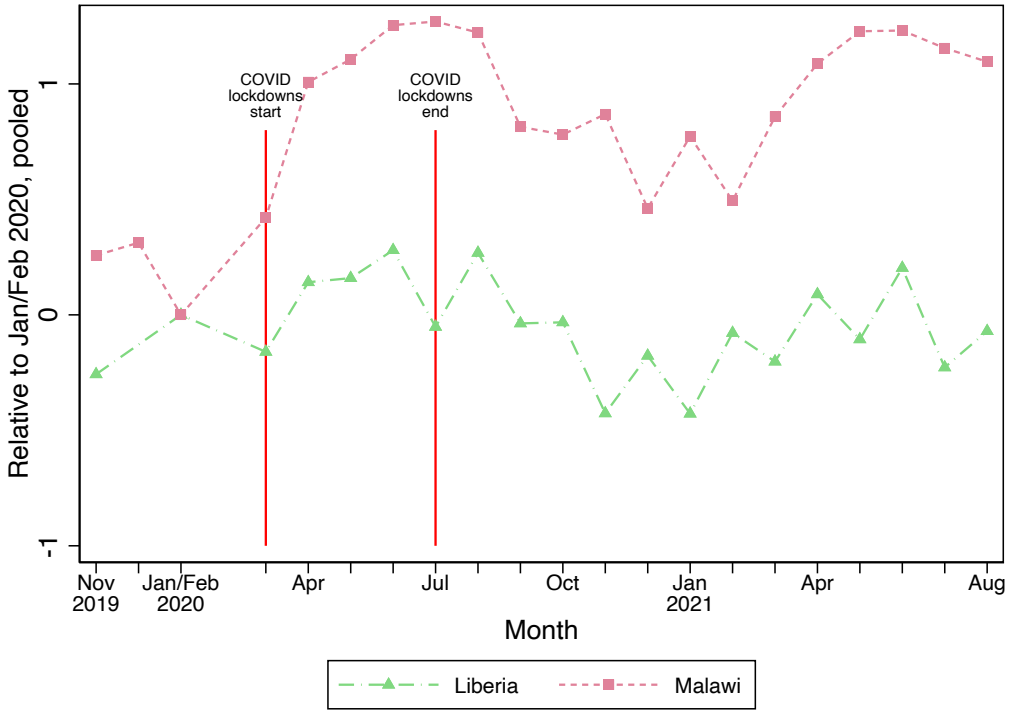
| | Liberia | Malawi |
|---|---|---|
| **Panel A: Economics activities** | | |
| =1 if following places/activities were closed/restricted: | | |
| schools (e.g. public, private, universities, colleges, etc.) | 0.98 | 0.99 |
| markets | 0.93 | 0.15 |
| retail shops | 0.90 | 0.11 |
| restaurants | 0.95 | 0.19 |
| entertainment centers (e.g. bars, clubs, betting centers, etc.) | 0.95 | 0.28 |
| religious centers (e.g. churches and mosques) | 0.86 | 0.71 |
| barber shops, beauty salons | 0.92 | 0.12 |
| supermarkets | 0.96 | 0.17 |
| gas stations | 0.90 | 0.09 |
| public transportation | 0.90 | 0.67 |
| street selling | 0.89 | 0.20 |
| mobile money agents | 0.89 | 0.10 |
| **Panel B: Behavior changes** | | |
| =1 if: | | |
| traveled less to shops or markets | 0.93 | 0.57 |
| started wearing a mask | 0.77 | 0.32 |
| stopped shaking hands | 0.97 | 0.95 |
| washed hands more often | 0.94 | 0.95 |
| cleaned things I touch more often | 0.73 | 0.46 |
| stopped going to religious services | 0.90 | 0.59 |
| kept social distance from people | 0.96 | 0.85 |
| Observations | 983 | 1,548 |
| **Panel C: Business disruptions on Crop Vendors** | | |
| =1 if: | | |
| closed or reduced business hours | 0.98 | 0.25 |
| inventory spoiled | 0.23 | 0.18 |
| consumed inventory for myself | 0.44 | 0.12 |
| supply source changed | 0.33 | 0.09 |
| Change in supply price from Feb to Now (%)[a] | 38.25 | 22.57 |
| | (40.27) | (47.19) |
| Observations | 654 | 1,021 |

Note: Means reported and standard deviations in parentheses. Data comes from first survey after COVID disruptions (in May-July 2020). Panel A and B sample includes both food vendors and households, while Panel C includes food vendors only.
[a] This is calculated from the reported cost of procuring a fixed bundle of items February 2020 versus when the survey was conducted, which ranges from May-July 2020.

# 4 Effect of COVID-19 lockdowns on food security

In this section, we present results on food security. Before showing the formal results, we start by presenting a time series of the food security index for both countries, starting well before the beginning of the lockdowns (November 2019) and continuing until the end of our data collection in August 2021. This series is plotted in Figure 1 and provides visual evidence that neither country experienced a worsening of food security during or after the lockdowns. In a simple pre-post comparison, food security actually improved in Malawi and was mostly unchanged in Liberia.

Figure 1: Trends in Household Food Security Index (z-score)




Note: Food Security Index is a standardized z-score of HDDS, FCS, and HHS (negatively weighted), using inverse covariance weighting (Anderson 2008) relative to pooled data from January and February 2020. For Liberia, the figure shows the phone survey data for Wave 2 only.

To analyze this data rigorously, we utilize our phone survey data in two distinct empirical approaches: (1) an event study around the date of the lockdown in March 2020; and (2) a difference-in-difference analysis comparing the same months in 2020 and 2021. For the event study, we restrict analysis to data collected between January and August 2020 (except March 2020, which was only partially affected). We run the following specification using January-February 2020 as a reference group:

$$y_{imt} = \sum_{m=Apr}^{Aug} \beta_{mt} D_{mt} + \mu_i + \varepsilon_{imt}, \tag{1}$$

where $D_{mt}$ is the effect for month $m$ in year $t$ and $\mu_i$ is a household fixed effect. The outcome variable $y_{imt}$ is a composite food security index ("FSI") of three different indices of food security – HDDS, FCS, and HHS – and higher values indicate greater food security.[16] $\beta_m t$ represents the difference in food security pre- and post-COVID lockdowns.

For the difference-in-difference specification, we restrict data to those same months in both 2020 and 2021 (January-August, but again excluding March), and run the following, with standard errors clustered at the household level:

$$y_{imt} = \alpha D_{2020} + \sum_{m=Apr}^{Aug} (\gamma_m + \beta_m D_{2020}) D_t + \mu_i + \varepsilon_{imt}, \tag{2}$$

where $D_{2020}$ is a dummy variable, taking a value of 1 for year 2020 and 0 for year 2021. $\gamma_m$ captures seasonality for a particular month as an average across the two years. The coefficient of the interaction term, $\beta_m$, is a vector of difference-in-difference estimators that compare the change in food security between January and August in 2020 to the change over the same period in 2021. The identifying assumption is that 2021 is a valid counter-factual for seasonal time trends, i.e. that without COVID lockdown measures, the seasonality between January and August in 2020 would have been comparable to the seasonality in 2021.

Finally, in order to account for endogenous attrition, we run a third specification, similar to Equation 2, but with the addition of a household * calendar month fixed effect. Doing so ensures that the estimated coefficient for each month is based on the support of only that sample which is present in the data in that calendar month for both the years - 2020 as well as 2021. Therefore, the regression we estimate is the following:

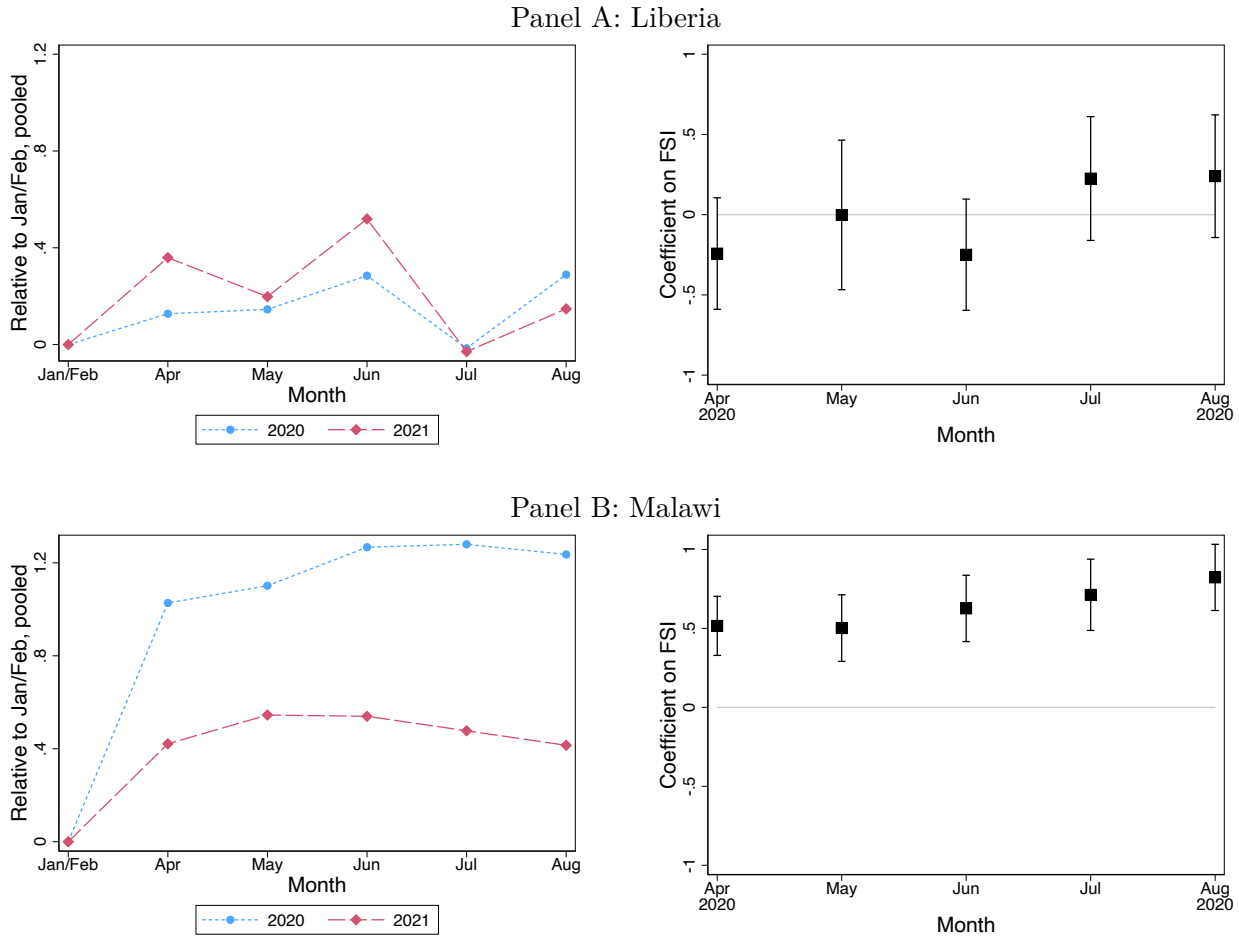
$$y_{imt} = \alpha D_{2020} + \sum_{m=Apr}^{Aug} (\gamma_m + \beta_m D_{2020}) D_t + \mu_{im} + \varepsilon_{imt}, \tag{3}$$

