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# ABSTRACT

## Polycrisis in Agrifood Systems: Climate-Conflict Interactions and Labor Dynamics for Women and Youth in 21 African Countries*

This paper provides evidence on the impacts of armed conflict and climate change on individual labor intensity. Based on pooled labor force survey, climate, and conflict event data from 21 African countries, we document that climate change and armed conflict can create a polycrisis: the negative impacts of extreme climate events on labor intensity in and outside of agriculture are more severe in conflict environments. This interaction effect, driven by heat waves and floods, is concentrated among young people, and it is the result of violent conflict presence before a climate event occurs, not of conflict events that occur at the same time as the climate event. In addition, our results suggest that conflict contributes to gender-specific shifts in labor allocation in response to climate events exacerbating women's work burden. Our findings emphasize the importance of concerted, evidence-based policies to tackle climate-conflict polycrises, taking into account the specific vulnerabilities shaped by individuals' gender and age.

**JEL Classification:** D74, J16, J22, O12, Q10, Q54

**Keywords:** Africa, agriculture, agrifood systems, climate, conflict, employment, gender, polycrisis, youth

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## 1 Introduction

Both climate change and violent conflict expose people worldwide in ways that put lives and livelihoods at severe risk (Kala et al., 2023; Vesco et al., 2025). Notably, adverse climate and conflict events tend to cluster in space and time in low- and middle-income countries. Furthermore, within these countries both climate and conflict events disproportionately affect more vulnerable populations with little to no access to effective institutional or individual coping mechanisms or safety nets. Even worse, climate and conflict events may interact to create poly-crises with impacts exceeding the sum of the impacts of the separate climate and conflict events. Despite the substantial implications for human welfare and policy-making, it is not yet understood to what extent, how, and for whom climate and conflict crises combine and interact in shaping human development in low- and middle-income countries.

We contribute to filling this knowledge gap by studying the joint impacts of climate and conflict events on economic activity in low- and middle-income countries. Specifically, we focus on the question of if and how the impacts of extreme climate events (including heat waves, floods and droughts) on individuals' labor intensity differ across local conflict and non-conflict situations. We distinguish labor intensity in agricultural and non-agricultural activities and study heterogeneity in impacts across gender and age. The agricultural sector, and subsistence farming in particular, merit particular attention as agricultural activities are highly prevalent in low- and middle-income settings and play an important role as a coping strategy for the extreme poor (Morton et al., 2007; FAO, 2011; FAO, 2017; FAO et al., 2023). Gender and age are important dimensions of heterogeneity in the micro-economic impacts of structural challenges, including armed conflict and climate change (Verwimp et al., 2019; Stojetz & Brück, 2023a; Nico & Azzarri, 2024; Stojetz & Brück, 2024; Ronzani et al., 2025).

Based on data from 21 countries in Africa, we document that climate change and armed conflict can create a poly-crisis: extreme climate events' detrimental impact on labor intensity in and out of agriculture is worse in conflict environments. These patterns are primarily driven by heat waves, floods, and conflict presence occurring before – and not at the same time of – a climate event. Our results suggest that conflict significantly contributes to highly gender-specific shifts in labor allocation in response to climate events increasing women's work burden (FAO, 2024). In addition, climate events in conflict-affected environments are particularly disruptive for labor supply among youth, in line with previous work on impacts of climate change (FAO, 2024).

Our study contributes to filling major knowledge gaps in the literature.

First, our paper contributes to a nascent literature analyzing poly-crises systematically (Homer-Dixon et al., 2022; Lawrence et al., 2022). Lawrence et al. (2024) call for a 'polycrisis research program' and emphasize three important elements: 1) focusing on crisis interactions, not just isolated crises; 2) studying broader crisis 'architectures', not just events; and 3) identifying intervention points. Our study responds to the call by studying the intersection and interaction of climate and conflict crises at the local level across 21 African countries; both longer-term stressors and events; as well as heterogeneity of poly-crisis impacts on economic activity across climate event types and societal groups.

Second, we also add to the discussion on the societal risks of climate change and weather shocks. A rapidly growing literature now documents the socio-economic risks climate change poses, especially in low- and middle-income countries (FAO, 2024). A specific set of studies has analyzed 'compound weather/climate events' and shown that the impact of climate events can amplify each other (Tynan et al., 2015; Zscheischler et al., 2018). Yet, there is a significant theoretical and empirical knowledge gap concerning impacts of 'compounds' of weather/climate and non-weather/climate events. Conflict events are a dominant form of non-weather/climate events that critically shape human behavior and well-being, but how their impacts combine and interact with those of weather/climate events has not been studied rigorously.

Third, a distinct body of studies analyze the causal relationship between climatic anomalies and armed conflict, which remains highly contested (Hsiang et al., 2013; Burke et al. 2015; Mach et al., 2019; Burke 2024a; Pacillo et al., 2024). In a recent meta-analysis, Burke et al. (2024a) conclude that extreme climate conditions can - on average - be linked to an increased risk of inter-group conflict and interpersonal violence. While some studies emphasize a range of factors that can influence the underlying mechanisms (Burke et al., 2024a), for example pointing at economic conditions as key mediator (Burke et al., 2024b), they model the occurrence of conflict as an outcome. Yet, most contexts where conflicts occur are notoriously fragile (Brück & d'Errico, 2019; Martin-Shields & Stojetz, 2019); and many climatic shocks occur in environments where the underlying risk of conflict is already elevated, which has been less considered in the literature.

Fourth, we contribute to the literature on the socio-economic impacts of violent conflict (Vesco et al., 2025). A large body of studies focuses on children and documents how exposure to violent conflict situations *in-utero* or in early childhood creates enormous risks to well-being in the short or medium run and intergenerationally (Bundervoet et al., 2009; Akresh et al., 2012, 2023; Singhal, 2019). More recently, a growing number of studies measure how individuals, households, and communities experience violent conflict heterogeneously (Brück et al., 2016) and how such experiences affect behaviors and outcomes (Bauer et al. 2016; Justino & Stojetz, 2019; Stojetz & Brück, 2023b). In addition, conflict has been studied as a mediator, for example through the link between climate change and migration (Abel et al., 2019; Hoffmann et al., 2020) and implicitly in some of the resource curse literature (Ross, 1999). Yet, how other challenges and events combine and interact with conflict conditions in shaping economic outcomes remains surprisingly ill-understood given the prevalence of non-conflict shocks in conflict situations.

Our study is of strong interest to policy and practice in low- and middle-income countries where poly-crises are on the rise (Lawrence et al., 2022; Lawrence et al., 2024). There is growing awareness that such poly-crises may create compounding, not just additive, challenges (UNICEF, 2023; Stojetz & Brück, 2023b), which means that policies cannot focus on challenges in isolation but must address them comprehensively. Many of today's poly-crises are defined by climate and conflict challenges. Thus, understanding how climate and conflict challenges shape socio-economic outcomes across groups is critical for the design of interventions in low- and middle-income countries that are more effective, efficient, and equitable.

The rest of the paper is organized as follows. Section 2 introduces the survey, conflict and climate data used in our empirical analyses. Section 3 outlines the empirical methodology. Section 4 presents and discusses our results and section 5 offers concluding remarks.

