Climate, Crops, and Postharvest Conflict

Presented at the Sydney Environment Institute Lunchtime Seminar Series

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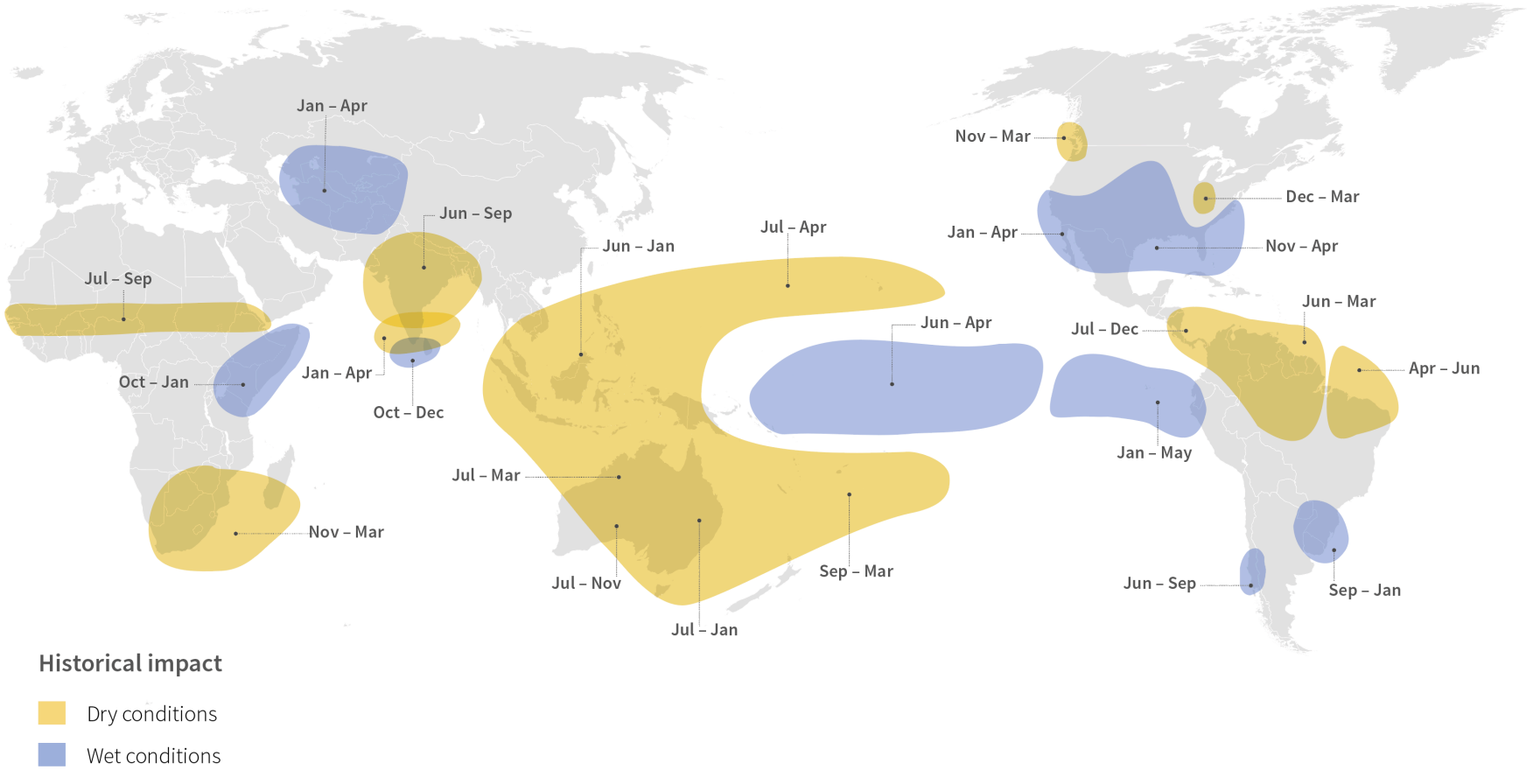
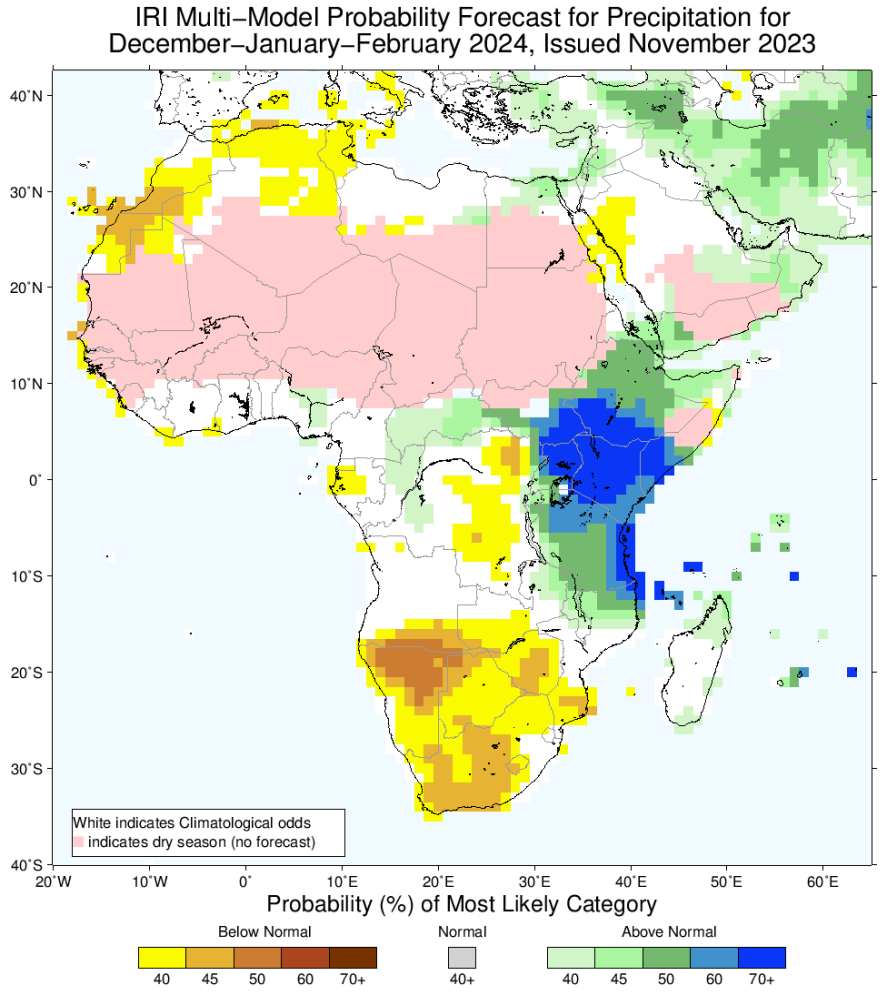
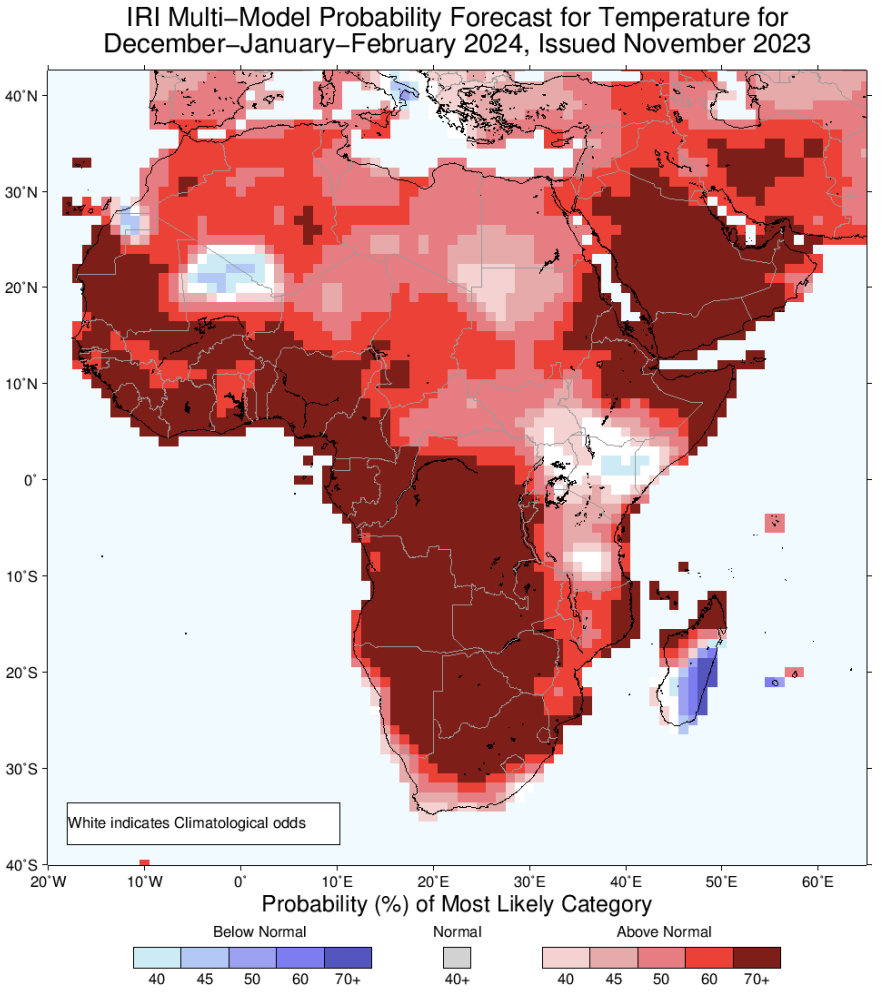
El Niño (Southern Oscillation) alters global weather