We present regression results separately for Liberia and Malawi graphically in Figure 2. For each country, the left-hand panel shows the event study estimates for each year and the right-hand

[16] Since lower values of HHS is better, the FSI includes the inverted value of the HHS.

panel shows the difference-in-difference estimates. The difference-in-difference estimates are based on the specification given in Equation 3.

Figure 2: Effect on Household Food Security Index (z-score)




Note: The regression results for this figure are reported in Table A4. The figure shows effects on the Food Security Index (z-score) using the household phone survey data from January - August for 2021 and 2021, excluding surveys conducted in months of March, as March 2020 was partially both pre- and post-COVID disruptions. Figures on the left correspond to event study results, while figures on the right show coefficients from the difference-in-differences specification in equation (2). The omitted group in the difference-in differences regressions is January / February 2021 (the comparison group of calendar months against the last survey round in 2020 right before COVID lockdowns). The difference-in-difference regressions include interactions between household fixed effects and calendar month fixed effects. All regressions control for household fixed effects and standard errors are clustered at the household level. The Food Security Index is a standardized z-score of HDDS, FCS, and HHS (negatively weighted), using inverse covariance weighting (Anderson 2008) relative to pooled data from January and February 2020.

Food security in 2020 is denoted in the blue dotted lines, and shows that food security improved during post-COVID lockdown months (i.e. months starting from April 2020) relative to the pre-COVID period (i.e. January and February 2020). The increase is 0.15-0.35 standard deviations in Liberia, while it is 0.8-0.9 standard deviations in Malawi. However, much of this change is due to

seasonality, as can be seen in the red dashed line, which denotes food security in 2021. The 2021 figures show an increase over the same time period, showing that that the jump between Jan/Feb and the subsequent months we see in 2020 can partially be explained by seasonality.

To difference this seasonal trend out, we implement the difference-in-difference in which we compare changes in 2020 to 2021. The difference-in-differences estimates on the right show that controlling for trends mitigates observed changes, but does not turn estimates negative. In fact, if anything, food security improved slightly in Liberia (0-0.35 standard deviations) and significantly so in Malawi (0.2-0.4 standard deviations).

We present corresponding regression results for both the event study and the diff-in-diff design in Table A4. Panel A shows Liberia and Panel B Malawi. Columns 1 and 4 show the event study for each country, and are followed by difference-in-differences specifications with and without household X month fixed effects. From the event study, we see an increase in food security of 0.19-0.39 standard deviations during the COVID lock-down period in Liberia, and an even bigger rise of more than 1 standard deviation in Malawi. From the difference in difference, we see that this increase is partially seasonal - effects are attenuated in both countries - in Liberia, all months are indistinguishable from zero, and some treatment effects are even negative. Similarly, the effects are smaller in Malawi but still substantial. This latter result could be attributed to a stronger harvest in Malawi in 2020 relative to 2021.[17]

We complement our main food security outcome, FSI, with food and household expenditure in Figure A4 and Figure A5. Interestingly, we see evidence of declines in food expenditure in both countries, at least when accounting for seasonal variation in the difference-in-difference. Thus, while we observe clear changes in expenditures (which is intuitive since market hours were restricted during this time period), this does not translate into food security directly. One explanation is that food expenditure was already low (i.e. less than a dollar per day), which makes not too painful for households to substitute to lower quality foods, or to consumption from own production.[18]

[17] According to the Ministry of Agriculture and Food Security, the maize harvest in 2020 was 11% larger than that in 2019, and 28% larger than the 5-year average for the country. See this FEWS NET brief for details.

[18] In Figures A6 – A8, we present results separately for each component of the Food Security Index, and find very similar results for each of them.

# 5 Discussion and Conclusion

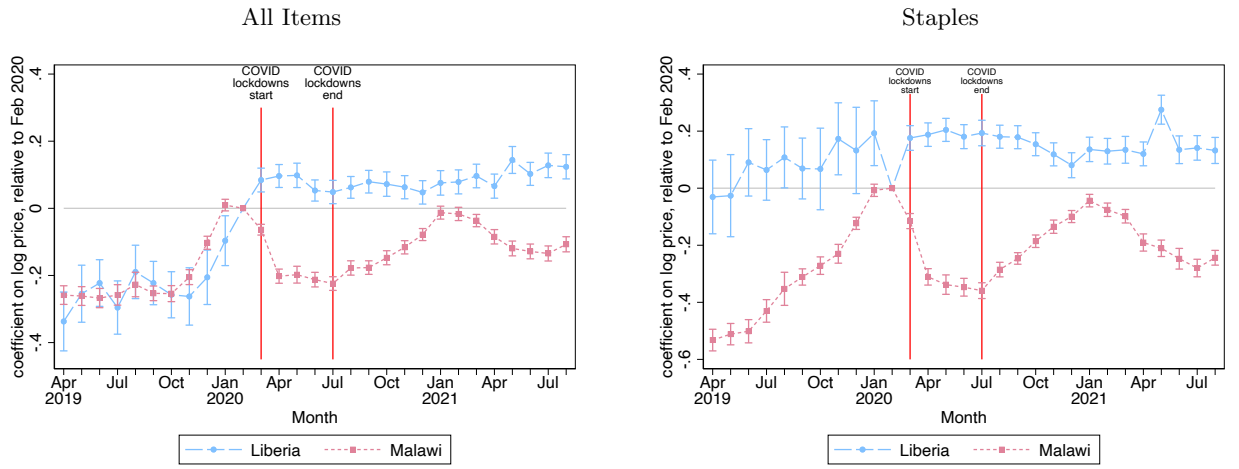
We document the effect of COVID-19 market disruptions in Liberia and Malawi using panel phone surveys of households and food vendors. We find high levels of awareness and behavior change and large declines in market activity. However, we find no evidence of increased food insecurity.

Before collecting this data, our prior was that we would find large negative effects. However, we can suggest an *ex post* reason for these results, namely that rural areas like the ones we study are poorly connected to economic centers of activity; and while this may be a core reason for their poverty, paradoxically the isolation of these areas may make them more immune to economic declines in urban centers. In this section, we provide some evidence for this.

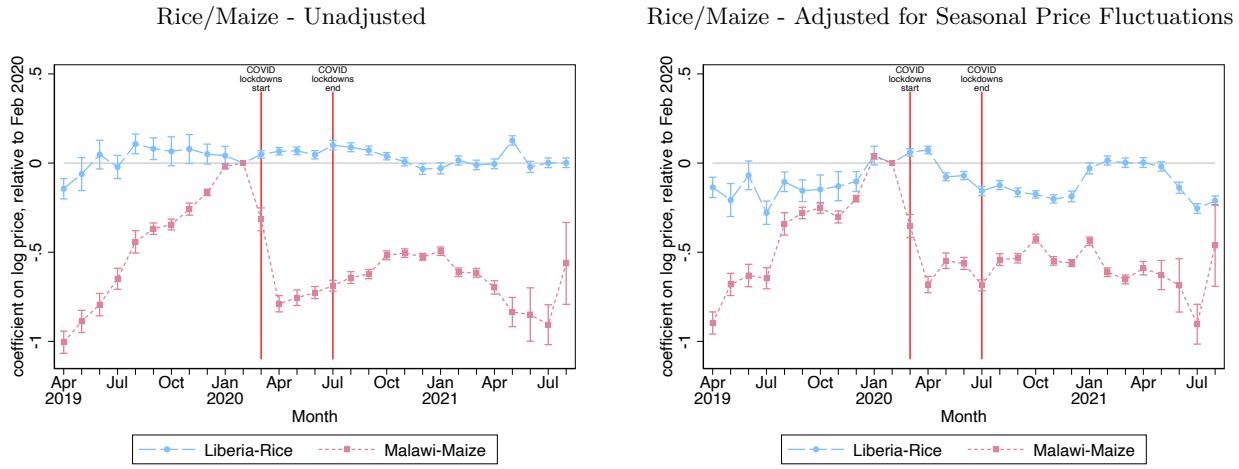
First, in our surveys, we collected information on income for the respondent from casual labor income, business, and other sources. We examine how income was affected in Table A5. The odd-numbered Columns show the event study and the even-numbered Columns show the difference-in-differences. The tables show business profits (Columns 1-2), labor income (Columns 3-4), and total non-agricultural income (Columns 5-6). To start, our data shows that people earn very little income, and so there is little to lose during COVID - the bottom of the Table shows the monthly mean pre-lockdown income from various sources, and shows that total non-agricultural income is only $7.16 in Liberia and $7.75 in Malawi. During COVID lockdowns, we observe no consistent pattern of changes in income in Liberia. While we do observe a consistent decline in casual labor income in Malawi (Column 3), this is entirely seasonal (Column 4). It is also worth noting that small declines in income - even for these poor households - may not necessarily translate into consumption declines for bare necessities such as food, as households will likely reallocate their budget away from discretionary expenditures to preserve food consumption. Therefore, our results should not be interpreted as saying that households have not been impacted by the lockdowns, but rather that their food security has not worsened.