## 2 Data

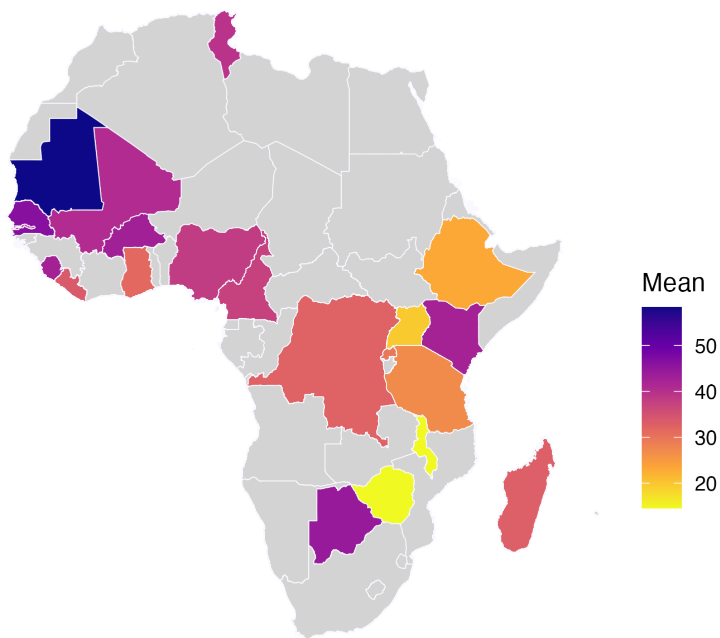
For the empirical analysis, we spatiotemporally match sex-disaggregated employment survey data from 21 African countries with local climate and conflict event data from multiple years. For each survey dataset, we match data at the lowest available administrative division provided by the survey, which is the region, district or village level, depending on the country/survey. The 21 countries are Botswana, Burkina Faso, Cameroon, Democratic Republic of Congo, Ethiopia, Gambia, Ghana, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritania, Nigeria, Rwanda, Senegal, Sierra Leone, Tanzania, Tunisia, Uganda, and Zimbabwe.

## 2.1 Employment survey data

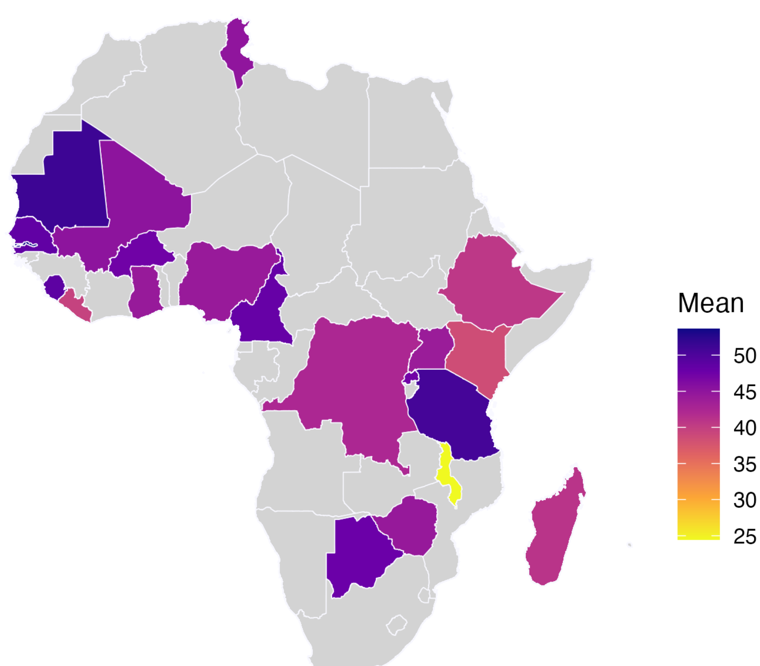
In order to evaluate the impact of conflict events on gender-specific employment in agriculture in Africa, we analyze a standardized labor-force survey dataset, which harmonizes Household Income and Expenditure Surveys (HIES), Labour Force Surveys (LFS), and Living Standards Measurement Study (LSMS) data from 21 African study countries (Nico and Azzarri, 2024). The surveys included in our analysis provide basic information on the working hours and sector of main economic activity. All survey data were collected between 2013 and 2019, except for three surveys in Botswana (2008), Democratic Republic of Congo (2011) and Senegal (2011), and are representative of both rural and urban populations. Figure 1 plots the variation in mean labor intensity at the national level in both agricultural (Fig. 1a) and non-agricultural activities (Fig. 1b).

