Food Fights: Global Food Prices, Real Income and Local Conflict in Africa

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Introduction: on the economic causes of conflict

Civil conflict is a pervasive, persistent and costly impediment to economic development in Africa (Blattman & Miguel 2010)

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Identification problems

- Weather
  (e.g., Miguel, Satyanath & Sergenti 2004; Harari & La Ferrara 2014)
- Exports
  (e.g., Collier & Hoeffler 2004; Besley & Persson 2008; Bazzi & Blattman 2014; Berman & Couttenier 2015; Dube & Vargas 2013; Bruckner & Ciccone 2010)

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Distinguishing mechanisms

- Depends on source of variation, level of (dis)aggregation

Food prices, real income and conflict

What is the causal impact of food price changes on conflict in Africa?

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Production side: share of primary sector is larger in Africa than in any other region

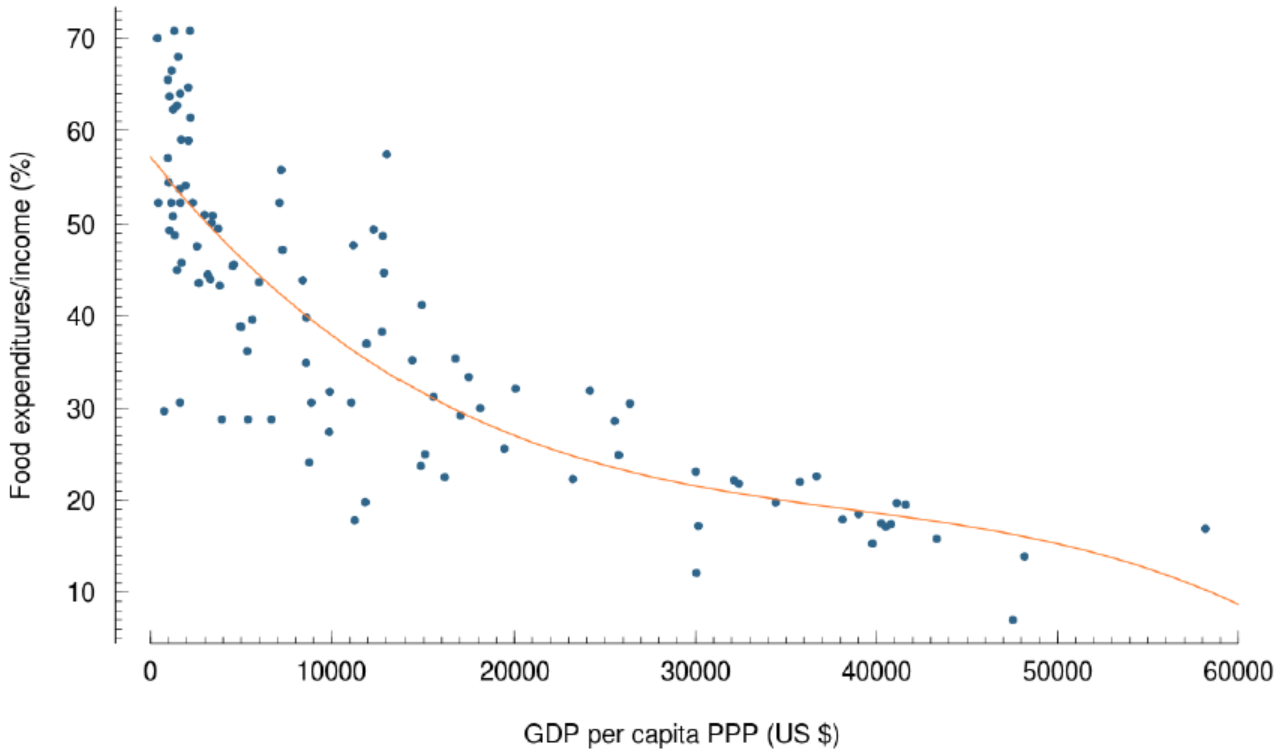
- Higher prices for farmers ought to increase their opportunity cost of joining rebel groups
- Bazzi & Blattman (2014), Dube & Vargas (2013), Berman & Couttenier (2015)

Food prices, real income and conflict

However...