Figure 3: Effect on Crop Prices

Panel A: Price of Basket of Food Items




Panel B: Price of Select Food Items




Note: Figure shows coefficients from a regression of log(price) on month dummies, omitting the reference period of February 2020 (the last month prior to lockdowns). The underlying unit of observation is market-month (there are 90 markets and 16 products in Malawi and 85 markets and 14 products in Liberia) - see footnote 19 for list of items). All monetary values are in USD and Winsorized at 1% and 99%. Standard errors are clustered at the market level. All specifications include product fixed effects and market fixed effects. Panel A shows effects on prices of basket of food items Staple crops in Liberia are local rice, imported rice, cassava, and cassava flour. Staple crops in Malawi are sweet potatoes, maize, maize flour, beans, and pigeon peas. Panel B shows (imported rice) and maize prices, with and without subtracting off monthly average prices from the WFP (the WFP data is only available for these two products).

Second, as part of our ongoing data collection, we have been collecting prices in markets near the cash transfer evaluation, and in comparison markets. There are a total of 80 markets in Liberia and 95 in Malawi. We have enrolled a set of vendors in each market in a price data collection exercise in which vendors are called once a month.[19] We use this data to construct market prices.

[19]In Liberia, the items are salt, imported rice, local rice, cassava, cassava flour, chicken, fresh fish, dried fish, palm

Figure 3 shows effects on food prices (the data series in blue is for Liberia and that in red for Malawi).[20] The top row of the Figure shows (1) all items weighted equally (top left); and (2) staples only (top right). The bottom row makes use of historical time series data on prices taken from the WFP to subtract off monthly average prices. However, this is only possible for the staple foods of rice (Liberia) and maize (Malawi), and so in the panel we show results with and without subtracting off this average. In each plot, the figure shows point estimates and confidence intervals relative to February 2020.

The figure shows that prices increased modestly in Liberia and actually declined in Malawi. This latter effect is due in part to the seasonal maize harvest, which occurs around this time (as can be seen in the 2021 data). We show these results in formal regressions in Table A6. In a difference-in-differences comparing 2020 and 2021, we observe price increases of 9-19% in Liberia for all crops (somewhat higher for staples, though lower for rice alone), and modest declines in Malawi. This is consistent with Barrett (2020), which documented that global food prices had not changed much in the early part of the pandemic.

All in all, it appears that the worst fears about lockdowns have not been realized, at least for these contexts. Our results suggest that lockdowns can be implemented in rural areas if necessary, without causing huge increases in food insecurity (at least for some amount of time), even in very poor settings. The disease itself has not yet spread widely in much of rural Africa, and activities like subsistence farming have apparently continued with modest disruption. Other sources of income were disrupted for some time, but most households earned very little from such activities. Similarly, in other contexts, people have worried about the loss of services such as school meals – yet in this setting, kids were not getting meals in the first place anyway, so there was little to lose.[21] In this context, market disruptions – which limit but do not eliminate economic activity, and not accompanied by a direct loss of assets – might be easier to cope with than natural disasters, even for very poor households.

oil, pepper, bitter balls, okra, onions and sugarcane juice. In Malawi, the items are salt, sugar, sweet potatoes, rice, maize, maize flour, chicken, soybeans, dried fish, mpiru (a local vegetable), beans, groundnuts, tomatoes, eggs, onions, and pigeon peas.

[20] Table A6 presents the same information in regression form.

[21] Table A7 shows that few children received meals and most of these were just replaced by parents.

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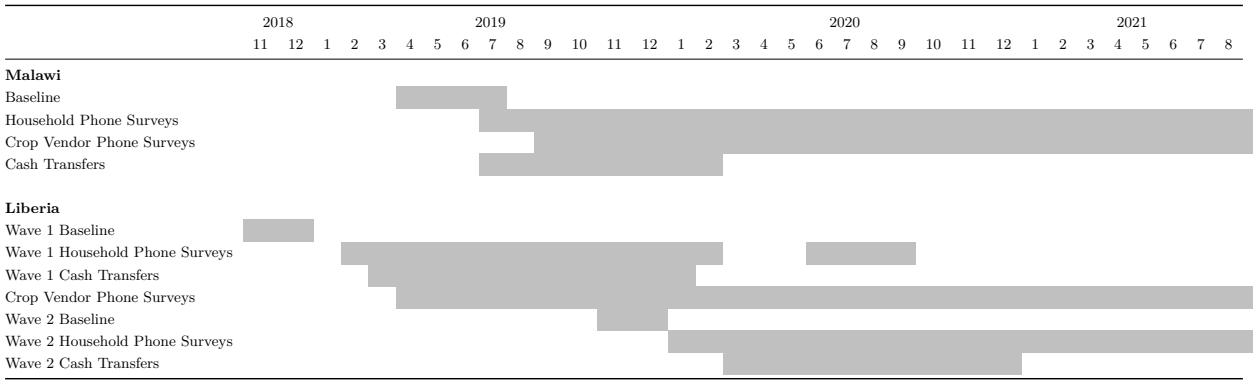
# Appendix

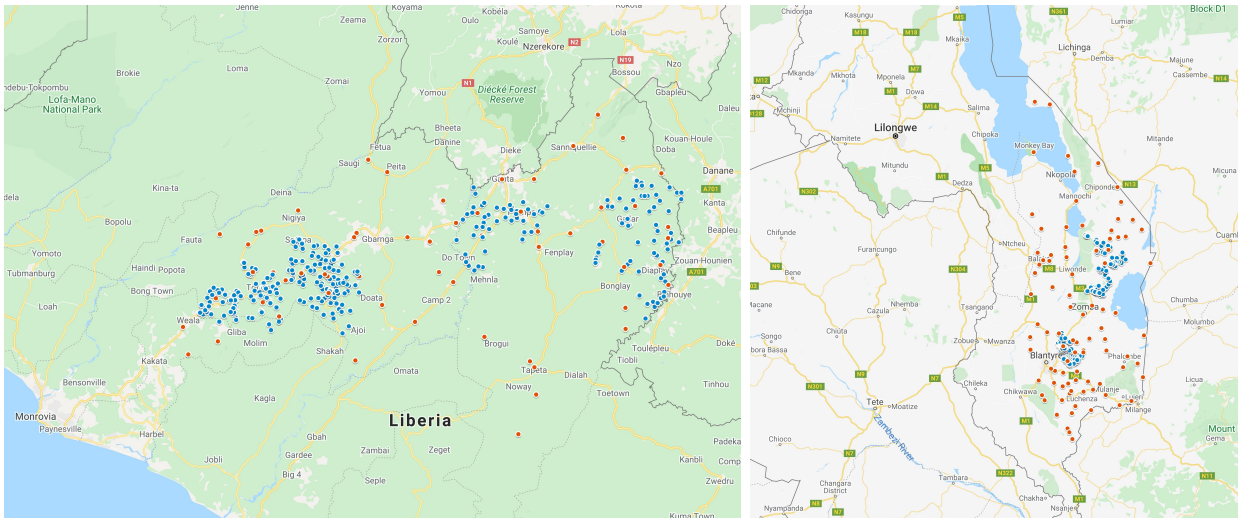
Figure A1: Timeline of Project Activities




Note: Data collection for phone surveys and endline continue in 2021, but they were omitted from this figure.

Figure A2: Map of Study Villages and Markets in Liberia and Malawi

(a) Liberia (b) Malawi




Note: Blue dots refer to villages, and orange dots markets. For Liberia, there are 300 villages and 80 markets. For Malawi, there are 300 villages and 95 markets.

