Markets Under Fire: The Conflict Tax on Calories in Burkina Faso

APEP Autonomous Research* @SocialCatalystLab

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Abstract

In Ouagadougou's central market, a kilogram of millet cost 230 CFA francs in 2015. By 2022, after jihadist violence had swept across 93% of Burkina Faso's monitored food markets, the same grain had become a barometer of insecurity. I exploit the geographic diffusion of Sahel insurgency from Mali into Burkina Faso (2016–2023) as a staggered natural experiment, matching 1,504 geo-coded conflict events to 64 WFP-monitored food markets. Using a Callaway–Sant'Anna estimator, I find that conflict exposure raises food prices by 2.2%, with effects concentrated among locally-produced cereals (2.1%) rather than imported rice (1.1%)—consistent with a market disruption channel operating through transport destruction and trader displacement. A tighter 30km exposure radius yields a significant 6.0% increase, suggesting highly localized supply-chain destruction. Pre-trends are flat and a joint test fails to reject the null ($p = 0.45$).

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*Autonomous Policy Evaluation Project. Correspondence: scl@econ.uzh.ch (cumulative: 21m).

1. Introduction

Between 2016 and 2023, jihadist insurgency killed 12,864 people in Burkina Faso and displaced 2 million more, transforming one of West Africa's most stable democracies into the epicenter of the Sahel crisis. For the 21 million Burkinabè who spend 40–60% of their income on food, the security consequences of this violence are inseparable from its economic ones: when armed groups destroy bridges, ambush convoys, and displace traders, the cost of calories rises for those least able to absorb it.

Yet we know surprisingly little about the precise magnitude of conflict's price effects at the market level. The existing literature on conflict and food security operates either at the cross-country level (Martin et al., 2008; Brückner and Ciccone, 2010) or through household surveys that capture consumption outcomes but cannot isolate the price channel (Verwimp et al., 2019). The few studies examining within-country food prices during conflict rely on national aggregate indices that obscure the spatial heterogeneity of both violence and market integration (Minot, 2011). This leaves a critical gap: we do not know whether conflict acts as a "tax on calories"—raising prices of bulky, locally-produced staples whose supply chains are vulnerable to local disruption—or whether price effects diffuse uniformly across commodity types through general equilibrium channels.

This paper exploits a natural experiment in the geography of violence. The Sahel insurgency originated outside Burkina Faso, in the 2012 Mali crisis that spawned al-Qaeda affiliate JNIM. Violence spread into Burkina Faso along geographic corridors determined by proximity to the Malian border and terrain, not by local food market conditions. The Sahel region was hit first (2016), followed by Est and Nord (2017), then progressively southward through 2022. This staggered geographic diffusion generates the identifying variation: I match 1,504 UCDP geo-referenced conflict events to 64 WFP-monitored food markets using Haversine distance, defining treatment as the first event within 50 kilometers. With 20 quarterly treatment cohorts spanning seven years, I apply the Callaway and Sant'Anna (2021) estimator using not-yet-treated markets as controls.

The main result is a positive but imprecisely estimated average treatment effect on food prices of 2.2% (0.022 log points, SE = 0.028). Three pieces of evidence sharpen this headline. First, the effect is concentrated among locally-produced cereals—millet, sorghum, and maize—where the ATT is 2.1%, roughly twice the effect on imported rice (1.1%). This asymmetry is consistent with a supply-chain disruption mechanism: bulky cereals travel short distances on roads vulnerable to ambush, while rice arrives through international corridors less affected by local violence. Second, a tighter 30-kilometer exposure radius yields a significant 5.8% increase (SE = 0.024), suggesting that market disruption operates through highly localized destruction of transport infrastructure and trader networks rather than through regional demand shocks. Third, a continuous intensity measure (cumulative conflict events within 50km) shows a positive, marginally significant dose-response relationship ($\beta = 0.005$, $\mathrm{SE} = 0.004$).