Hendrik Houthakker: "Of all the empirical regularities observed in economic data, Engel's Law is probably the best established."

Figure: Food expenditure and GDP per cap (van Weezel 2014)



Food prices, real income and conflict

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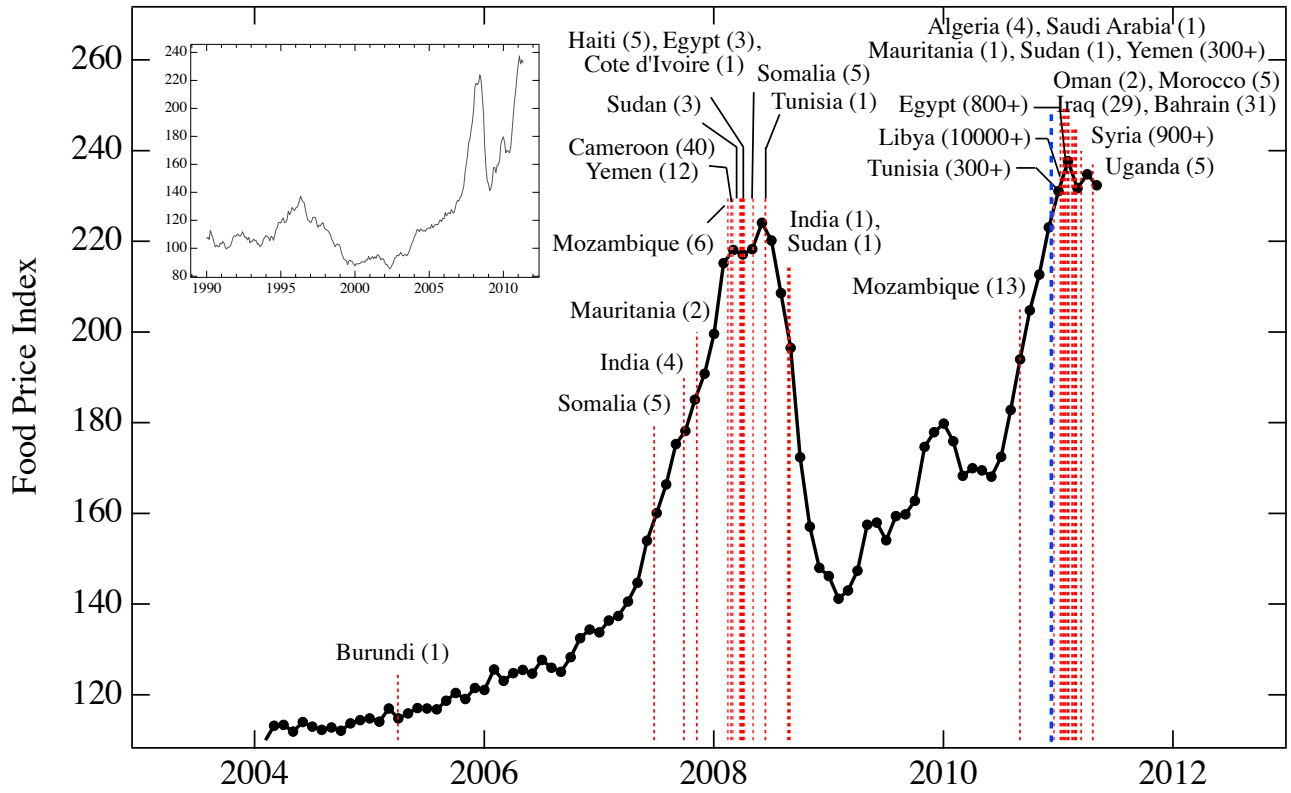
Figure: Food price index and social unrest (Lagi et al. 2011)



Food prices, real income and conflict

What is the causal impact of food price changes on conflict in Africa?