Figure A3: Timeline of Government Responses

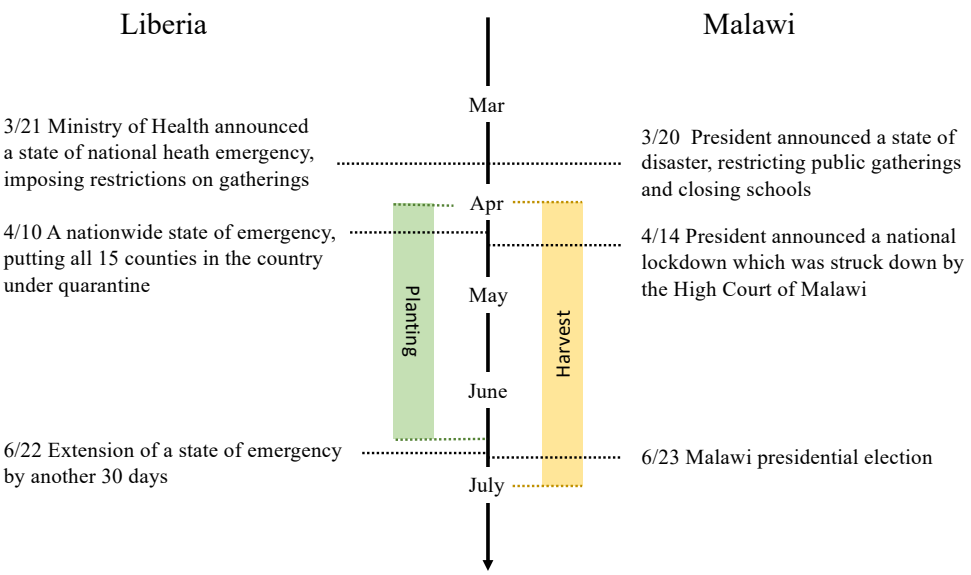
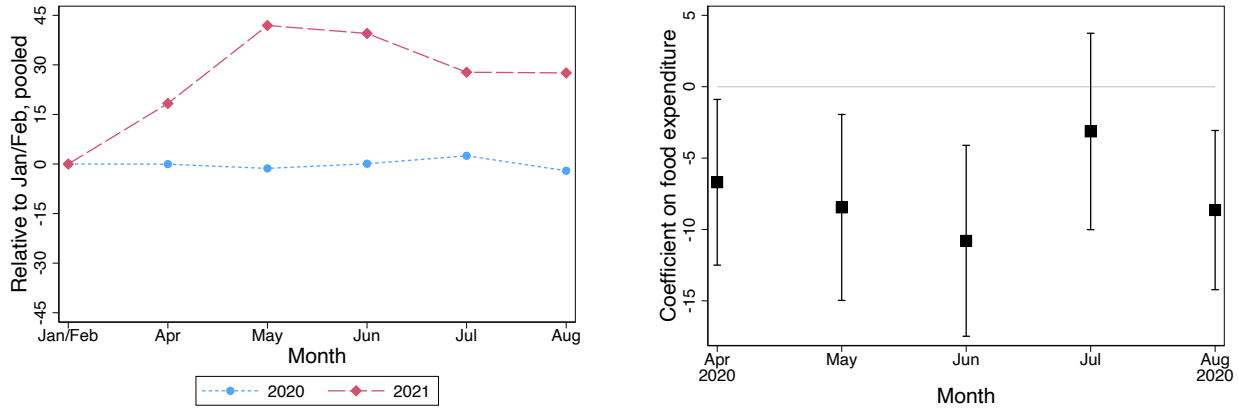
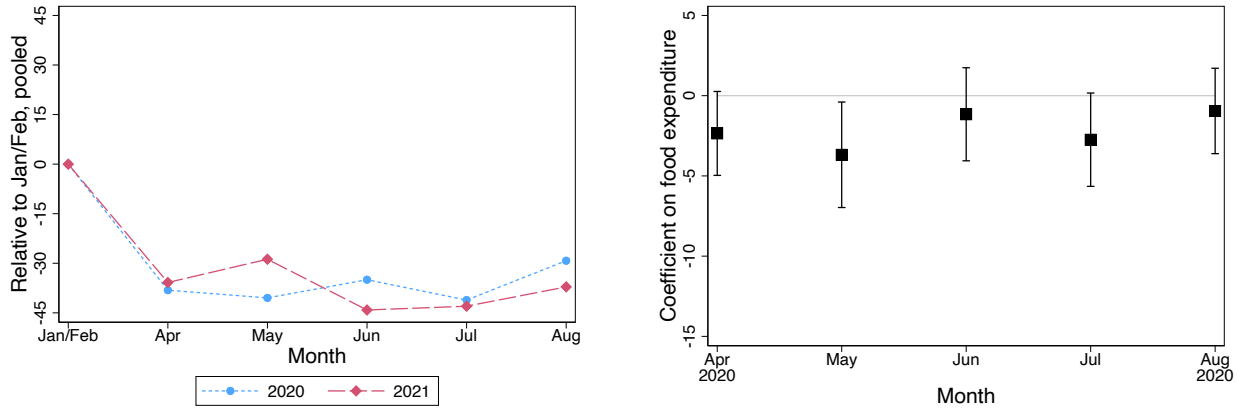


Figure A4: Effect on Monthly Household Food Expenditures

Panel A: Liberia

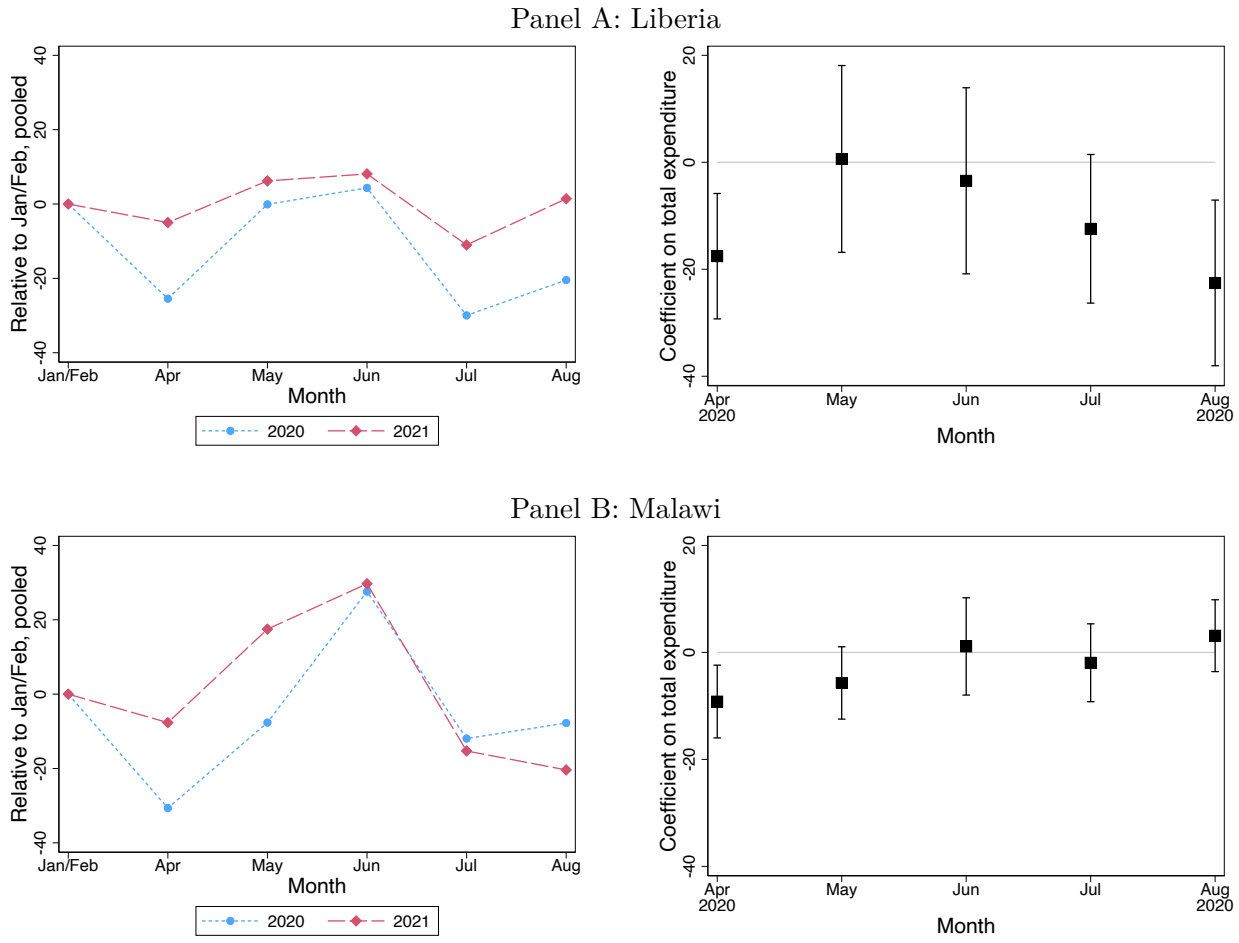



Panel B: Malawi




Note: The figure shows effects on monthly food expenditure using the household phone survey data from January - August for 2020 and 2021, excluding surveys conducted in months of March, as March 2020 was partially both pre- and post-COVID disruptions. Figures on left correspond to event study results, while figures on right show coefficients from difference-in-differences specification in equation (2). Omitted group in the difference-in differences regressions is January and February 2021 pooled (the comparison group of calendar months against the last survey round in 2020 right before COVID lockdowns). Difference-in-difference regressions include interactions between household fixed effects and calendar month fixed effects. All regressions control for household fixed effects and standard errors clustered at the household level.