Figure 1. Average number of hours worked per country

(a) Average number of hours worked in agriculture



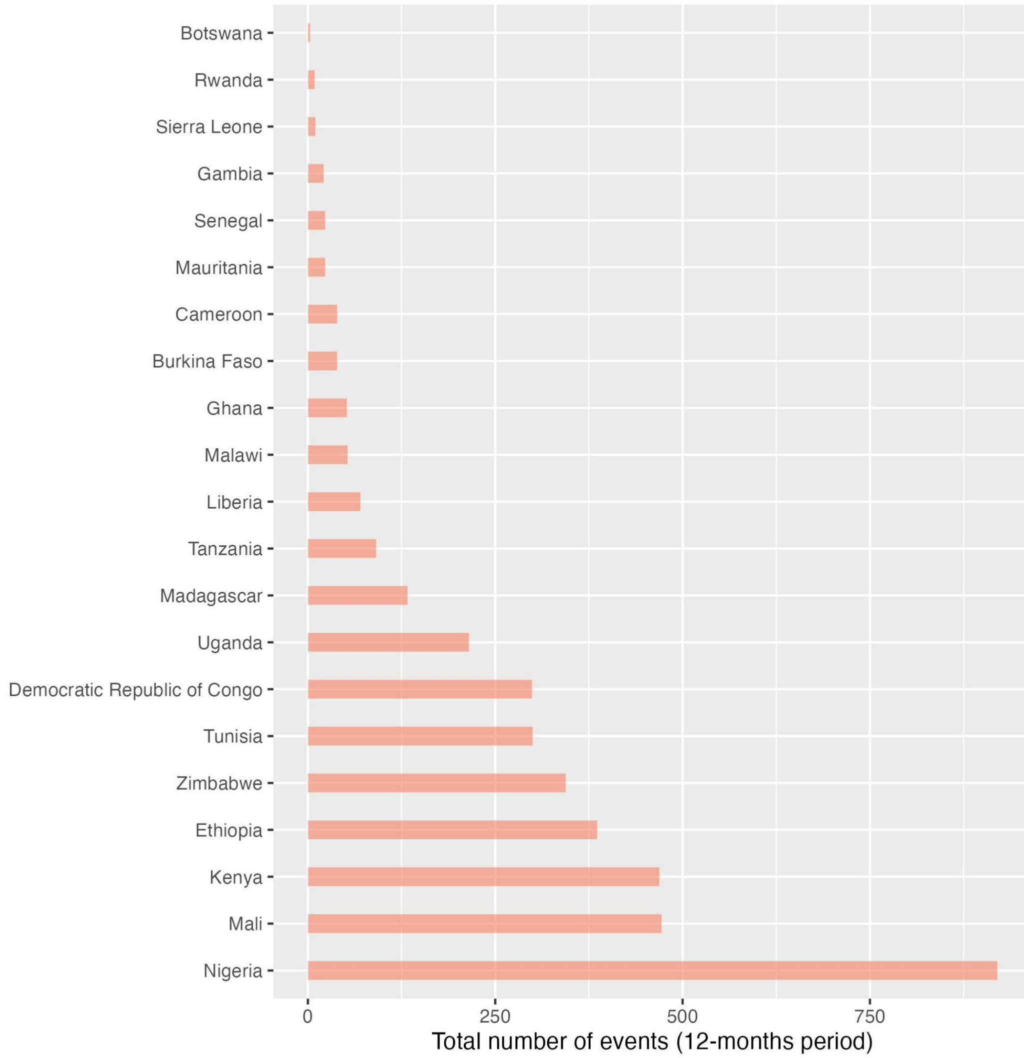

(b) Average number of hours worked out of agriculture



## 2.2 Conflict event data

Conflict is defined here as a spectrum of conditions of insecurity, fragility and violence. Our study gathers and analyzes external data from ACLED (2023) on the types of armed conflict, their actors and when and where they occur. ACLED uses a global methodology to track a range of violent and non-violent actions by political agents, including governments, rebels, militias, identity groups, political parties, external actors, rioters, protesters and civilians (Raleigh et al., 2010). As noted by Dowd et al. (2023), the literature frequently overlooks specific forms of violence, such as localized conflicts and informal violence, which can significantly impact food systems. These gaps highlight the need to adopt more holistic, systems-based approaches that address the unique dynamics of different regions and types of conflict. Unlike other sources like the Georeferenced Event Dataset from the Uppsala Conflict Data Program (UCDP), which focuses primarily on organized armed conflict, ACLED's broader scope allows us to capture localized and informal violence that is often overlooked in other datasets. This is particularly important for our analysis, as the impact of these less conventional forms of violence on food systems can be profound. Figure 2 plots the total number of conflict events recorded twelve months before a survey took place at the national level, showing that our study sample spans a diverse set of broad settings in terms of conflict intensity. Appendix Figure A1 shows these country-level plots for the 6-month, 24-month and 36-month periods.

Figure 2. Conflict intensity in study countries during the 12 months before the survey




## 2.3 Climate event data

For climate events, we use the gridded event data from Nico & Azzarri (2024) derived from long-term time series of local monthly averages of local temperature and rainfall from WorldClim (Fick and Hijmans, 2017). The approximate spatial resolution is 1km x 1km, which is aggregated to the lowest administrative level of the survey to calculate average values for temperature and rainfall. In addition, we use data on the coefficients of variation in long-term temperature and rainfall from ERA5 (Hersbach et al., 2018).

# 3 Methodology

## 3.1 Conceptual approach and indicators

**Intersectionality**. Guided by existing knowledge about labor supply in crisis conditions (as discussed in the introduction), we adopt an intersectional approach (Bastia, 2014). Such an approach aims to explore different forms and sources of disadvantage and emphasizes their interconnectedness and interdependencies, rather than approaching them as separate domains (Crenshaw, 1990; Valentine, 2007). Specifically, intersectionality seeks to understand outcomes by exploring the relationships and interactions between different factors and across the individual and group levels (Kapilashrami and Hankivsky, 2018).

Intersectional approaches are increasingly applied in development research and have been shown to improve analyses of labor market outcomes in Sub-Saharan Africa (Elu & Loubert, 2013; Grünenfelder & Schurr, 2015). From a gender perspective, it can help to uncover the interlinkages between the multiple sources of gender inequalities and "focus on the experiences of those who have been excluded thus far from feminist analysis" (Bastia, 2014). We thus aim to analyze how different forms of disadvantage stemming from climate change, armed conflict, gender and age shape economic activity at the individual level.

**Climate events**. One of the main consequences of climate change is the increase in frequency, severity, and impacts of some types of extreme weather events, such as heat waves, droughts and floods. Indeed, projected changes in some extreme shocks over the 21st century are quite robust, such as generally rising sea levels that increase the impacts of coastal storms and warming and can place more stress on water resources during droughts (Rummukainen, 2012). As proxies of weather-related extreme events, we follow Nico & Azzarri (2024) to study three binary indicators of heat wave, drought, and flood exposure during the relevant cropping season by country as identified by FAO.

We classify areas affected by weather shocks within each country if the local monthly temperature and precipitation values deviate significantly, either positively by more than +2 standard deviations (SDs) or negatively by more than -2 SDs, from the long-term (50-year) monthly averages in the six months prior to the survey interview. In our study sample, two in 10 individuals were exposed to an (extreme) climate event in the six months before the survey (Table 1). 15 percent of individuals experienced a strong heat wave, while strong droughts (2 percent) and floods (15 percent) were relatively rare.

**Conflict events**. We define armed conflict as the “systematic breakdown of the social contract resulting from and/or leading to changes in social norms, which involves mass violence instigated through collective action” (Justino et al., 2013: 6). Situations of armed conflict entail conflict events (or fatal organized violence) that take place in specific places at specific times, giving rise to conflict event datasets (Sundberg and Melander, 2013). Such a definition of armed conflict thus includes a spectrum of conditions and shocks related to insecurity, fragility, and violence.

Our main conflict measure is a binary indicator of conflict events having occurred in the past 12 months, following Ronzani et al. (2023). The decision to employ a binary conflict variable in our study was motivated by the need for a clear and interpretable measure that captures the presence or absence of conflict in a given location. In addition, it mitigates concerns of measurement error in the exact number of conflict events that occurred in a given location. Our approach also facilitates easy comparisons across regions and time frames and is particularly advantageous when dealing with large datasets across multiple countries, where varying definitions and intensities of conflict could otherwise complicate the interpretation based on analyses of the pooled data. As climate events are considered over a six-month period, we also separately study conflict events that occurred up to 6 months before the survey, and conflict events that occurred between 6 to 12 months before the survey.

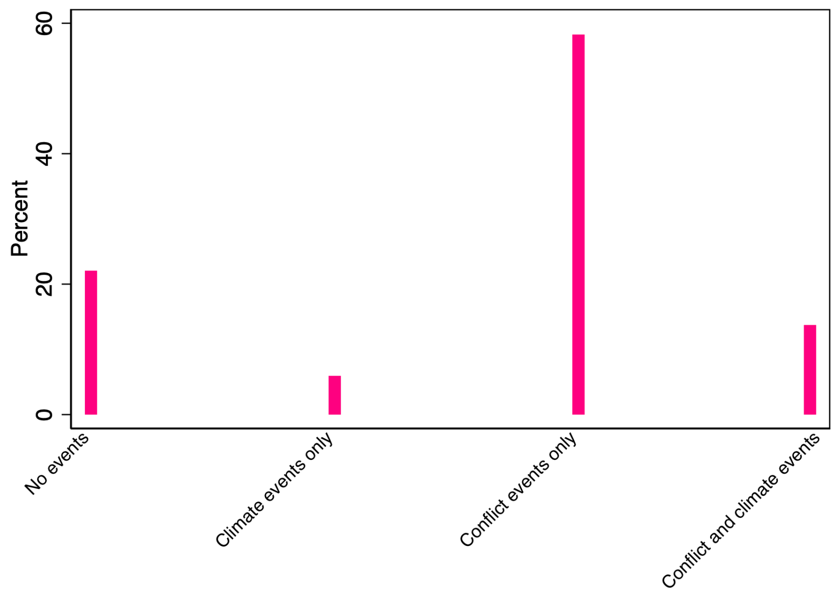
In our study sample, 72 percent of individuals were exposed to at least one local conflict event in the 12 months before the survey (Table 1). Over the past six months, 64 percent experienced a local conflict event and 55 percent in the period between six and 12 months before the survey. To take long-term conflict patterns into account, we also include measures of conflict that occurred between 12 and 24 months before the survey and 24 to 36 months before the survey, which are also based on the conflict event data.