Production side: share of primary sector is larger in Africa than in any other region

Consumption side: share of food expenditure is larger in Africa than any other region

- Food prices are associated with social unrest, "food riots"
- Bellemare (2014), Lagi et al. (2011), Van Weezel (2014), Hendrix & Haggard (2015)

Literature suggests that food price changes have heterogenous effects on real income and violent conflict

Food prices, real income and conflict

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Challenges:

- Local price data is endogenous (and hard to find)
- Disaggregating consumer and producer effects within countries

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Approach: combine five types of data to create price indices:

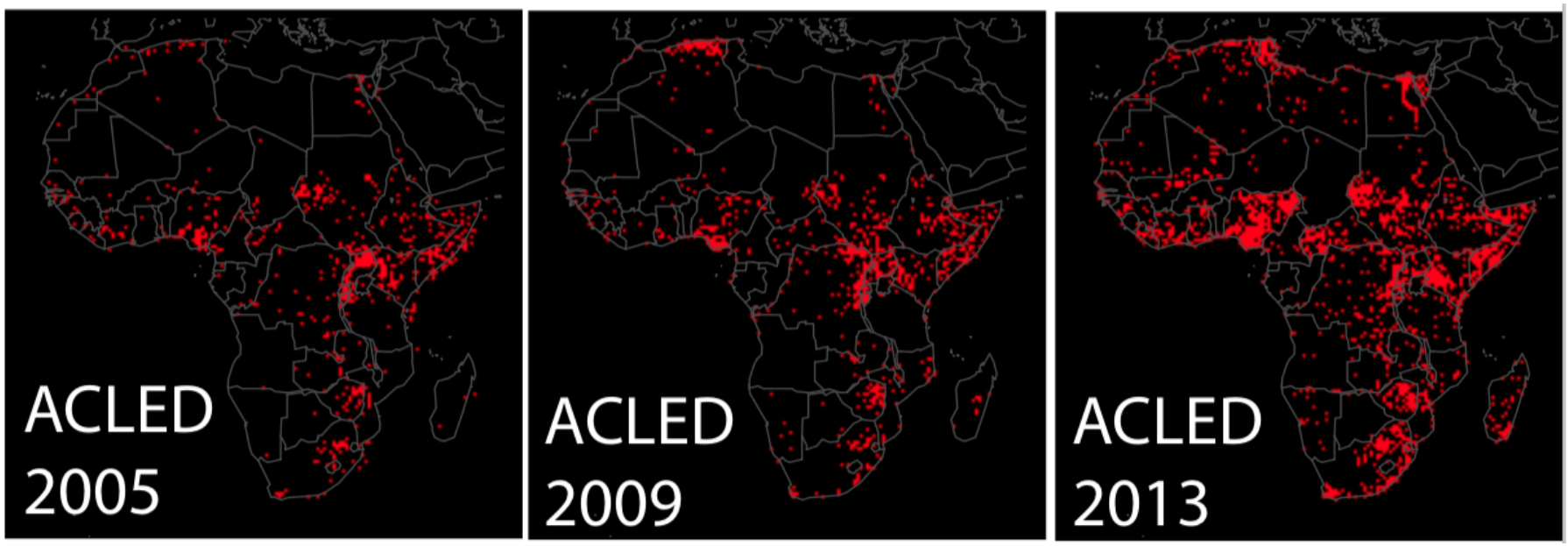
1. International food prices
2. What crops are produced where
3. What crops are consumed where
4. Trade shares (by crop & country)
5. Cell characteristics: urbanization, distance to markets

Data

Conflict 1: ACLED – Armed Conflict Location and Event Data Project (Raleigh et al. 2014)

- Geo-referenced political violence events from 1997-2013
- 8 event types, incl. unorganized riots, protests, criminal violence, as well as violence against civilians and battles between organized actors
- Event locations assigned to 0.5×0.5 degree grid cells
- Event time assigned to years
- $= 1$ if any conflict event in a given cell-year
- $N = 173893$, mean $= 0.072$, s.d. $= 0.25$