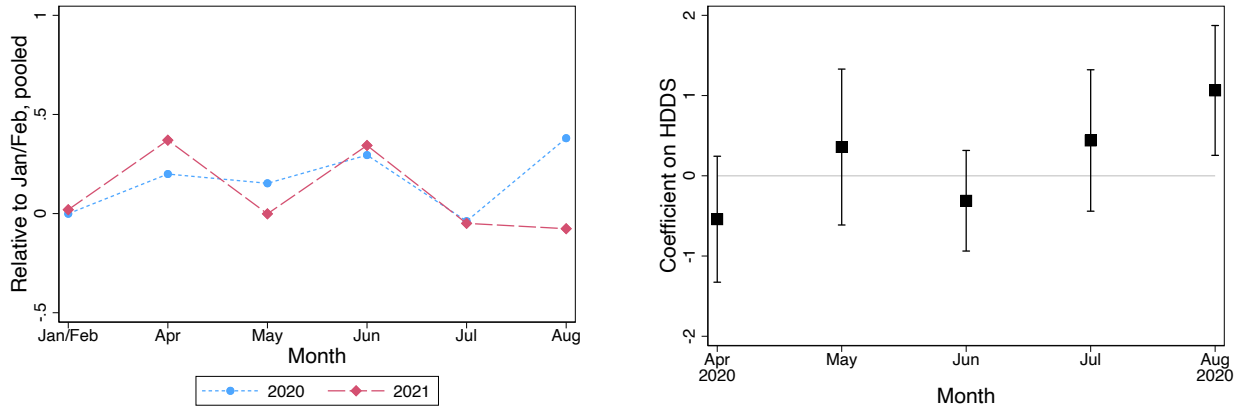
Figure A5: Effect on Monthly Household Total Expenditure



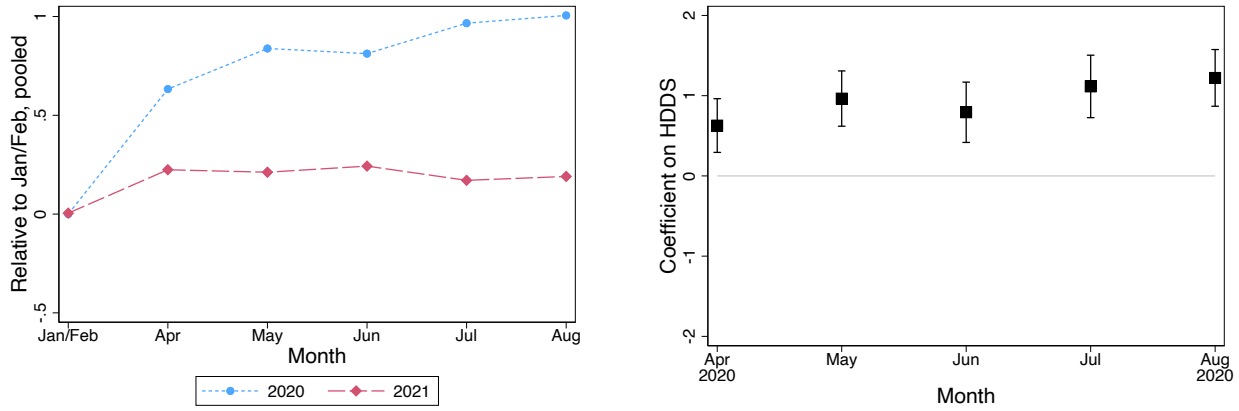

Note: The figure shows effects on total monthly expenditure using the household phone survey data from January - August for 2020 and 2021, excluding surveys conducted in months of March, as March 2020 was partially both pre- and post-COVID disruptions. Figures on left correspond to event study results, while figures on right show coefficients from difference-in-differences specification in equation (2). Omitted group in the difference-in differences regressions is January and February 2021 pooled (the comparison group of calendar months against the last survey round in 2020 right before COVID lockdowns). Difference-in-difference regressions include interactions between household fixed effects and calendar month fixed effects. All regressions control for household fixed effects and standard errors clustered at the household level.

Figure A6: Food Security Index Component 1: Household Dietary Diversity Score (z-score)

Panel A: Liberia



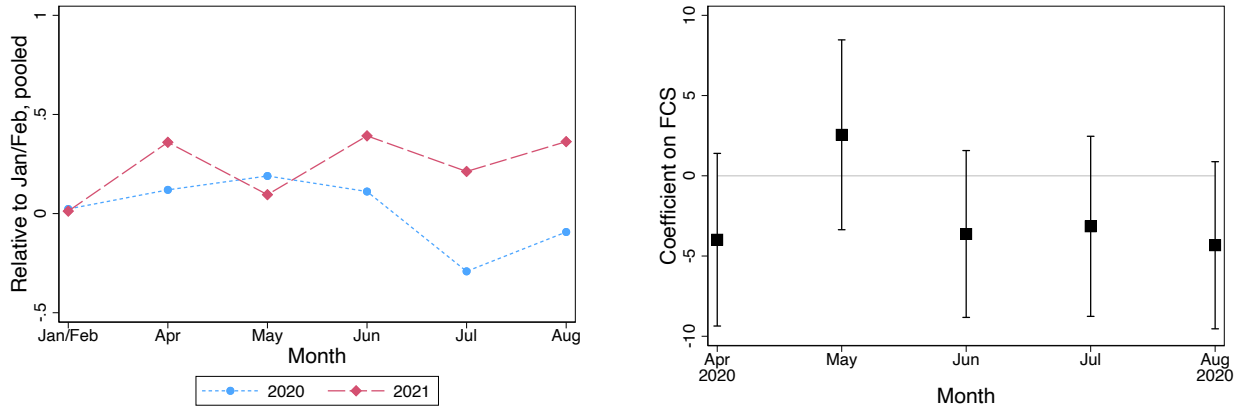

Panel B: Malawi



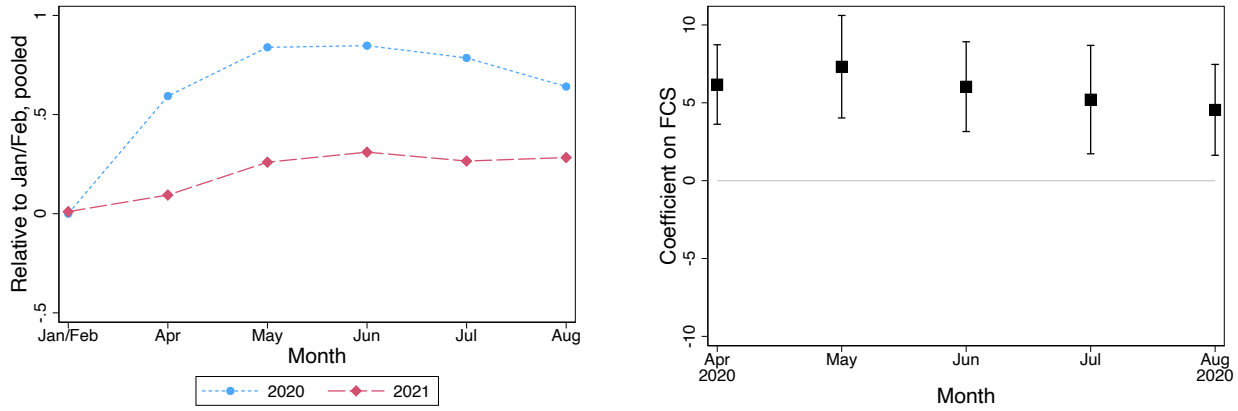

Note: Food security index in Figure 2 has three components: (a) the household dietary diversity score (HDDS), (b) the food consumption score (FCS), and (c) the household hunger scale HHS). The figure shows effects on household dietary diversity score (HDDS) using the household phone survey data from January - August for 2020 and 2021, excluding surveys conducted in months of March, as March 2020 was partially both pre- and post-COVID disruptions. The recall period for HDDS is 24 hours. Figures on left correspond to event study results, while figures on right show coefficients from difference-in-differences specification in equation (2). Omitted group in the difference-in differences regressions is January and February 2021 pooled (the comparison group of calendar months against the last survey round in 2020 right before COVID lockdowns). Difference-in-difference regressions include interactions between household fixed effects and calendar month fixed effects. All regressions control for household fixed effects and standard errors clustered at the household level.

Figure A7: Food Security Index Component 2: Food Consumption Score (z-score)