Dec 2023 - Feb 2024 forecasts (relative to 1991-2020)





Do El Niño events contribute to social conflict?

Deviations in weather have been linked with changes in political violence and social unrest (Hendrix & Salehyan 2012; Couttenier & Soubeyran 2014).

If the key channel in this relationship is agriculture, we would expect to observe the effect **in locations with crop agriculture**, where **local weather is most responsive to ENSO events**.

In these locations, we would expect the effect to manifest itself **during the harvest or early postharvest season** when the potential benefits of political violence are the highest, and when intra-year and inter-group disparities in income are most apparent.

Yes... El Niño events reduce conflict!

In locations with crop agriculture during the early postharvest season.

A 1°C increase in the December Oceanic Niño Index (ONI)—typically indicative of a moderate El Niño event—is associated with at least three percent reduction in political violence with civilian targeting during the three-months period after harvest (evaluated at average cropland size and average crop growing season intensity of ENSO teleconnections).

Anecdotal evidence: Late 19th century El Niño events

As a result of (or in relation to) the 1876-78 El Niño events:

- In India, thievery became commonplace, with perpetrators targeting rural landowners, seizing their grain stores, and destroying their properties; calls for armed rebellion against British rule (Davis, 2002; Fagan, 2009).
- In Indonesia, to make the most impact, Dutch invaders strategically timed their scorched-earth campaign to coincide with the onset of the rice harvest season (Kreike, 2022).

Anecdotal evidence: Late 19th century El Niño events

In Ethiopia, 'The Great Famine of 1888-92' was likely triggered (or, at least, partly aided) by El Niño events that brought about droughts.

- The lack of food provision turned provincial governors and their warriors into foraging bandits. Trade routes in Ethiopia and neighboring countries fell victim to raids aimed at appropriating imported grain (Davis, 2002).
- Like Dutch colonialists in Indonesia, Italian invaders in Ethiopia used the pretext of abandoned lands to pave the way for the colonization of the Eritrean highlands and the Tigray plateau (Davis, 2002).

Relative food abundance during its general scarcity

(El Niño related) weather adversities lead to food scarcity. But in that regime, sporadic abundances of food has often served as a trigger for grievances or a motive for the rapacious attacks (e.g., Davis, 2002; Hassen, 2002).

Military invasions often were strategically staged around harvest seasons to ensure access to food and impose hardship on the local population by destroying their years' worth of work (Hanson, 1998; Keeley, 2016).

Harvest-time violence against civilians with intent to gain access to local food supplies—a tactic known as 'living off the land'—has been a feature of warfare throughout history (Erdkamp, 1998; Koren and Bagozzi, 2017).

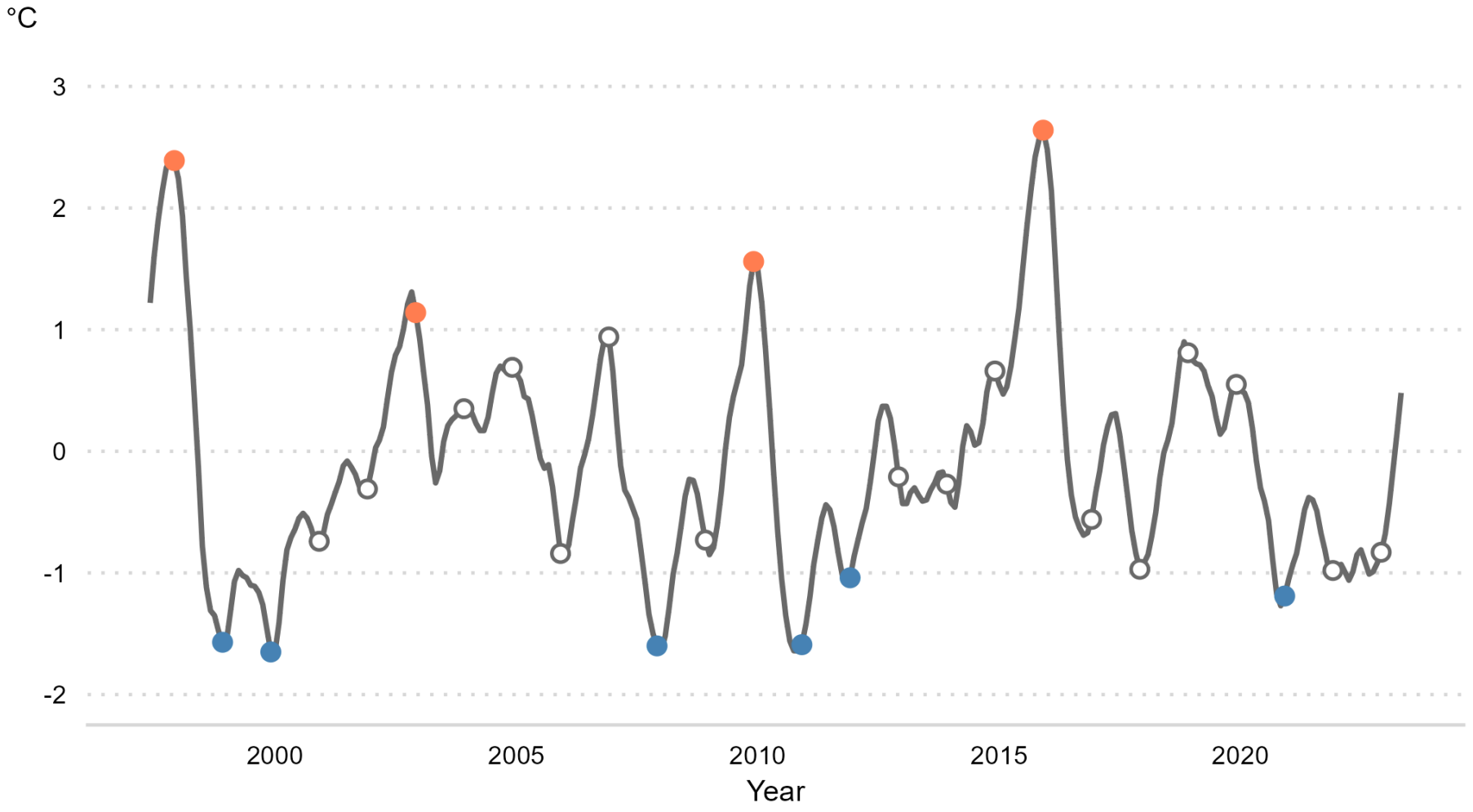
Why (and how) might harvest alter conflict?