Data



Data

Conflict 2: UCDP Georeferenced Event Dataset (Sundberg et al. 2011)

- Actors are organized
- Events feature at least one fatality
- All actors have crossed 25 death threshold in any year of the series
- Dichotomized in same manner as Acled
- $N = 225038$, mean $= 0.027$, s.d. $= 0.16$

Data

- **Conflict**: ACLED and UCDP
- **Food prices**: IMF Financial Statistics. International dollar denominated prices for 13 crops
- **Local production shares**: Monfreda et al (2008). Time-invariant crop maps
  - Aggregate to share of 0.5deg cell covered by given crop
- **Consumption shares**: FAO food balance sheets
  - Estimated average calories per capita consumed of given crop per country-year
  - Use series mean to generate time-invariant weights for each crop
- **Trade weights**: FAO country-crop specific production + trade data
  - Use series mean to generate time-invariant weights for each crop
- **Cell characteristics**:
  - Global Rural-Urban Mapping Project, Columbia
  - Distance to city and port, urbanization statistics

Data

Observations are at the cell-year level (10229 per year)

- **Producer price** in cell i at year t:

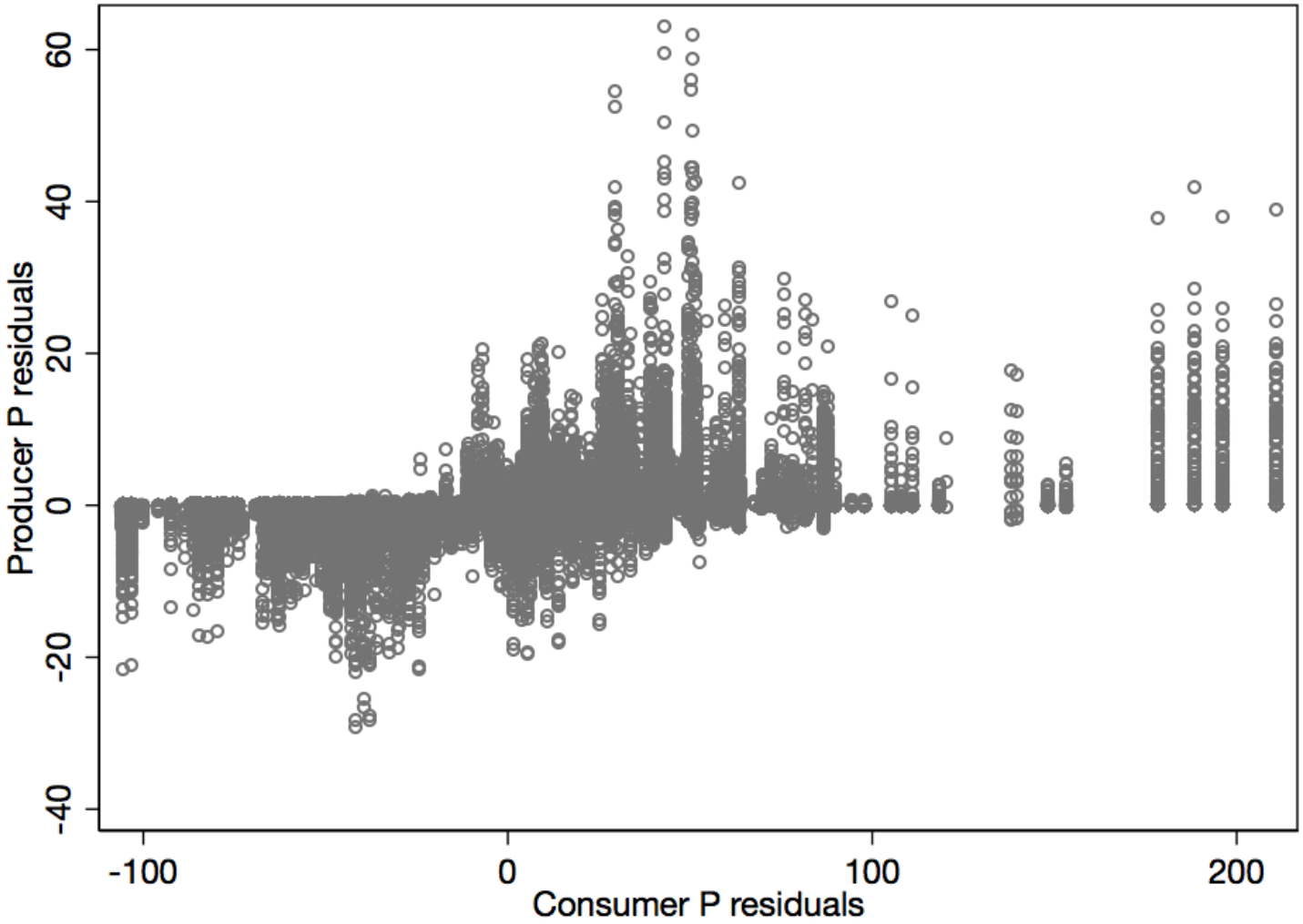
$$P^p_{ict} = \sum_{j=1}^{n} (P_{jt} \times \underbrace{\frac{imp_{jc} + exp_{jc}}{prod_{jc}}}_{trade\ \ weight} \times \underbrace{\lambda_{jic}}_{crop\ \ share})$$