Table 1. Climate events and conflict events

| | Mean | S.D. | Min. | Max. |
|---|---|---|---|---|
| **A: Climate events (2 SD, 6 months)** | | | | |
| Climate events (#) | 0.29 | 0.69 | 0 | 5 |
| Climate events (yes/no) | 0.20 | 0.40 | 0 | 1 |
| **Heat waves** | | | | |
| Heat waves (#) | 0.23 | 0.61 | 0 | 5 |
| Heat waves (yes/no) | 0.15 | 0.36 | 0 | 1 |
| **Droughts** | | | | |
| Droughts (#) | 0.02 | 0.15 | 0 | 2 |
| Droughts (yes/no) | 0.02 | 0.15 | 0 | 1 |
| **Floods** | | | | |
| Floods (#) | 0.04 | 0.21 | 0 | 1 |
| Floods (yes/no) | 0.04 | 0.21 | 0 | 1 |
| **B: Conflict events (12 months)** | | | | |
| Conflict events (#) | 34.47 | 111.11 | 0 | 1273 |
| Conflict events (yes/no) | 0.72 | 0.45 | 0 | 1 |
| **0-6 months** | | | | |
| Conflict events (#) | 27.16 | 99.58 | 0 | 1253 |
| Conflict events (yes/no) | 0.64 | 0.48 | 0 | 1 |
| **6-12 months** | | | | |
| Conflict events (#) | 7.31 | 19.73 | 0 | 129 |
| Conflict events (yes/no) | 0.55 | 0.50 | 0 | 1 |

**Climate and conflict events**. Our sample contains a sufficient number of individuals across different combinations of exposure to climate events (in the past 6 months) and conflict events (in the past 12 months) to study how local conflict affects the impacts of climate shocks. 14 percent of individuals experienced a climate event in the presence of conflict (either simultaneously or in the 6 month-period before), 58 percent did neither experience a climate event nor conflict, 6 percent experienced a climate event in the absence of conflict, and 22 percent experienced neither a climate event nor conflict (Fig. 3). Appendix Figure A2 splits up the 12-month period in conflict exposure and shows the breakdowns by climate event and conflict event exposure for each.

Figure 3. Climate events (over 6 months) and conflict events (over 12 months)




## 3.2 Modeling

We model two outcomes related to labor intensity: the (log-transformed) total number of hours worked by an individual per week in agriculture, and the (log-transformed) total number of hours worked by an individual per week in non-agriculture. The average individual for whom the main economic activity is agriculture works 35.5 hours per week (SD = 19.3), the average individual for whom the main economic activity is non-agriculture works 45.1 hours per week (SD = 21.3).

In our baseline model specification, we estimate linear fixed-effects models to assess the effect of local climate and conflict challenges on economic activity at the individual level:

$$Y_{ict} = \beta_1 Climate_{ct} + \beta_2 Conflict_{ct} + \beta_3 Climate_{ct} \, x \, Conflict_{ct} + \beta_4 X_{ict} + n_d + a_t + \varepsilon_{ict}$$

Here, $Y_{ict}$ is the labor intensity of individual i in location c at time t. $Climate_{ct}$ is a binary indicator of climate event exposure, that equals one if the individual experienced intense recent climate events in location c at time t, including heat waves, drought, and floods. Similarly, $Conflict_{ct}$ is a binary indicator of conflict event exposure, that equals one if the individual has been exposed to at least one recent conflict event in location c at time t. Further, $Climate_{ct}$ x $Conflict_{ct}$ is the interaction between climate event and conflict event exposure. $X_{ict}$ is a vector of climate, conflict, household, and individual covariates, $n_d$ are country fixed effects, $a_t$ are year fixed effects, and $\varepsilon_{ict}$ is the error term. Appendix Table A1 provides summary statistics for key covariates in addition to the main climate and conflict variables.

### 3.3 Identification

Our main parameter of interest is $\beta_3$, which captures the interaction effects of experiencing climate and conflict events. By introducing time and country fixed effects we control for particular temporal trends and geographic differences across countries. The combined model removes potential bias from unobservables that change over time but remain constant across locations, as well as factors that differ across locations but remain constant over time.

Climate and conflict challenges are first and foremost aggregate phenomena beyond the labor intensity decisions of individuals. Moreover, the fact that we measure exposure to challenges in periods prior to the survey interview further mitigates concerns of reverse causality from labor supply to conflict outcomes. Doubts about the exogeneity of exposure to challenges, especially conflict events, may remain. However, we posit that even if that were the case, the *interaction* of the two types of challenges can still be considered as exogenous aiding a causal interpretation.

Another concern may be that climate events trigger conflict events. There are several reasons to believe that this concern is minor in our study. First, the latest research on the climate-conflict link suggests that such a link is strongest for interpersonal conflict. For intergroup conflict, there is substantial variation in the strength and direction of the link ranging across studies, with evidence ranging from climate events substantially reducing to increasing intergroup conflict (Burke et al., 2024a). We study data from locations spread across 21 countries under analysis, mitigating concerns of a systematic link between climate and conflict events. In addition, it has now become increasingly clear that the climate-conflict link is strongest for the intensive versus the extensive margin of conflict (Koubi, 2019), which is what we study, thus mitigating concerns further. Lastly, we primarily study how the impacts of a climate event in a six-month period before the survey vary with conflict in the 12-month period before the survey. Many suggested climate impacts on conflict are usually complex and take some time to materialize, and any conflict events that occurred before climate events cannot be their result to start with, which puts into question whether such a mechanism is realistic in our setup.

In addition to these theoretical arguments, we also conduct several empirical exercises and validation tests to support a causal interpretation of our estimated relationships based on insights from the climate-conflict literature. First, we recognize that climate events occurring in the six-month period before the survey may be part of longer-term local climate conditions and change. If these conditions and changes in the local climate affect both climate outcomes occurring in the six-month period before and conflict outcomes in the 12-month period before the survey this may introduce bias. To mitigate these concerns we control for long-term climate means and variance (temperature and precipitation). Second, and similarly, we also control for long-term conflict trends by controlling for indicators of conflict presence in the 12-to-24 months before the survey and the 24-to-36 months before the survey. Third, to mitigate concerns of bias due to a link from climate outcomes to conflict outcomes even further, we also estimate specifications where we split up the 12-month conflict period into two periods, the first period of which precedes any identified climate events (with and without controlling for conflict in the second period). Fourth, we build on the finding that the climate-conflict link is often concentrated in locations where households rely strongly on agriculture (Burke et al., 2024a). Specifically, we test if our findings hold when we exclude individuals in locations with the highest reliance on agriculture. We proxy reliance on agriculture by classifying all survey clusters in terms of the share of economically active individuals whose main sector of activity is agriculture. We then test robustness by excluding individuals above the 99th percentile and the 95th percentile in terms of local agriculture reliance.

## 4 Results

### 4.1 Work in agriculture

Conditional on local conflict, a climate event significantly reduces labor intensity in agriculture by 2% (Table 2). This result confirms the previously established negative impacts of climate events on labor intensity that do not control for local conflict outcomes (Nico & Azzarri, 2024). The effect size is about one quarter of that of being female (which reduces labor intensity by 9%) and about the same as that of age (3%). Conflict presence reduces labor intensity (by about 1%), confirming prior work that did not control for climate events (Ronzani et al., 2024) but does not significantly affect the negative impact of climate events (column 2).

Splitting up the 12-month period used for measuring conflict presence into two six-month periods reveals that local conflict before a climate event takes place significantly exacerbates the climate event's negative impact on labor supply in agriculture.