Location and timing are typically known well in advance, but crop yields are determined by weather conditions shortly before the harvest.

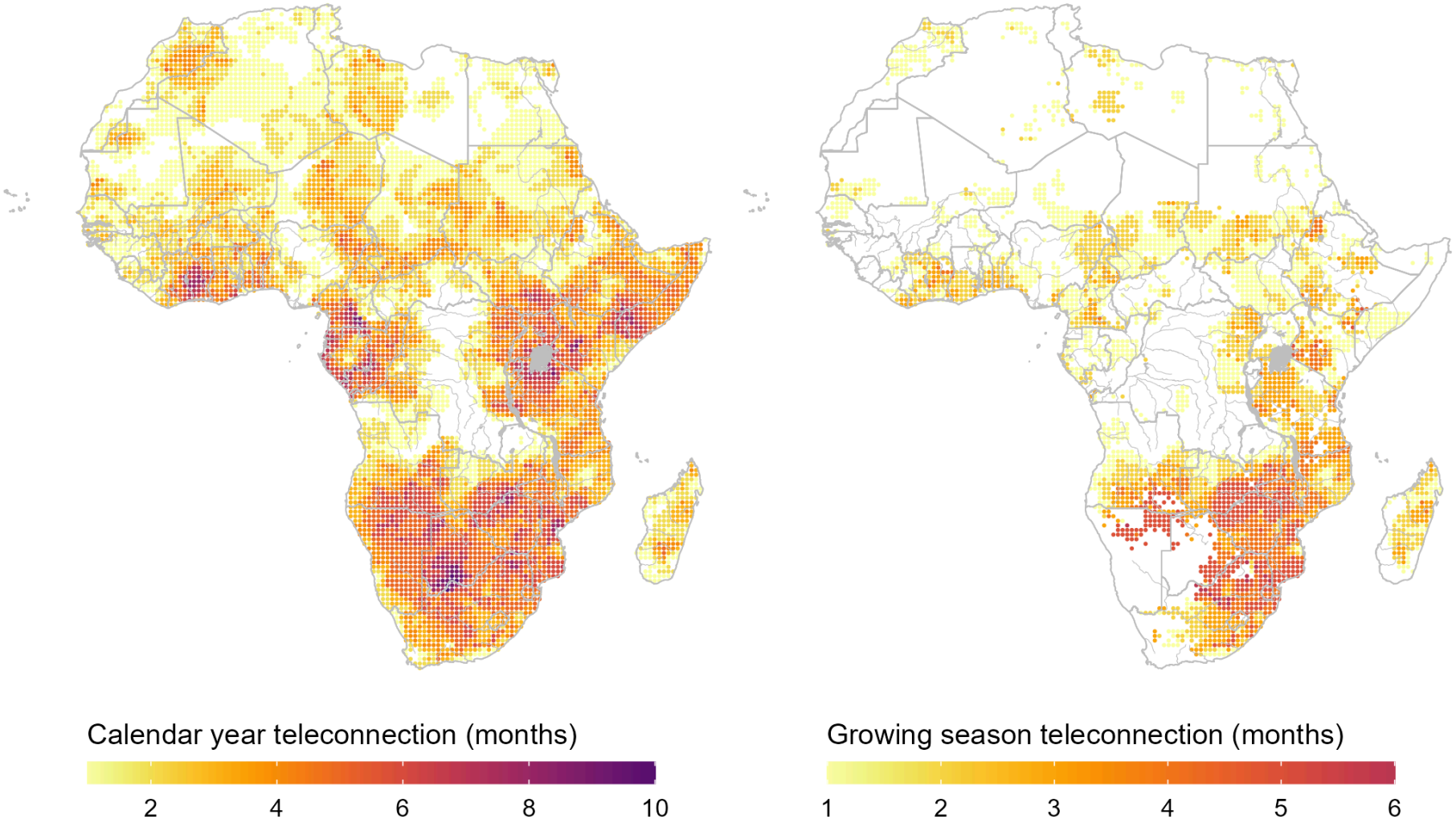
Crop growing season weather and realized yields can influence perpetrators' decisions as they assess whether the potential spoils to be appropriated are worth their effort (Koren and Bagozzi, 2017; McGuirk and Burke 2020).

Resentment, as farmers and non-farmers assess their well-being relative to the expectations or to the well-being of others, can amplify political violence (Mitra and Ray, 2014; Hendrix and Haggard, 2015).