Panel A: Liberia



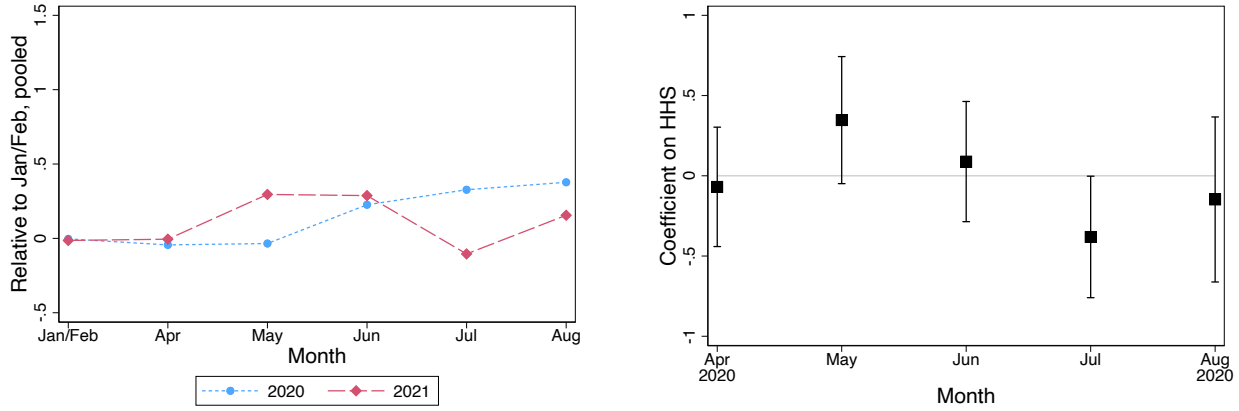

Panel B: Malawi



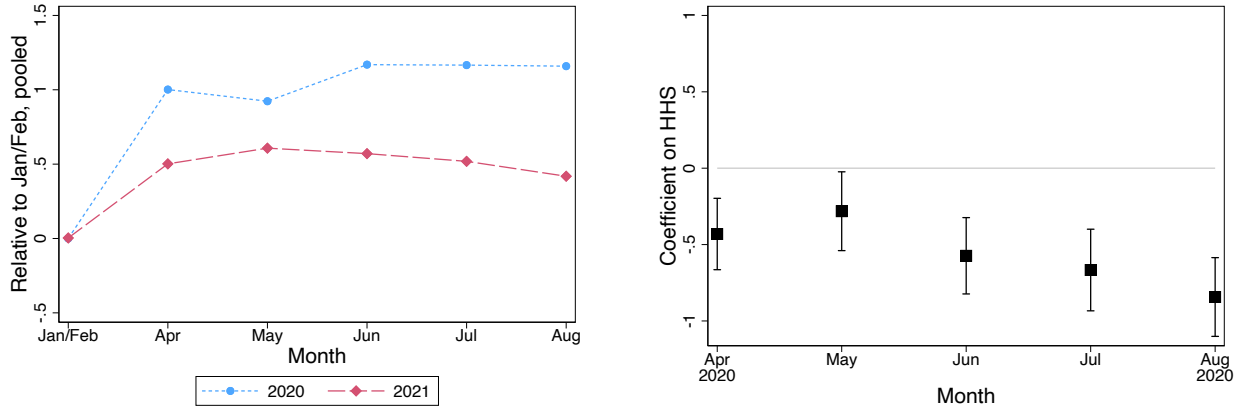

Note: Food security index in Figure 2 has three components: (a) the household dietary diversity score (HDDS), (b) the food consumption score (FCS), and (c) the household hunger scale HHS). The figure shows effects on food consumption score (FCS) using the household phone survey data from January - August for 2020 and 2021, excluding surveys conducted in months of March, as March 2020 was partially both pre- and post-COVID disruptions. The recall period for FCS is one week. Figures on left correspond to event study results, while figures on right show coefficients from difference-in-differences specification in equation (2). Omitted group in the difference-in differences regressions is January and February 2021 pooled (the comparison group of calendar months against the last survey round in 2020 right before COVID lockdowns). Difference-in-difference regressions include interactions between household fixed effects and calendar month fixed effects. All regressions control for household fixed effects and standard errors clustered at the household level.

Figure A8: Food Security Index Component 3: Household Hunger Scale (z-score)

Panel A: Liberia

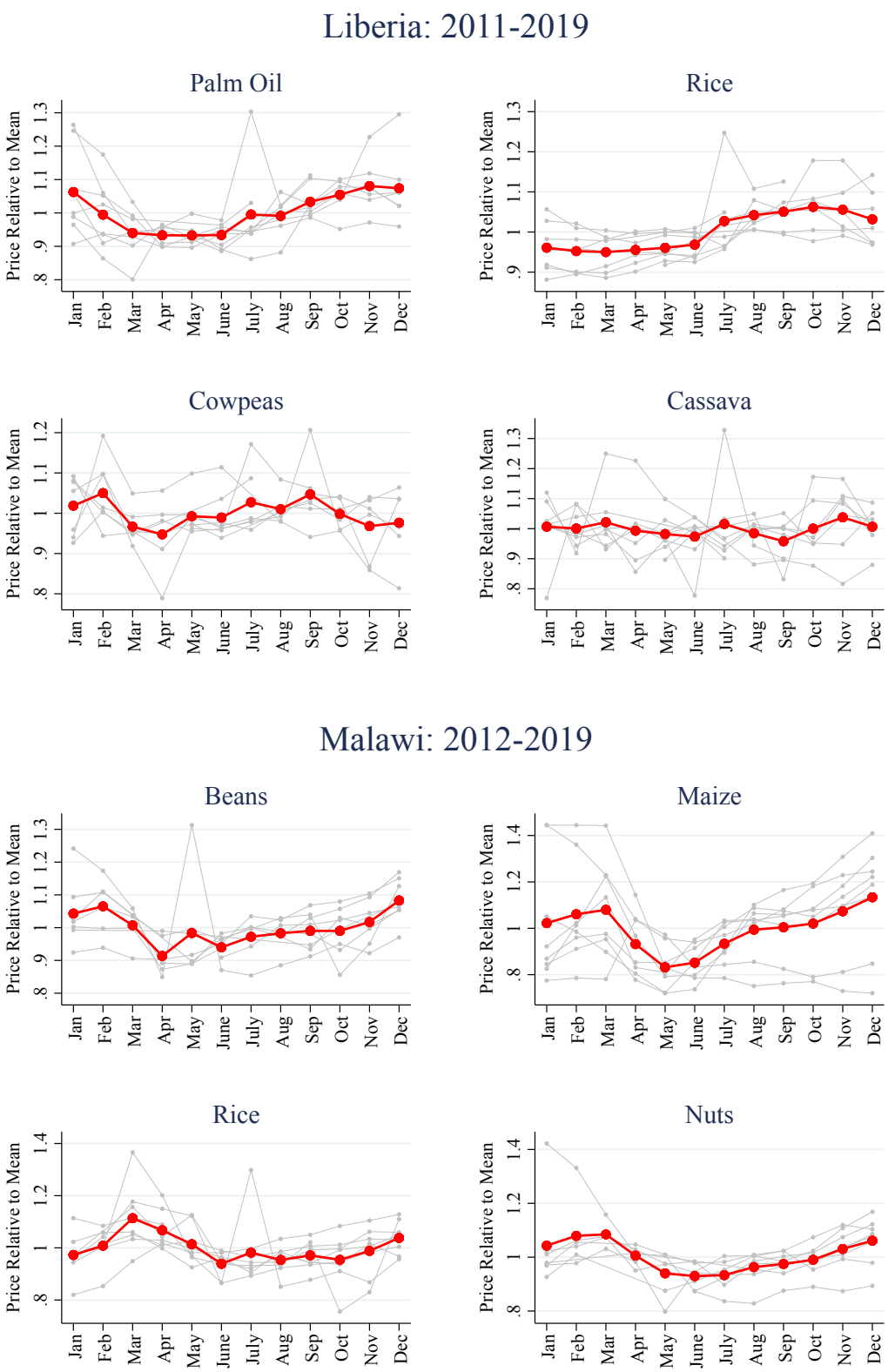



Panel B: Malawi




Note: Food security index in Figure 2 has three components: (a) the household dietary diversity score (HDDS), (b) the food consumption score (FCS), and (c) the household hunger scale HHS). The figure shows effects on household hunger scale (HHS) using the household phone survey data from January - August for 2020 and 2021, excluding surveys conducted in months of March, as March 2020 was partially both pre- and post-COVID disruptions. The recall period for HHS is one month. Figures on left correspond to event study results, while figures on right show coefficients from difference-in-differences specification in equation (2). Omitted group in the difference-in differences regressions is January and February 2021 pooled (the comparison group of calendar months against the last survey round in 2020 right before COVID lockdowns). Difference-in-difference regressions include interactions between household fixed effects and calendar month fixed effects. All regressions control for household fixed effects and standard errors clustered at the household level.

Figure A9: Historical Price Trends




Note: Each grey lines indicate prices for each individual year and red dots show the long run average prices across years in a given month.

Table A1: Household Attrition from Phone Surveys – Percent Completed Each Month

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | =1 if completed survey in following month: | | | | | | | | | | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| **Panel A: Liberia** | | | | | | | | | | | | |
| 2020 | 0.67 | 0.82 | 0.77 | 0.61 | 0.70 | 0.70 | 0.56 | 0.60 | 0.61 | 0.69 | 0.63 | 0.59 |
| 2021 | 0.60 | 0.53 | 0.50 | 0.54 | 0.49 | 0.50 | 0.50 | 0.46 | | | | |
| **Panel B: Malawi** | | | | | | | | | | | | |
| 2020 | 0.89 | 0.90 | 0.91 | 0.92 | 0.91 | 0.97 | 0.97 | 0.94 | 0.95 | 0.97 | 1.00 | 0.77 |
| 2021 | 0.79 | 0.89 | 0.87 | 0.83 | 0.83 | 0.81 | 0.81 | 0.77 | | | | |

Note: The Liberia results (Panel A) include only Wave 2 of the study (since coverage over this time period was spotty in Wave 1). There are 206 respondents in Liberia and 297 respondents in Malawi in GiveDirectly control group. Half of the phone survey sample is interviewed each month, calling each respondent in every third month.