Table 2. Joint impacts on work intensity in agriculture

| | Outcome: Hours worked in agriculture (ln) | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | | | | | Agriculture reliance | |
| | | | | | p99 | p95 |
| Climate event | −0.022*** | −0.026*** | −0.016** | −0.015** | −0.013* | −0.005 |
| | (0.005) | (0.008) | (0.007) | (0.007) | (0.007) | (0.008) |
| Conflict (12m) | −0.009** | −0.010** | | | | |
| | (0.004) | (0.004) | | | | |
| Climate event × Conflict (12m) | | 0.005 | | | | |
| | | (0.008) | | | | |
| Conflict (6m) | | | −0.011** | | −0.011** | −0.011** |
| | | | (0.005) | | (0.005) | (0.005) |
| Climate event × Conflict (6m) | | | 0.003 | | 0.004 | 0.003 |
| | | | (0.010) | | (0.010) | (0.010) |
| Conflict (6-12m) | | | 0.003 | −0.001 | 0.006 | 0.009* |
| | | | (0.005) | (0.004) | (0.005) | (0.005) |
| Climate event × Conflict (6-12m) | | | −0.016* | −0.014* | −0.018* | −0.020** |
| | | | (0.010) | (0.008) | (0.010) | (0.010) |
| Female | −0.093*** | −0.093*** | −0.093*** | −0.093*** | −0.095*** | −0.094*** |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| Age | 0.034*** | 0.034*** | 0.034*** | 0.034*** | 0.035*** | 0.038*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Age (sq.) | −0.000*** | −0.000*** | −0.000*** | −0.000*** | −0.000*** | −0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Long-term climate | Yes | Yes | Yes | Yes | Yes | Yes |
| Long-term conflict | Yes | Yes | Yes | Yes | Yes | Yes |
| Socio-demographic | Yes | Yes | Yes | Yes | Yes | Yes |
| Year | Yes | Yes | Yes | Yes | Yes | Yes |
| Country | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 194117 | 194117 | 194117 | 194117 | 189511 | 172579 |
| $R^2$ | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 |

*Notes:* Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Working in a conflict environment approximately doubles the negative impact of a climate event compared to a non-conflict environment (column 3). By contrast, conflict occurring in the same (six-month) period as the climate event does not affect the impact of the climate event. In addition, the negative interaction between climate events and conflict presence in the previous (six-month) period is not noticeably affected when we do not control for contemporaneous conflict (column 4). Moreover, we show that our results are robust to excluding individuals in areas that are most reliant on agriculture (columns 5 and 6).

Table 3. Joint impacts on work intensity in agriculture, differentiating climate events

| | Outcome: Hours worked in agriculture (ln) | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Heat wave | −0.001 | | | −0.004 |
| | (0.008) | | | (0.008) |
| Heat wave × Conflict (6-12m) | −0.028*** | | | −0.026** |
| | (0.011) | | | (0.011) |
| Flood | | −0.066*** | | −0.067*** |
| | | (0.013) | | (0.013) |
| Flood × Conflict (6-12m) | | −0.035** | | −0.035* |
| | | (0.018) | | (0.018) |
| Drought | | | 0.063*** | 0.058*** |
| | | | (0.017) | (0.017) |
| Drought × Conflict (6-12m) | | | 0.020 | 0.034 |
| | | | (0.025) | (0.026) |
| Conflict (6-12m) | 0.008* | 0.006 | 0.003 | 0.009** |
| | (0.004) | (0.004) | (0.004) | (0.004) |
| Female | −0.093*** | −0.093*** | −0.093*** | −0.093*** |
| | (0.003) | (0.003) | (0.003) | (0.003) |
| Age | 0.034*** | 0.034*** | 0.034*** | 0.034*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Age (sq.) | −0.000*** | −0.000*** | −0.000*** | −0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Long-term climate | Yes | Yes | Yes | Yes |
| Long-term conflict | Yes | Yes | Yes | Yes |
| Conflict 6m | Yes | Yes | Yes | Yes |
| Socio-demographic | Yes | Yes | Yes | Yes |
| Year | Yes | Yes | Yes | Yes |
| Country | Yes | Yes | Yes | Yes |
| N | 194117 | 194117 | 194117 | 194117 |
| $R^2$ | 0.37 | 0.37 | 0.37 | 0.37 |

*Notes:* Significance levels: * p < 0.1, ** p < 0.05, *** p < 0.01. Robust standard errors in parentheses.

Differentiating types of climate events, we find that the negative interaction between climate events and conflict events is driven by heat waves and floods (Table 3). For both types of events individuals' labor supply in agriculture is most strongly affected when they occur in a local environment affected by conflict before the climate event takes place. The adverse impacts of heat waves are concentrated in such conflict environments, reducing labor intensity in agriculture by 3%. Floods have highly detrimental impacts across environments but are strongest in conflict environments, where they reduce work intensity in agriculture by 10%, as opposed to 7% in non-conflict settings. By contrast, we estimate that droughts *increase* labor supply in agriculture to the same extent in conflict and non-conflict situations, thus suggesting that their impacts differ systematically from those of heat waves and floods. One potential explanation for the differing impacts may be that drought impacts are such that people engage in even more agricultural work to mitigate them.

### 4.2 Work in non-agriculture

We also find evidence for compounding impacts of climate and conflict challenges for work in non-agriculture (Table 4). We document that there are negative impacts of climate events on labor intensity, which are concentrated among individuals who were recently exposed to conflict (columns 1-3). The strength of the interaction (a 3% shift in labor intensity) is about one fifth of the difference that an individual's gender makes, where being female is associated with a 15% reduction in labor intensity in non-agriculture.

Table 4. Joint impacts on work in non-agriculture

| | Outcome: Hours worked outside agriculture (ln) | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Climate event | −0.012** | −0.022** | −0.010 | −0.000 |
| | (0.005) | (0.009) | (0.008) | (0.007) |
| Conflict (12m) | 0.012*** | 0.009** | | |
| | (0.004) | (0.004) | | |
| Climate event × Conflict (12m) | | 0.014 | | |
| | | (0.009) | | |
| Conflict (6m) | | | −0.010** | |
| | | | (0.004) | |
| Climate event × Conflict (6m) | | | 0.023** | |
| | | | (0.010) | |
| Conflict (6-12m) | | | 0.023*** | 0.019*** |
| | | | (0.004) | (0.004) |
| Climate event × Conflict (6-12m) | | | −0.032*** | −0.022*** |
| | | | (0.009) | (0.008) |
| Female | −0.154*** | −0.154*** | −0.154*** | −0.154*** |
| | (0.003) | (0.003) | (0.003) | (0.003) |
| Age | 0.039*** | 0.039*** | 0.039*** | 0.039*** |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| Age (sq.) | −0.000*** | −0.000*** | −0.000*** | −0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Long-term climate | Yes | Yes | Yes | Yes |
| Long-term conflict | Yes | Yes | Yes | Yes |
| Socio-demographic | Yes | Yes | Yes | Yes |
| Year | Yes | Yes | Yes | Yes |
| Country | Yes | Yes | Yes | Yes |
| N | 159310 | 159310 | 159310 | 159310 |
| $R^2$ | 0.16 | 0.16 | 0.16 | 0.16 |

*Notes:* Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Analyzing different types of climate events separately, we again find that the adverse impacts of heat waves are strongly concentrated in areas that had just experienced conflict (Table 5). Floods cause a 3% reduction in labor supply in non-agriculture, which does, however, not vary across conflict and non-conflict situations. We also document an interesting pattern for droughts: when they occur in a non-conflict situation they significantly reduce non-agricultural labor intensity (by 4%) but when they are in environments that had recently been affected by conflict, they increase non-agricultural labor intensity. That droughts can increase economic activity in the non-agricultural sector corroborates findings on climate impacts that did not account for conflict (Nico & Azzari, 2024). Our findings thus suggest that such increases are particularly likely among individuals who have just been affected by local conflict.