- **Consumer price** in country c at year t:

$$P^c_{ct} = \sum_{j=1}^{n} (P_{jt} \times \underbrace{\frac{imp_{jc} + exp_{jc}}{prod_{jc}}}_{trade\ \ weight} \times \underbrace{\theta_{jc}}_{calorie\ \ share})$$

Prices

Constructed consumer and producer prices correlated, but not perfectly so.



Theoretical predictions

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Opportunity cost:

- Violent conflict is more likely when the opportunity cost of soldiering is lower.
- E.g., climate shocks reduce the cost of recruiting affected farmers.
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State-as-prize:

- Violent conflict is more likely when the spoils of appropriation increase in value.
- Dal Bo & Dal Bo (2011); Dube and Vargas (2013)

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Consider consumption side:

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  - Food price increase is a correlated shock – relative wage largely unchanged
  - Exception: those who are shifted beneath minimum consumption threshold

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  - Agricultural gains unlikely to accrue to state (compared to extractive commodity rents, e.g.)
- State capacity?
  - Possible that fixed-wage government security officials could reduce labor supply following real income shock caused by higher food prices

Theoretical predictions

Food price changes can affect different types of violence in different ways

Consumer effects:

1. Type 1 riot (+)
   Usually unorganized urban demonstrations, perpetrated by net-consumers with a view to provoking change in government policy to lower prices (World Bank 2014). Violence can be initiated by civilians or government.

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   Unorganized riots perpetrated by net-consumers with a view to appropriating food (World Bank 2014). "Rapacity effect" (Becker 1968).

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   Marginal households shifted beneath minimum consumption threshold more likely to be recruited by armed groups.

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   Marginal households shifted beneath minimum consumption threshold more likely to be recruited by armed groups.
4. State capacity (+)
   Reduction in labor supply from government security officials following

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2. Type 2 riot (+)
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4. State capacity (+)

Producer effects:

1. Opportunity cost (−)
   Higher prices for farmers increase opportunity cost of entering predatory sector

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Producer effects:

1. Opportunity cost (−)
   Higher prices for farmers increase opportunity cost of entering predatory sector
2. Type 2 riot (+)

Empirical approach

We begin by estimating:

$$ACLED_{ict} = \beta_1 P^c_{ct} + \beta_2 P^p_{ict} + \delta_t \gamma_c + \eta_i + \epsilon_{ict} \quad (1)$$

$$UCDP_{ict} = \beta_3 P^c_{ct} + \beta_4 P^p_{ict} + \delta_t \gamma_c + \eta_i + \nu_{ict} \quad (2)$$