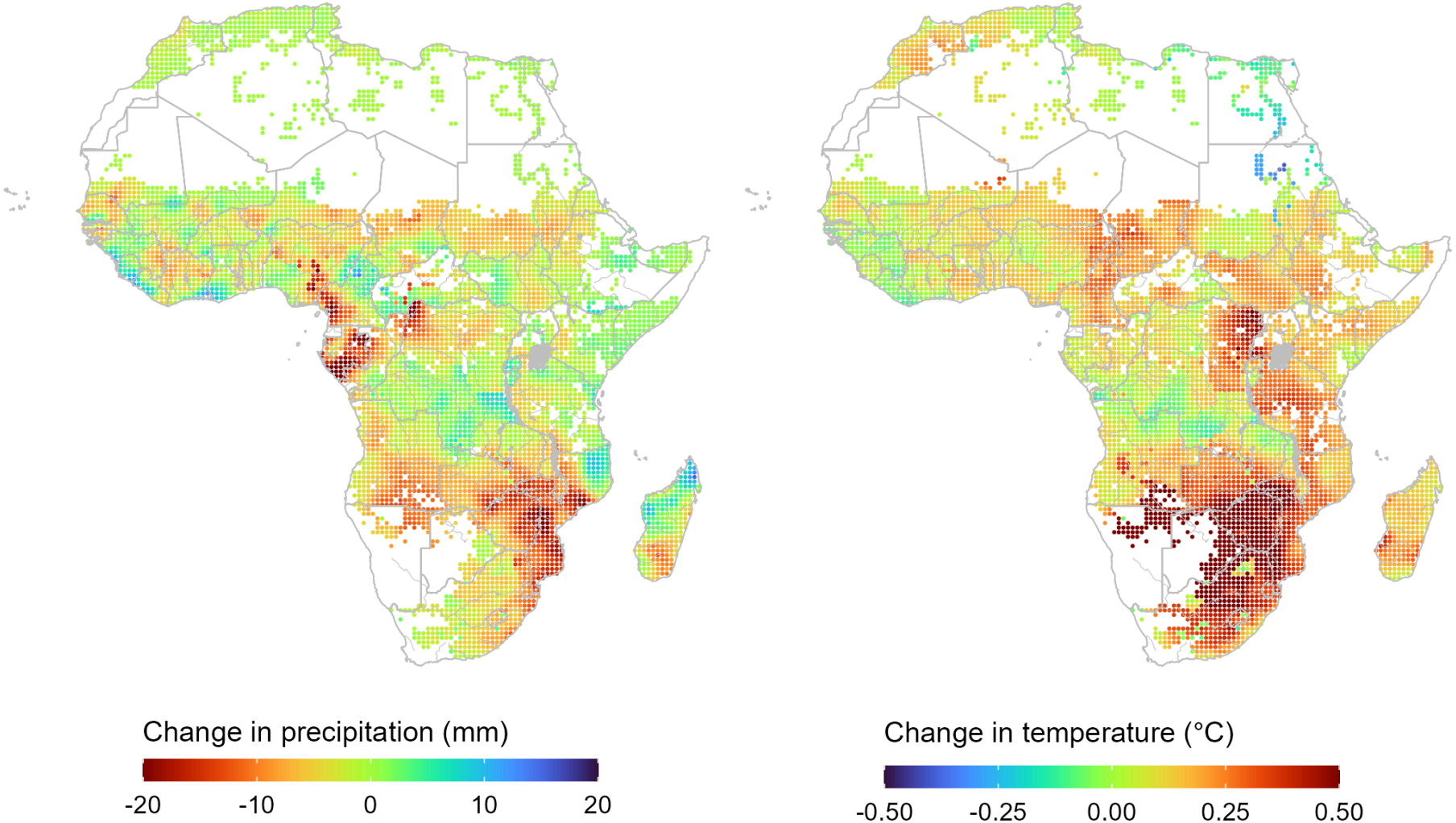
Oceanic Niño Index



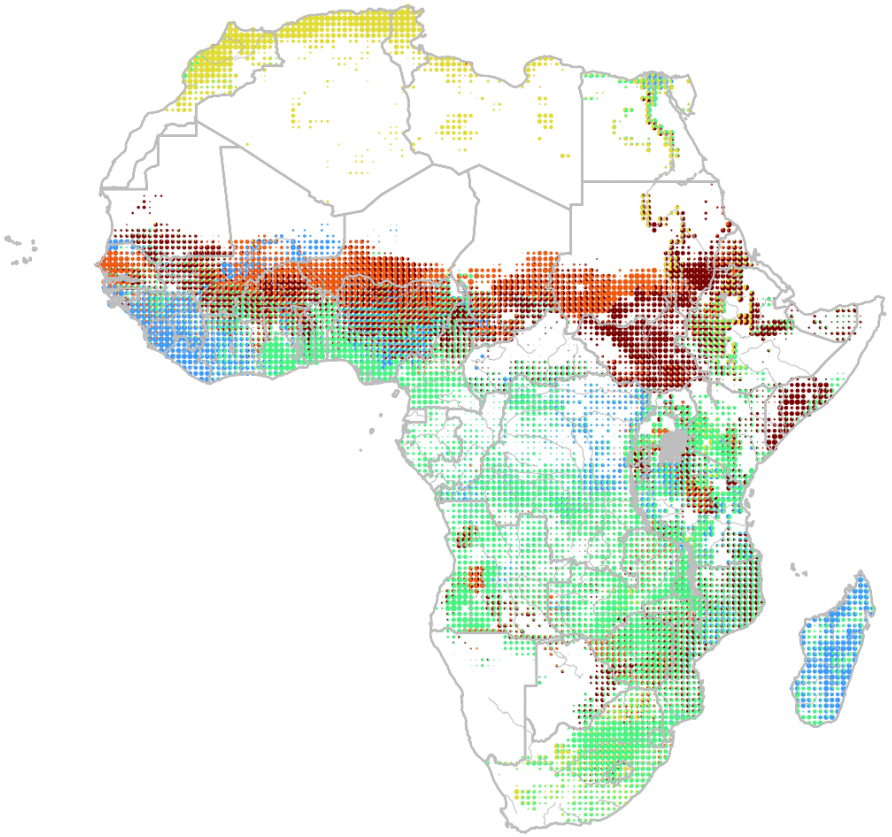
ENSO teleconnections

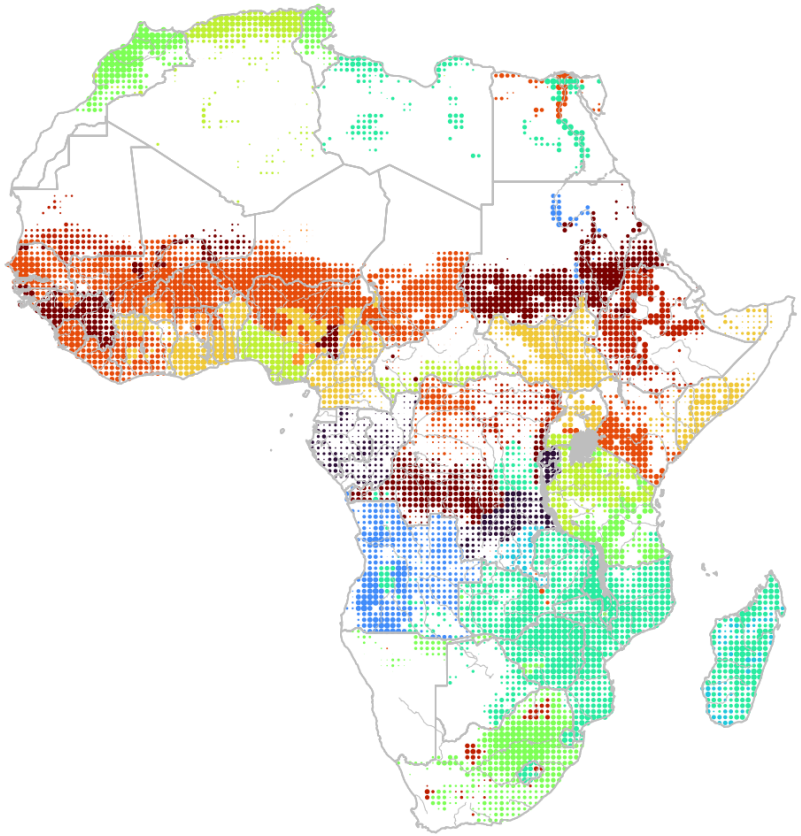


Local weather responses to El Niño events



Crop production and harvest seasons





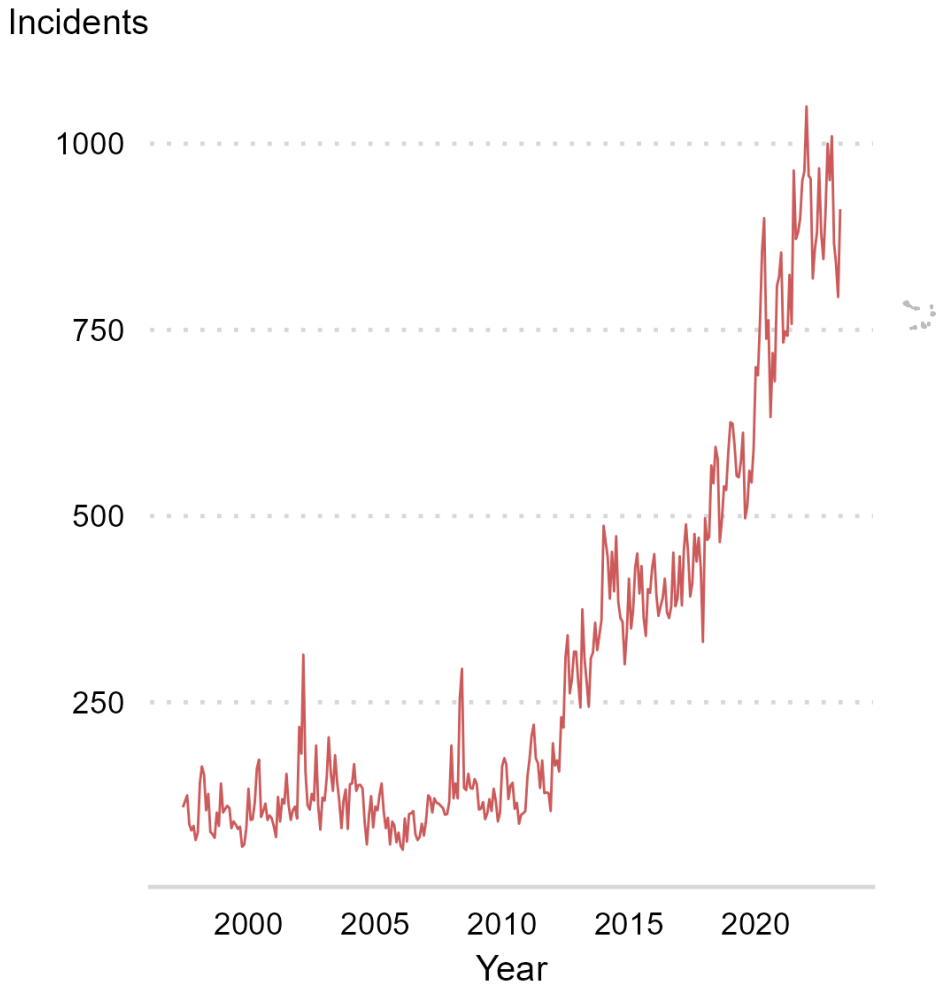
Crop

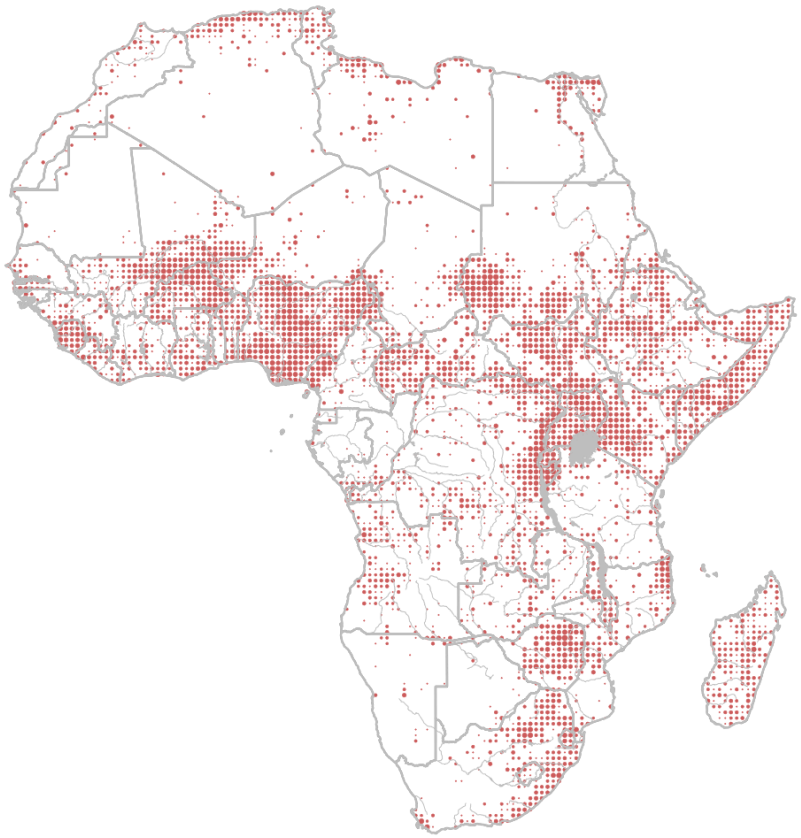
rice maize wheat millet sorghum

Harvest month

Jan Feb Mar Apr May Jun
Jul Aug Sep Oct Nov Dec

Political violence over time and across space





Research design

I exploit variations in the ENSO–conflict relationship between cells with different numbers of months during the crop growing season, in which changes in local weather are linked to changes in sea surface temperatures during the peak ENSO season.

The ENSO–conflict relationship in locations with small or no cropland is assumed to serve as a good counterfactual for the ENSO–conflict relationship that would have been observed in locations with sizable cropland in absence of an ENSO event.

Main result

A 1°C increase in growing-season-adjusted December ONI **reduces** political violence by $\mathbf{3.6\%}$ during the postharvest season. This effect is relative to the observed average incidents conflict in croplands (0.04) evaluated at the average cropland size (9,000 hectares) and the average teleconnection intensity (0.28).

Robustness checks

The estimated effect is not (overly) sensitive to

- different sets of fixed effects
- different sizes of postharvest windows
- omitting conflict hotspots
- different measures of teleconnection
- using incidence as the dependent variable

Adverse El Niño

In a subset of countries where most of the cropland is characterized by a simultaneous decrease in average growing season precipitation and increase in average growing season maximum temperature in response to a positive deviation in December ONI:

A 1°C increase in growing-season-adjusted December ONI **reduces** political violence by 4.6% during the postharvest season.