Table A2: Awareness and Attitudes about COVID-19

| | (1) Liberia | (2) Malawi |
|---|---|---|
| **Panel A: Basic awareness** | | |
| =1 if respondent: | | |
| is aware of recent virus outbreak | 0.98 | 0.99 |
| knows that it's called coronavirus/COVID-19 | 0.90 | 1.00 |
| thinks it's a real public health problem | 0.95 | 0.98 |
| **Panel B: Opinions about government response to COVID** | | |
| Do you trust the information central gov't is providing?[a] | 4.37 | 4.71 |
| Do you trust the information local leaders are providing?[a] | 4.39 | 4.68 |
| =1 if central gov't and local leaders give different info | 0.05 | 0.12 |
| Do you think gov't measures to prevent spread are helpful?[b] | 4.24 | 4.10 |
| Do you approve gov't measures?[c] | 4.19 | 4.09 |
| **Panel C: Support from government/NGO during lockdown** | | |
| =1 if received cash transfers | | 0.00 |
| =1 if received food support | | 0.00 |
| **Panel D: Concern about COVID contraction** | | |
| =1 if worried or extremely worried about COVID contraction | 0.87 | 0.93 |
| =1 if knows anyone who tested for COVID-19 | 0.04 | 0.09 |

Note:
[a] 0-5 scale index. 0 - have not received any guidelines; 1 - don't trust at all; 2 - somewhat distrust; 3 - neither trust nor distrust; 4 - somewhat trust; 5 - trust completely.
[b] 1-5 scale index. 1 - not at all helpful; 2 - not helpful; 3 - neither helpful nor not helpful; 4 - helpful; 5 - very helpful.
[c] 1-5 scale index. 1 - strongly disapprove; 2 - disapprove; 3 - neither approve nor disapprove; 4 - approve; 5 - strongly approve.

Table A3: Change in Business Outcomes for Food Vendors

| | (1) No. of customers (daily) | (2) Revenue (monthly) | (3) Profit (monthly) | (4) Other income (monthly) |
|---|---|---|---|---|
| **Panel A: Liberia** | | | | |
| April | -14.40*** | -101.68*** | -24.62*** | -5.00** |
| | (0.80) | (11.56) | (2.43) | (2.22) |
| May | -12.05*** | -98.30*** | -18.30*** | -3.16 |
| | (0.92) | (21.24) | (3.97) | (2.43) |
| June | -10.11*** | -83.31*** | -13.48*** | -1.71 |
| | (1.11) | (24.20) | (4.52) | (2.47) |
| February mean | 31.50 | 255.90 | 47.42 | 8.11 |
| February SD | 21.08 | 394.56 | 68.70 | 56.11 |
| F statistic | 115.22 | 31.35 | 41.68 | 3.41 |
| Observations | 2,200 | 2,200 | 2,200 | 2,200 |
| No. of vendors | 676 | 676 | 676 | 676 |
| **Panel B: Malawi** | | | | |
| April | -22.12*** | -182.01*** | -44.34*** | -17.50*** |
| | (1.64) | (30.12) | (4.92) | (6.23) |
| May | -23.80*** | -136.60*** | -32.20*** | 2.64 |
| | (2.44) | (50.38) | (6.82) | (8.46) |
| June | -24.88*** | -118.67** | -21.73*** | 3.40 |
| | (2.40) | (48.05) | (7.68) | (6.86) |
| February mean | 67.68 | 592.57 | 103.59 | 34.80 |
| February SD | 73.82 | 1276.22 | 196.02 | 188.23 |
| F statistic | 61.53 | 12.73 | 28.49 | 5.95 |
| Observations | 3,813 | 3,813 | 3,813 | 3,813 |
| No. of vendors | 1,042 | 1,042 | 1,042 | 1,042 |

Note: All variables are Winsorized at 99%. All monetary values are in USD. Standard errors are clustered at the market level.

Table A4: Effect on Household Food Security Index

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Liberia | | | Malawi | | |
| | Event Study | Difference-in Difference | | Event Study | Difference-in Difference | |
| April 2020 | 0.19 | -0.22 | -0.24 | 1.12*** | 0.50*** | 0.52*** |
| | (0.13) | (0.16) | (0.18) | (0.09) | (0.09) | (0.10) |
| May 2020 | 0.11 | -0.06 | 0.00 | 1.01*** | 0.49*** | 0.50*** |
| | (0.14) | (0.20) | (0.24) | (0.09) | (0.11) | (0.11) |
| June 2020 | 0.39*** | -0.16 | -0.25 | 1.39*** | 0.63*** | 0.63*** |
| | (0.14) | (0.16) | (0.18) | (0.09) | (0.10) | (0.11) |
| July 2020 | -0.04 | 0.13 | 0.23 | 1.22*** | 0.69*** | 0.71*** |
| | (0.15) | (0.18) | (0.20) | (0.09) | (0.11) | (0.12) |
| Aug 2020 | 0.39** | 0.13 | 0.24 | 1.38*** | 0.74*** | 0.82*** |
| | (0.16) | (0.17) | (0.20) | (0.09) | (0.10) | (0.11) |
| Jan-Feb 2020 mean | 0.00 | 0.00 | -0.02 | 0.00 | 0.00 | 0.02 |
| Jan-Feb 2020 SD | 1.00 | 1.00 | 1.03 | 1.00 | 1.00 | 1.00 |
| Observations | 456 | 832 | 642 | 960 | 1,823 | 1,643 |
| No. of households | 140 | 142 | 110 | 264 | 266 | 240 |

Note: The table reports results for food security index (z-score) using the household phone survey data from January - August for 2020 and 2021, excluding surveys conducting in the months of March, as March 2020 was partially both pre- and post-COVID disruptions. Columns 1 and 4 show event study regressions as specified in Equation 1 using the data for 2020. Omitted group in event study regressions is January and February 2020 pooled. Columns 2, 3, 5, and 6 show difference-in-difference regressions specified in Equation 2. Omitted group in the difference-in-difference regressions is January and February 2021 pooled (the comparison group of calendar months against the last survey round in 2020 right before COVID lockdowns). All regressions include household fixed effects and standard errors clustered at household level. Columns 3 and 6 additionally include the interactions between household fixed effects and calendar month fixed effects, therefore we compare the same set of households for each calendar month in 2020 and 2021.
Food security index is a standardized z-score of HDDS, FCS, and HHS (negatively weighted), using inverse covariance weighting (Anderson 2008) of means and standard deviations of pooled data from January and February 2020.

Table A5: Effect on Household Non-agricultural Income

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Business profit | | Casual Labor income | | Other Non-agricultural income | |
| **Panel A: Liberia** | | | | | | |
| April 2020 | 1.33 | 1.19 | 3.74*** | 1.67 | 3.56*** | 2.34 |
| | (0.86) | (1.26) | (1.31) | (1.83) | (1.27) | (1.78) |
| May 2020 | -1.42* | -1.50 | 1.17 | 4.29* | 1.31 | 4.60* |
| | (0.73) | (1.16) | (1.45) | (2.50) | (1.40) | (2.45) |
| June 2020 | 0.47 | -0.46 | 0.43 | -1.21 | 0.37 | -0.31 |
| | (0.59) | (0.89) | (0.45) | (1.14) | (0.45) | (0.98) |
| July 2020 | -1.70** | -1.74* | 0.77 | 3.50** | 1.37 | 3.13** |
| | (0.67) | (0.92) | (1.10) | (1.66) | (1.04) | (1.56) |
| August 2020 | -0.13 | -0.71 | 1.63* | -2.38 | 1.07* | -2.47 |
| | (0.87) | (0.93) | (0.84) | (2.08) | (0.64) | (1.93) |
| Jan-Feb 2020 mean | 3.25 | 3.22 | 2.56 | 2.56 | 1.35 | 1.46 |
| Jan-Feb 2020 SD | 7.18 | 7.27 | 6.58 | 6.78 | 6.13 | 6.37 |
| Observations | 593 | 889 | 593 | 889 | 593 | 889 |
| No. of households | 144 | 133 | 144 | 133 | 144 | 133 |
| **Panel B: Malawi** | | | | | | |
| April 2020 | 0.02 | -0.37 | -4.08*** | -1.13 | -0.75*** | -0.04 |
| | (0.35) | (0.52) | (0.57) | (0.90) | (0.22) | (0.39) |
| May 2020 | -0.00 | -0.71 | -1.70*** | 0.46 | -0.24 | -0.26 |
| | (0.27) | (0.58) | (0.64) | (0.81) | (0.19) | (0.43) |
| June 2020 | 0.05 | -0.52 | -3.10*** | -0.56 | -0.70*** | -0.73 |
| | (0.29) | (0.58) | (0.66) | (1.05) | (0.22) | (0.45) |
| July 2020 | 0.32 | -0.99* | -1.47*** | 1.19 | -0.09 | -0.36 |
| | (0.32) | (0.59) | (0.50) | (0.87) | (0.22) | (0.47) |
| August 2020 | 0.51* | -0.27 | -3.33*** | 0.04 | -0.31 | -0.34 |
| | (0.30) | (0.54) | (0.64) | (0.85) | (0.30) | (0.53) |
| Jan-Feb 2020 mean | 0.94 | 0.95 | 6.55 | 6.63 | 0.26 | 0.26 |
| Jan-Feb 2020 SD | 3.74 | 3.77 | 8.46 | 8.50 | 2.21 | 2.22 |
| Observations | 1,252 | 1,954 | 1,252 | 1,954 | 1,252 | 1,954 |
| No. of households | 265 | 261 | 265 | 261 | 265 | 261 |

Note: The table reports the results for household monthly income in USD using the household phone survey data from January - August for 2020 and 2021, excluding the surveys conducting in the months of March, as March 2020 was partially both pre- and post-COVID disruptions. Odd columns show event study regressions using the data for 2020 and omitted group is January and February 2020 pooled. Even columns show difference-in-difference regressions and omitted group in the difference-in differences regressions is January and February 2021 pooled (the comparison group of calendar months against the last survey round in 2020 right before COVID lockdowns). All regressions include household fixed effects. Standard errors clustered at household level. Difference-in-difference regressions additionally include interactions of household fixed effects and calendar month fixed effects. All monetary variables are in USD and Winsorized at the 99th percentile. Exchange rates used for calculation are 733 Malawian Kwacha (MWK) = 1 USD and 198 Liberian Dollars (LRD) = 1 USD (May 14, 2020).