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ACLED regression:
$\beta_1 > 0$ (type 1, type 2, threshold; state capacity)
β_2 ambiguous (type 2 vs opportunity cost)

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ACLED regression:
$\beta_1 > 0$ (type 1, type 2, threshold; state capacity)
β_2 ambiguous (type 2 vs opportunity cost)

UCDP regression:
$\beta_3 > 0$ (threshold; state capacity)
$\beta_4 < 0$ (opportunity cost)

Results

Table: Acled conflict and food prices in Africa

	(1) ACLED	(2) ACLED	(3) ACLED
Consumer price	0.0001***		0.0001***
	(0.0000)		(0.0000)
Producer price		0.0038***	0.0034***
		(0.0011)	(0.0011)
Consumer price std. % effect	9.7		8.2
Producer price std. % effect		8.5	7.6
Observations	158270	173893	158270
R squared	0.397	0.399	0.397
Cell FE	Yes	Yes	Yes
Country time trend	Yes	Yes	Yes

Clustered standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Results

Table: UCDP conflict and food prices in Africa

	(1) UCDP	(2) UCDP	(3) UCDP
Consumer price	-0.0000		0.0000
	(0.0000)		(0.0000)
Producer price		-0.0021**	-0.0022***
		(0.0009)	(0.0008)
Consumer price std. % effect	-1.2		1.5
Producer price std. % effect		-12.6	-12.8
Observations	204820	225038	204820
R squared	0.287	0.290	0.288
Cell FE	Yes	Yes	Yes
Country time trend	Yes	Yes	Yes

Clustered standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Results

Table: Year fixed effects

	(1) ACLED	(2) UCDP	(3) ACLED	(4) UCDP	(5) ACLED	(6) UCDP
Consumer price	0.0001***	0.0000	0.0001	-0.0000	0.0002***	-0.0000
	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0001)	(0.0000)
Producer price	0.0034***	-0.0022***	0.0035***	-0.0022***	0.0030***	-0.0023***
	(0.0011)	(0.0008)	(0.0011)	(0.0008)	(0.0010)	(0.0009)
Consumer price std. % effect	8.2	1.5	8.6	-9.3	16.2	-5.1
Producer price std. % effect	7.6	-12.8	7.8	-13.0	6.7	-13.4
Observations	158270	204820	158270	204820	148960	195510
R squared	0.397	0.288	0.403	0.289	0.407	0.304
Cell FE	Yes	Yes	Yes	Yes	Yes	Yes
Country time trend	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	Yes	Yes	Yes
Consumption weights	Fixed	Fixed	Fixed	Fixed	LMA	LMA

Clustered standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Results

Table: Cell-level interactions

	(1) ACLED	(2) ACLED	(3) ACLED
Consumer price	0.0001	0.0001	0.0002**
	(0.0001)	(0.0001)	(0.0001)
Consumer price * %Urban area	0.0052***		
	(0.0009)		
Consumer price * Urban pop.		0.0000***	
		(0.0000)	
Consumer price * Dist. to city			-0.0001*
			(0.0001)
Consumer std. eff. at 5th Pctile	6.3	8.1	14.9
Consumer std. eff. at median	6.3	8.1	10.8
Consumer std. eff. at 95th Pctile	24.0	11.2	4.5
Producer std. eff. at 5th Pctile	3.9	7.6	8.0
Producer std. eff. at median	3.9	7.6	0.2
Producer std. eff. at 95th Pctile	3.1	7.4	-11.8
Observations	158168	158270	158270
R squared	0.405	0.403	0.403