Table 5. Joint impacts on work intensity in non-agriculture, differentiating climate events

| | Outcome: Hours worked outside agriculture (ln) | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Heat wave | 0.011 | | | 0.014 |
| | (0.009) | | | (0.009) |
| Heat wave × Conflict (6-12m) | −0.035*** | | | −0.042*** |
| | (0.011) | | | (0.011) |
| Flood | | −0.034** | | −0.033** |
| | | (0.014) | | (0.014) |
| Flood × Conflict (6-12m) | | −0.009 | | −0.013 |
| | | (0.017) | | (0.017) |
| Drought | | | −0.044** | −0.054** |
| | | | (0.022) | (0.023) |
| Drought × Conflict (6-12m) | | | 0.079*** | 0.104*** |
| | | | (0.030) | (0.030) |
| Conflict (6-12m) | 0.023*** | 0.017*** | 0.015*** | 0.023*** |
| | (0.004) | (0.004) | (0.004) | (0.004) |
| Female | −0.154*** | −0.154*** | −0.154*** | −0.154*** |
| | (0.003) | (0.003) | (0.003) | (0.003) |
| Age | 0.039*** | 0.039*** | 0.039*** | 0.039*** |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| Age (sq.) | −0.000*** | −0.000*** | −0.000*** | −0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Long-term climate | Yes | Yes | Yes | Yes |
| Long-term conflict | Yes | Yes | Yes | Yes |
| Conflict 6m | Yes | Yes | Yes | Yes |
| Socio-demographic | Yes | Yes | Yes | Yes |
| Year | Yes | Yes | Yes | Yes |
| Country | Yes | Yes | Yes | Yes |
| N | 159310 | 159310 | 159310 | 159310 |
| $R^2$ | 0.16 | 0.16 | 0.16 | 0.16 |

*Notes:* Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

### 4.3 Heterogeneity by gender and age

#### 4.3.1 Agriculture

For work in agriculture, we inspect further how the strong interactions of heat waves and floods with existing conflict vary with gender and age.

Comparing men and women, we find that the compounding impacts of conflict and heat waves that significantly reduce the essential labor supply in the agricultural sector are concentrated among men (Fig. 4). For women, there is no such significant interaction. Recent work has established that climate change, and heat stress in particular, can cause less reductions in labor supply for women than men but at the same also stronger reductions in economic opportunities and well-being for women (FAO, 2024; Nico & Azzarri, 2024). Our results thus suggest that conflict presence significantly contributes to the additional (relative) work burden heat stress can create for women (FAO, 2024). In addition, if heat stress drives primarily women away from their own household's farms (FAO, 2024), this finding suggests that in the presence of conflict women mitigate the negative effects of heat stress relatively more by diverting to agricultural work outside their farm.

For floods, we see the opposite pattern: in this case, existing conflict exacerbates the flood-induced reduction in agricultural labor supply significantly only for women. This pattern also aligns with prior work, suggesting that there are important gendered differences across climate event types (FAO, 2024). For both heat waves and floods, young people change their labor intensity more than other groups when there is conflict contributing to stronger reactions to climate change impacts among young people (FAO, 2024).

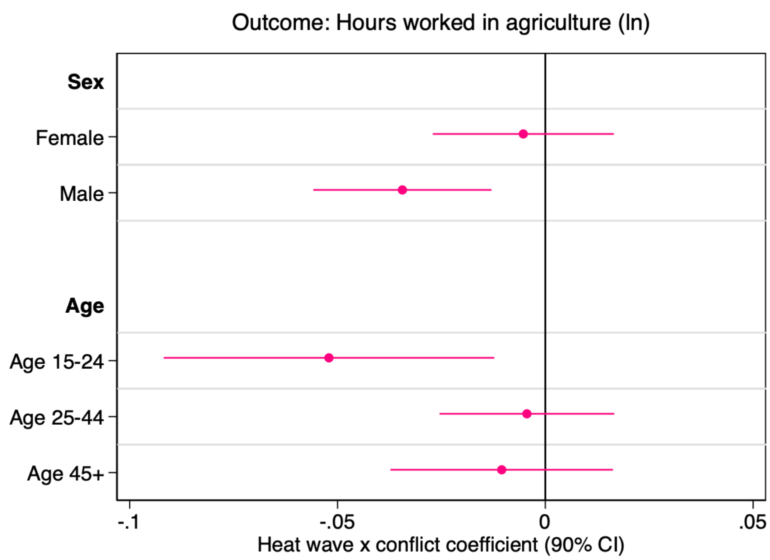
#### 4.3.2 Non-agriculture

For work outside agriculture, we provide further insights into how the strong interaction between heat waves and droughts with prior conflict varies across gender and age lines.

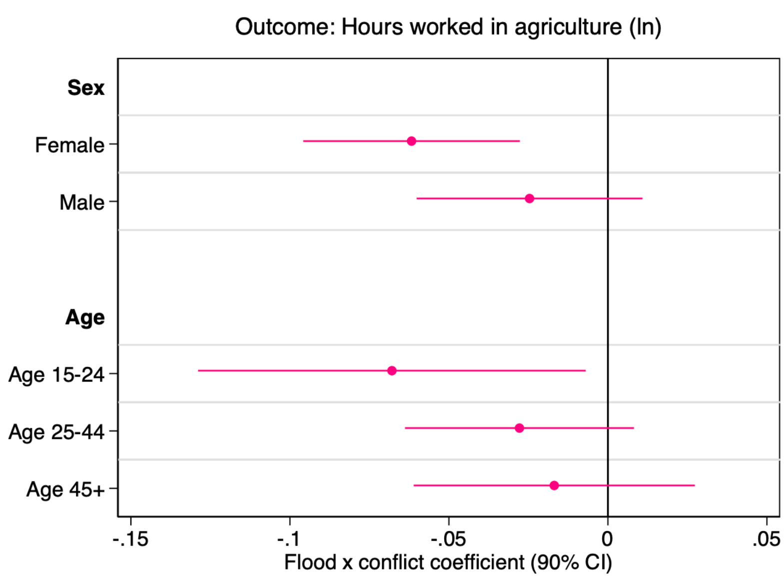
For heat waves, we once again find that conflict presence contributes the strongest to labor reallocation after heat waves among young people (Fig. 5). The pattern of the gendered impacts of heat stress on work outside agriculture is reversed, compared to work in the agricultural sector: conflict exacerbates the heat-induced reduction in non-agricultural labor supply significantly only for women. This pattern could, for example, be the result of women having relatively less work opportunities outside the agricultural sector or less mobility more generally than men during heat waves in conflict environments. In combination, our results provide evidence that conflict situations can contribute to highly gender-specific shifts in labor allocation in response to heat stress (FAO, 2024).