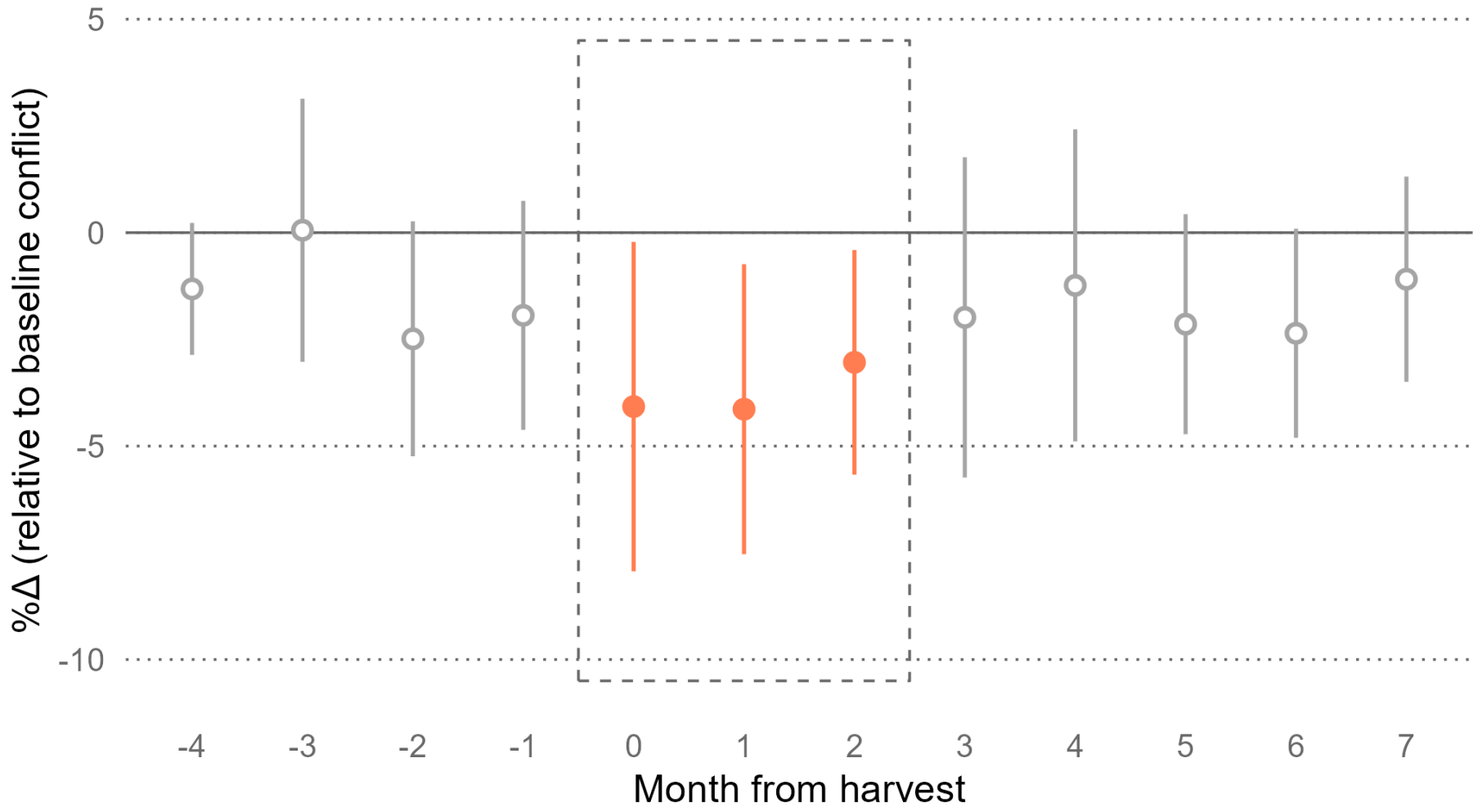
In the rest of the countries the effect is smaller and not significant.

Agrarian conflict

Keywords: farm, farmer, peasant, producer, agriculture, agricultural, livestock, animal, cattle, sheep, goat, crop, cereal, grain, maize, millet, rice, sorghum, wheat, produce, food, harvest.

A 1°C increase in growing-season-adjusted December ONI **reduces** political violence by $\mathbf{6.7\%}$ during the postharvest season.

Conflict dynamics



Contribution to climate-conflict nexus

I clarify that **the effect of El Niño on conflict is not unequivocally positive**, as previously thought (e.g., Hsiang et al., 2011)

- I focus on small-scale incidents of different conflict types and on short-term climate shocks.
- Hsiang et al. (2011) focused on larger-scale incidents and longer-term conflict dynamics.

El Niño–induced weather adversity during a crop-growing season **decreases political violence during the short period after harvest**, plausibly because of a smaller prize in the form of food or cash available for perpetrators.

Contribution to conflict seasonality

ENSO-related changes in conflict materialize through the agricultural channel.

While not surprising, this finding unveils an important nuance related to the seasonal nature of agricultural production: **the effect aligns with crop-year calendars and manifests during the early postharvest season**.

This accords with recent literature on the positive relationship between agricultural output and conflict (e.g., McGuirk and Burke 2020; Koren and Schon 2023) and contributes to the emerging literature on the seasonality of conflict (Guardado and Pennings 2023; Ubilava et al. 2023).

An alternatve interpretation

That El Niño-induced weather adversities during the crop growing season result in less political violence is not exactly a silver lining.

One interpretation of this findings may be that postharvest conflict serves as a litmus test of socioeconomic vulnerability in conflict-prone countries.

Lack of political violence may be seen as a sign of food scarcity and increased hardship among rural households.

Policy implications

Because we can predict ENSO events at least several months in advance, the estimated linkages between ENSO shocks and conflict can have clear policy implications in establishing an early-warning system for political violence in ENSO-affected regions of Africa.

Because ENSO events can simultaneously alter several weather variables, including extreme weather events, across large swathes of land, the ENSO effect can be viewed as a better approximation of the effect of changing climate on societal outcomes

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