Results

Table: Lagged prices

	(1) ACLED	(2) UCDP
Consumer price	-0.0000	-0.0000
	(0.0000)	(0.0000)
Consumer price, t-1	0.0001**	0.0000
	(0.0001)	(0.0000)
Consumer price, t-2	0.0001*	0.0000
	(0.0000)	(0.0000)
Producer price	0.0003	-0.0018
	(0.0017)	(0.0014)
Producer price, t-1	0.0024	0.0011
	(0.0024)	(0.0021)
Producer price, t-2	0.0023	-0.0026
	(0.0019)	(0.0021)
Sum of consumer effects	0.0002	0.0000
p-value	0.000	0.515
Sum of producer effects	0.0050	-0.0034
p-value	0.000	0.007
Consumer price std. % effect	13.9	2.9
Producer price std. % effect	11.2	-20.0
Observations	158270	195510
R squared	0.398	0.302

Results

Table: Separate food and cash crops (with lags)

	(1) ACLED	(2) UCDP
Sum of consumer effects	0.0002	0.0000
p-value	0.000	0.518
Sum of producer food effects	0.0065	-0.0034
p-value	0.000	0.027
Sum of producer cash effects	-0.0029	-0.0037
p-value	0.370	0.151
Consumer price std. % effect	14.1	2.9
Producer food price std. % effect	12.3	-17.0
Producer cash price std. % effect	-2.7	-9.2
Observations	158270	195510
R squared	0.399	0.302

Results

Table: Onset and Ending

	(1) ACLED ONSET	(2) ACLED END	(3) UCDP ONSET	(4) UCDP END
Consumer price	0.0000**	-0.0010***	-0.0000	-0.0001
	(0.0000)	(0.0003)	(0.0000)	(0.0004)
Producer price	0.0031***	0.0055**	-0.0010*	0.0103
	(0.0010)	(0.0027)	(0.0006)	(0.0066)
Consumer std. % effect	6.6	-13.8	-2.8	-0.7
Producer std. % effect	13.0	2.1	-10.9	3.1
Observations	152880	10970	202298	5352
R squared	0.171	0.481	0.126	0.442

Results

Table: Onset & ending, separate food and cash crops

	(1) ACLED ONSET	(2) ACLED END	(3) UCDP ONSET	(4) UCDP END
Consumer price	0.0000**	-0.0010***	-0.0000	-0.0001
	(0.0000)	(0.0003)	(0.0000)	(0.0004)
Producer food price	0.0042***	0.0039	-0.0010	0.0125*
	(0.0011)	(0.0024)	(0.0007)	(0.0066)
Producer cash price	-0.0023	0.0211**	-0.0010	-0.0176
	(0.0022)	(0.0090)	(0.0010)	(0.0234)
Consumer std. % effect	6.7	-13.5	-2.8	-1.0
Producer food std. % effect	15.2	1.2	-9.3	3.2
Producer cash std. % effect	-4.1	3.3	-4.5	-2.2
Observations	152880	10970	202298	5352
R squared	0.171	0.482	0.126	0.442

Summary

Consumer price:

- Higher food prices for consumers increase the incidence, onset and duration of unorganized violence in Africa
- This violence in concentrated in urban areas: at 95th percentile, a unit standard deviation increase in food prices raises the risk of conflict incidence by 24%
- Consumer prices have no effect on violence between organized groups

Summary

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- Higher food prices for consumers increase the incidence, onset and duration of unorganized violence in Africa
- This violence in concentrated in urban areas: at 95th percentile, a unit standard deviation increase in food prices raises the risk of conflict incidence by 24%
- Consumer prices have no effect on violence between organized groups

Producer price:

- Higher prices for producers lower the incidence, onset and duration of violence between organized actors
- A unit standard deviation increase lowers the onset risk of organized violence by 10.9%
- Higher food crop prices for producers raise the onset risk of unorganized violence
- Higher cash crop prices reduce the duration of unorganized violence

Conclusions

- Evidence of Type 1 food riots in urban areas
- Evidence of Type 2 food riots ("rapacity effect") in producer cells
- Evidence of opportunity cost mechanism in producer cells
- Next step: linking four rounds of Afrobarometer data at the village-month level to improve understanding of mechanisms