Figure 4. Work in agriculture

a) Heat waves



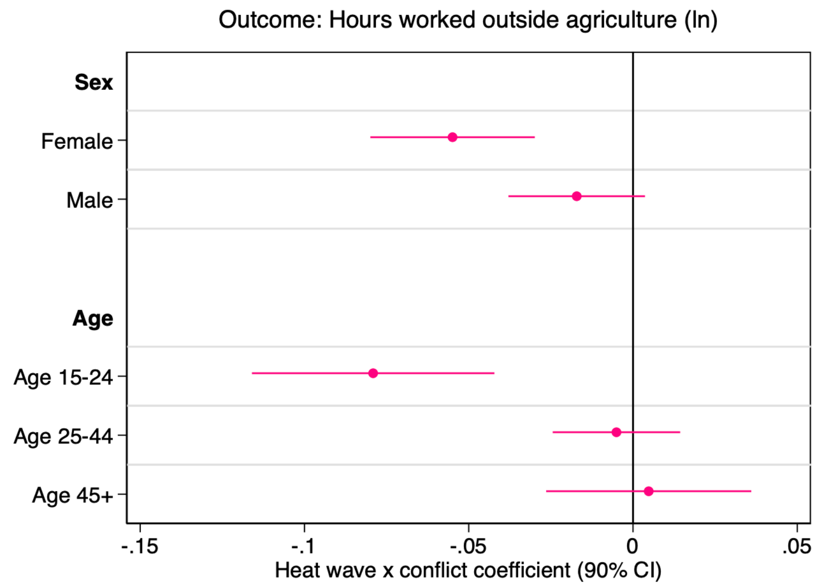

b) Floods



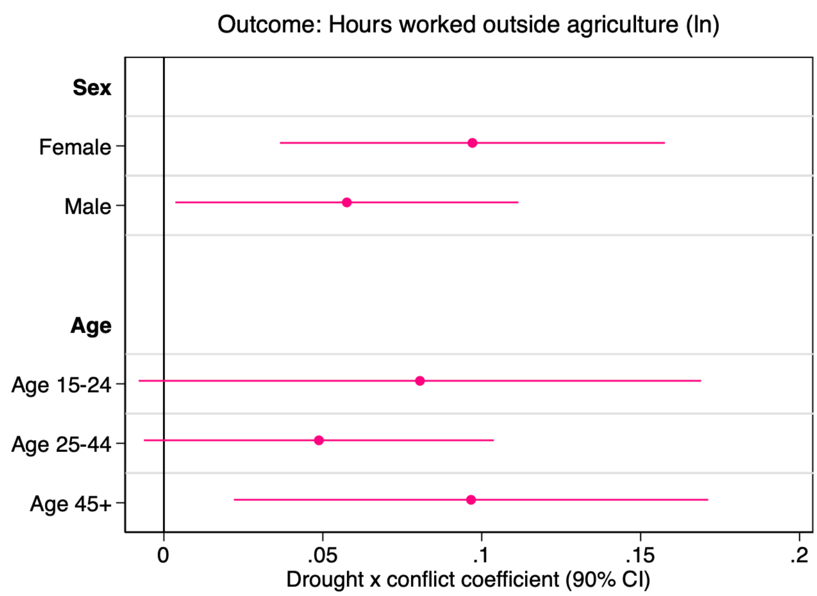

We observe that in the presence of conflict droughts strongly drive individuals towards work outside the agricultural sector across gender and age groups. This result is consistent with the prior observations that droughts can increase economic activity outside the agricultural sector for both men and women (Nico & Azzari, 2024). Our findings suggest that such increases are particularly likely in situations that have just been affected by conflict.

Figure 5. Work in non-agriculture

a) Heat waves




b) Droughts



## 5 Conclusions

We present statistical evidence from 21 African countries that demonstrates that extreme climate events and armed conflict can create poly-crises: when an extreme climate event occurs in a local conflict environment its negative impacts on labor intensity are worse than in non-conflict environments. This is the result of conflict occurring in the time period *before* climate events strike, not conflict that occurs at around the same time as a climate shock. For labor supply in agriculture, conflict presence approximately doubles the negative impact of a climate event. The adverse impacts of heat waves are concentrated in conflict environments, where they reduce labor intensity in agriculture by 3%. Floods have highly detrimental impacts, which are exacerbated impacts in conflict environments, where they reduce work intensity in agriculture by 10%, as opposed to 7% in non-conflict settings. For labor supply in non-agriculture, the negative impacts of climate events are also concentrated in settings affected by conflict presence in the time period before the event strikes. This pattern is driven by heat waves, which reduce non-agricultural labor supply by 4% in wake of conflicts.

Our results also suggest that conflict presence contributes to the additional (relative) work burden climate events can cause for women and to substantial gender-specific shifts in labor allocation in response to climate events. In addition, conflict presence is particularly disruptive for the labor supply of youth contributing to stronger labor elasticity of young people in the face of climatic challenges as documented in prior literature.

Our study provides timely evidence on the challenges and impacts of poly-crises, which not only fills a crucial empirical gap, but is also highly relevant for policies and interventions. We focus on the causal combination of climate change and conflict impacts to show that the two crises have compounding negative effects and, hence, their interaction deserves careful attention by policy-makers and practitioners. Our findings suggest supporting the livelihoods and well-being of young people and women affected by climate crises amid existing conflict crises merits special attention in times of climate-conflict poly-crises.

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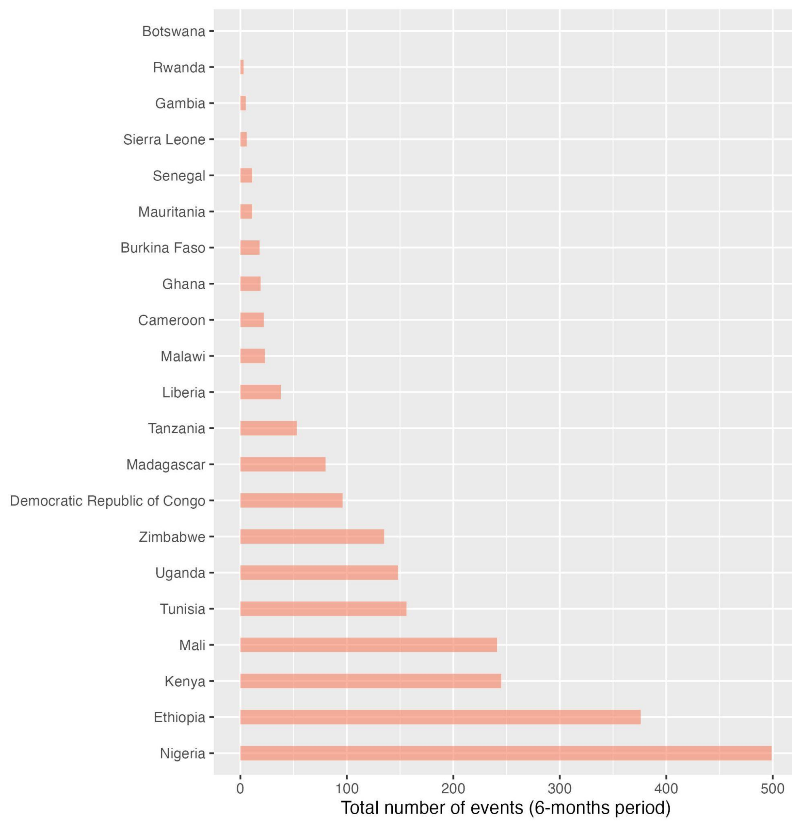
# Appendices