Table A6: Change in Crop Prices

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | All Items | | Staples | | Rice/Maize | | Rice/Maize | |
| | Dep. Variable: Ratio of Price to Average Price in February of Same Year | | | | | | | |
| **Panel A: Liberia** | | | | | | | | |
| April 2020 | 0.123*** | 0.190*** | 0.220*** | 0.346*** | 0.070*** | 0.088*** | 0.138*** | 0.174*** |
| | (0.018) | (0.024) | (0.029) | (0.027) | (0.011) | (0.017) | (0.022) | (0.033) |
| May 2020 | 0.129*** | 0.080*** | 0.251*** | 0.239*** | 0.072*** | -0.041** | 0.141*** | -0.084** |
| | (0.018) | (0.020) | (0.026) | (0.029) | (0.012) | (0.020) | (0.023) | (0.040) |
| June 2020 | 0.082*** | 0.105*** | 0.217*** | 0.330*** | 0.049*** | 0.083*** | 0.097*** | 0.164*** |
| | (0.017) | (0.023) | (0.029) | (0.030) | (0.012) | (0.016) | (0.024) | (0.032) |
| July 2020 | 0.082*** | 0.077*** | 0.245*** | 0.352*** | 0.107*** | 0.119*** | 0.211*** | 0.235*** |
| | (0.018) | (0.023) | (0.029) | (0.029) | (0.015) | (0.019) | (0.029) | (0.037) |
| August 2020 | 0.094*** | 0.088*** | 0.217*** | 0.332*** | 0.096*** | 0.108*** | 0.188*** | 0.213*** |
| | (0.016) | (0.021) | (0.028) | (0.027) | (0.013) | (0.019) | (0.026) | (0.038) |
| 2020 | | 0.041** | | 0.126*** | | 0.002 | | -0.037 |
| | | (0.018) | | (0.025) | | (0.013) | | (0.026) |
| Controls for Price Trend | N | N | N | N | N | N | Y | Y |
| Markets | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| Products | 14 | 14 | 4 | 4 | 1 | 1 | 1 | 1 |
| Observations | 6,333 | 12,729 | 1,762 | 3,634 | 473 | 931 | 473 | 931 |
| Feb 2020 Mean (USD) | 1.516 | 1.516 | 0.553 | 0.553 | 0.681 | 0.681 | 0.681 | 0.681 |
| **Panel B: Malawi** | | | | | | | | |
| April 2020 | -0.159*** | -0.095*** | -0.234*** | -0.126*** | -0.536*** | -0.459*** | -1.607*** | -1.479*** |
| | (0.010) | (0.012) | (0.012) | (0.018) | (0.013) | (0.019) | (0.038) | (0.042) |
| May 2020 | -0.149*** | -0.044*** | -0.250*** | -0.065*** | -0.520*** | -0.333*** | -1.560*** | -1.240*** |
| | (0.012) | (0.014) | (0.014) | (0.017) | (0.013) | (0.033) | (0.038) | (0.062) |
| June 2020 | -0.158*** | -0.046*** | -0.256*** | -0.030 | -0.512*** | -0.283*** | -1.535*** | -1.120*** |
| | (0.010) | (0.013) | (0.013) | (0.019) | (0.010) | (0.071) | (0.030) | (0.110) |
| July 2020 | -0.172*** | -0.054*** | -0.268*** | -0.007 | -0.493*** | -0.219*** | -1.479*** | -1.043*** |
| | (0.010) | (0.012) | (0.011) | (0.016) | (0.010) | (0.036) | (0.031) | (0.066) |
| August 2020 | -0.137*** | -0.044*** | -0.218*** | 0.015 | -0.469*** | -0.505*** | -1.407*** | -1.508*** |
| | (0.010) | (0.014) | (0.012) | (0.017) | (0.012) | (0.119) | (0.036) | (0.202) |
| 2020 | | -0.001 | | -0.002 | | -0.001 | | 1.367*** |
| | | (0.010) | | (0.011) | | (0.012) | | (0.025) |
| Controls for Price Trend | N | N | N | N | N | N | Y | Y |
| Markets | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 |
| Products | 16 | 16 | 5 | 5 | 1 | 1 | 1 | 1 |
| Observations | 8,823 | 17,198 | 2,682 | 4,937 | 566 | 775 | 566 | 775 |
| Feb 2020 Mean (USD) | 1.053 | 1.053 | 0.708 | 0.708 | 0.489 | 0.489 | 0.489 | 0.489 |

Note: All prices are in USD and Winsorized at 1% and 99%. Odd columns show event study regressions for sample from crop vendor phone survey for February - August 2020, excluding March 2020, which was partially both pre- and post-COVID disruptions; omitted group is February 2020. Even columns show difference-in-differences regressions for the sample from February - August 2020 and February - August 2021, excluding surveys conducted in the months of March; omitted group is February 2021. Standard errors are clustered at the market level. Regressions include product fixed effects and market fixed effects. Staple crops in Liberia are local rice, imported rice, cassava, and cassava flour. Staple crops in Malawi are sweet potatoes, maize, maize flour, beans, and pigeon peas. Columns 5-8 refer to imported rice for Liberia (Panel A) and maize for Malawi (Panel B). Additionally, in Columns 7-8, the long run monthly average prices for February from the WFP 2011-2019 price database are used to calculate the price ratio.

Table A7: School Meals

| | (1) Liberia | (2) Malawi |
|---|---|---|
| =1 if following meals were provided in school (before closure): | | |
| breakfast | 0.03 | 0.56 |
| lunch | 0.33 | 0.01 |
| snack | 0.01 | 0.00 |
| no food at all | 0.52 | 0.37 |
| =1 if respondent reported yes to: | | |
| children miss out meals | 0.23 | 0.12 |
| respondent spends money to make more food | 0.56 | 0.76 |
| assitance from family/neighbor/friends | 0.01 | 0.00 |
| assistance from village chief/gov't/aid programs | 0.33 | 0.13 |

Note: Questions were asked of all households and crop vendors with school-aged children. N=2,029 (507 in Liberia and 1,522 in Malawi).

Table A8: Household Summary Statistics from Liberia HIES-2016 and Malawi LSMS-2019

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Liberia HIES 2016 | | | | Malawi LSMS 2019 | | | |
| | Rural | | Study Area | | Rural | | Study Area | |
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| **Panel A: Demographics** | | | | | | | | |
| Age | 43.92 | 35.89 | 42.96 | 13.36 | 43.86 | 16.75 | 43.14 | 17.18 |
| =1 if currently married or has partner | 0.82 | | 0.81 | | 0.69 | | 0.64 | |
| Years of education | 2.42 | 2.35 | 2.39 | 2.21 | 5.57 | 2.52 | 5.27 | 2.39 |
| Number of household members | 5.37 | 2.19 | 5.51 | 2.22 | 4.43 | 2.04 | 4.28 | 1.95 |
| **Panel B: Income, expenditure, and assets** | | | | | | | | |
| =1 planted any crop | 0.89 | | 0.99 | | 0.40 | | 0.79 | |
| =1 if sold any harvest | 0.56 | | 0.52 | | 0.30 | | 0.44 | |
| =1 if owns a business enterprise | 0.21 | | 0.25 | | 0.57 | | 0.19 | |
| =1 if household owns a mobile phone | 0.35 | | 0.46 | | 0.70 | | 0.50 | |
| =1 if house owned | 0.66 | | 0.85 | | 0.52 | | 0.75 | |
| =1 if house has thatch roof | 0.26 | | 0.51 | | 0.12 | | 0.47 | |
| Household food expenditure | 20.22 | 17.23 | 14.94 | 15.68 | 23.87 | 17.18 | 10.15 | 10.18 |
| Business income (USD) | 3.27 | 13.54 | 2.31 | 10.69 | 89.19 | 368.63 | 21.09 | 72.44 |
| Total value of physical assets | 74.26 | 137.59 | 98.26 | 190.71 | 518.99 | 1,060.31 | 275.62 | 808.58 |
| Durable goods (USD) | 26.22 | 65.27 | 54.28 | 126.10 | 490.56 | 1,055.90 | 196.58 | 709.54 |
| Livestock (USD) | 48.04 | 113.69 | 43.98 | 116.95 | 28.43 | 143.87 | 79.04 | 298.43 |
| **Panel C: Food security** | | | | | | | | |
| =1 if insufficient food in past 12 months | 0.92 | | 0.88 | | 0.53 | | 0.68 | |
| Household dietary diversity score (0-12) | 5.76 | 1.88 | 5.51 | 1.67 | 8.93 | 1.80 | 8.44 | 2.22 |
| Food Consumption Score (0-112) | 48.17 | 15.86 | 46.22 | 15.07 | 54.07 | 16.18 | 44.30 | 17.12 |
| Observations | 5570 | | 740 | | 9342 | | 688 | |

Note: Rural sample includes all households from rural areas as identified in the survey. Study area include Bong and Nimba counties from Liberia, and Chiradzulu and Machinga districts from Malawi. Sample weights are used to calculate mean and standard deviations. All monetary values are in USD and Winsorized at the 99th percentile.