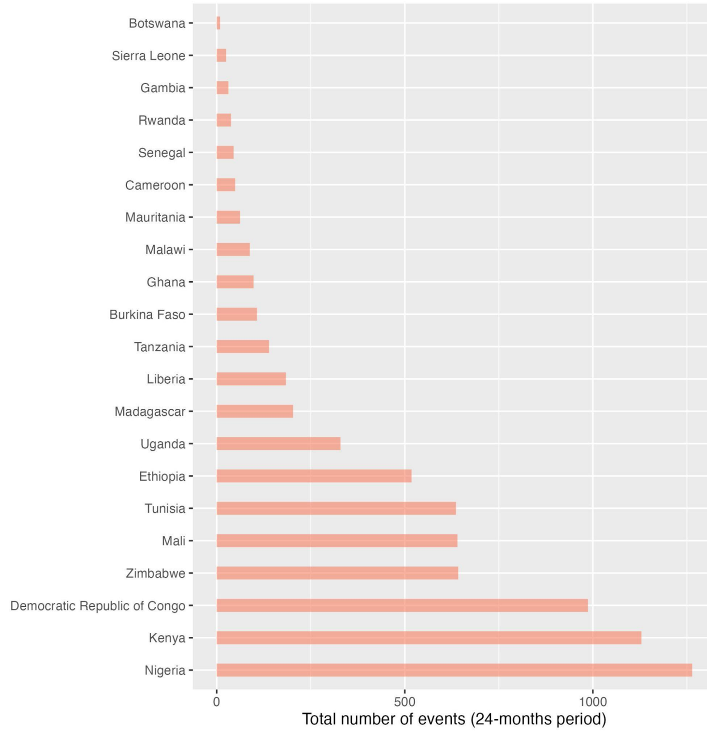
## A1 Additional figures

Figure A1. Number of conflict events per country

(a) 6 months prior to survey




(b) 24 months prior to survey




(c) 36 months prior to survey

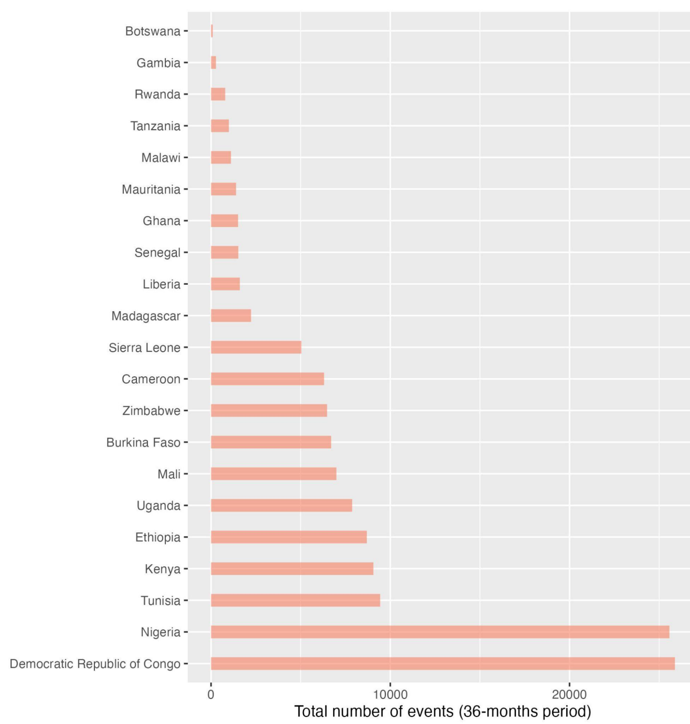
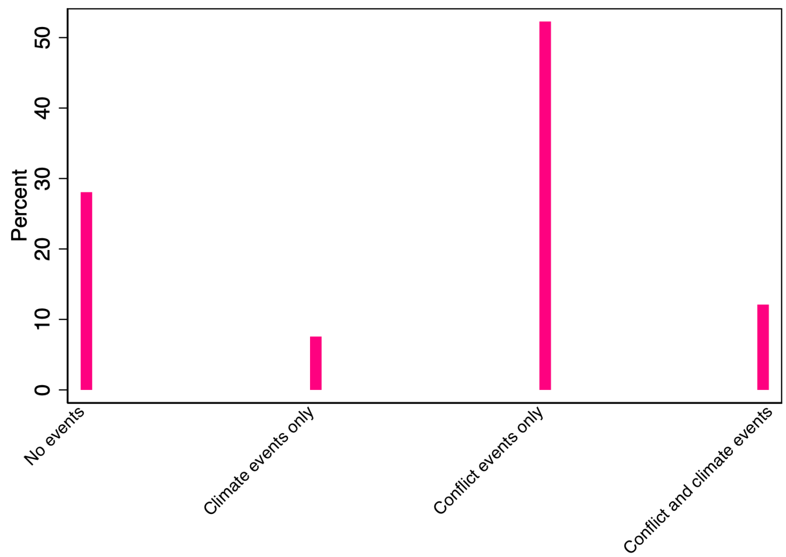
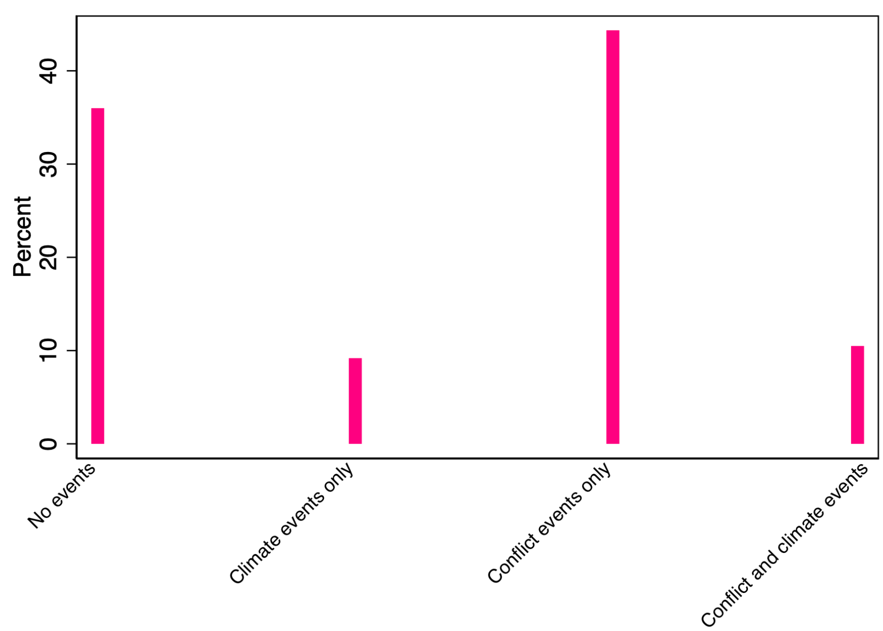


Figure A2. Climate and conflict events

(a) Conflict event period: 6 months




(b) Conflict event period: 6-12 months




## A2 Additional tables

Table A1. Summary statistics

| | Mean | S.D. | Min. | Max. |
|---|---|---|---|---|
| Weekly hours worked agriculture (log) | 3.33 | 0.83 | 0 | 5 |
| Weekly hours worked non-agriculture (log) | 3.65 | 0.66 | 0 | 5 |
| Rural | 0.58 | 0.49 | 0 | 1 |
| Age | 34.76 | 15.69 | 0 | 100 |
| Female | 0.46 | 0.50 | 0 | 1 |
| Highest level of education | 1.31 | 0.63 | 1 | 4 |
| Long-term average temperature | 24.42 | 3.51 | 13 | 30 |
| Long-term average precipitation | 1061.59 | 620.82 | 24 | 3724 |
| Altitude | 583.93 | 575.36 | 3 | 2532 |
| Temperature coefficient of variation | 184.98 | 117.60 | 23 | 798 |
| Precipitation coefficient of variation | 95.12 | 37.25 | 26 | 163 |
| Conflict 12-24 months (yes/no) | 0.71 | 0.45 | 0 | 1 |
| Conflict 24-36 months (yes/no) | 0.54 | 0.50 | 0 | 1 |