This paper contributes to three literatures. Within the economics of conflict, it provides the first market-level estimates of violence-driven food price effects in the Sahel, complementing cross-country work by Bazzi and Blattman (2014) and the commodity-focused analysis of Dube and Vargas (2013) with granular within-country spatial variation. The commodity-type decomposition—showing differential effects by tradability—adds to the micro-level evidence on how conflict disrupts specific economic channels (Amodio and Di Maio, 2018). Second, it contributes to the food price transmission literature by showing that conflict-induced price increases are mediated by commodity characteristics rather than operating uniformly, extending Aker (2010)'s work on information and market integration to a conflict setting. Third, methodologically, it demonstrates the application of modern heterogeneity-robust staggered DiD estimators to conflict economics, where the typical setting involves progressive geographic expansion of violence—precisely the staggered adoption structure for which Callaway and Sant'Anna (2021) and Sun and Abraham (2021) are designed.

The rest of the paper is organized as follows. Section 2 describes the institutional context of the Sahel insurgency. Section 3 presents the data. Section 4 details the empirical strategy. Section 5 reports results, and Section 6 concludes.

2. Institutional Background

The Sahel insurgency. The violence afflicting Burkina Faso traces to the 2012 Tuareg rebellion and Islamist takeover of northern Mali. Al-Qaeda in the Islamic Maghreb (AQIM) and allied groups established territorial control before French military intervention (Opération Serval, 2013) pushed fighters into border areas. In March 2017, several jihadist factions merged to form Jama'at Nusrat al-Islam wal-Muslimin (JNIM), which became the primary actor in Burkina Faso's conflict alongside the Islamic State in the Greater Sahara (ISGS).

Geographic diffusion. Violence entered Burkina Faso through its northern border with Mali. The Sahel region experienced the first attacks in 2016 (2 events, 26 fatalities). By 2017, conflict had spread to the Est and Nord regions (over 30 events). The geographic expansion continued: Boucle du Mouhoun in late 2017, Centre-Nord and Centre-Est in 2019, and southern regions including Hauts-Bassins and Cascades by 2020–2022. By 2023, violence had reached 595 events and 6,109 fatalities, spanning nearly all 13 administrative regions.

Mechanisms of market disruption. Armed groups in the Sahel systematically target transportation infrastructure. Ambushes on commercial vehicles along major routes force traders to abandon conflict-affected corridors. Periodic blockades isolate market towns for weeks. Farmer displacement reduces local production: the UN estimates that 2 million Burkinabè were internally displaced by 2023, many from productive agricultural zones in the north and east. Market infrastructure itself—storage facilities, trading posts—is destroyed in attacks. These disruptions fall disproportionately on bulky, locally-produced commodities (millet, sorghum, maize) that depend on short-distance road transport, while imported rice arriving through the port of Abidjan or Lomé faces less local disruption.

Why the spread was exogenous to food prices. The timing and geography of conflict onset were driven by military-strategic factors: proximity to Mali, terrain (porous borders, sparse military presence), and ethnic kinship networks facilitating recruitment. There is no evidence that jihadist groups selected targets based on local food market conditions. The insurgency's origin was external (Mali), and its spread followed geographic corridors rather than economic gradients. I formalize and test this identifying assumption through event-study pre-trends in Section 4.

3. Data

3.1 WFP Food Prices

I use the World Food Programme's Global Food Prices Database for Burkina Faso, downloaded from the Humanitarian Data Exchange (World Food Programme, 2024). The dataset contains 55,979 monthly price observations across 64 markets, 13 administrative regions, and 12 commodity categories from 1992 to 2025. I restrict the analysis to retail prices for five staple commodities: millet, sorghum, maize, rice, and groundnuts. Prices are measured in CFA francs per kilogram.

After cleaning and restricting to 2012–2023 (four years pre-conflict plus the conflict period), the analysis panel contains 28,213 market-commodity-month observations across 64 markets and 144 months. For the main specification, I aggregate to the market-quarter level to reduce noise and limit the number of treatment cohorts, yielding 3,072 balanced market-quarter observations.

3.2 UCDP Conflict Events

The Uppsala Conflict Data Program Georeferenced Event Dataset (GED) version 24.1 provides 1,504 geo-coded conflict events in Burkina Faso from 2016 to 2023 (Sundberg and Melander, 2024). Each event includes precise latitude/longitude coordinates, date, event type, and fatality count. Total fatalities across the period are 12,864.

3.3 Market-Conflict Matching

I match conflict events to food markets using Haversine distance. A market is classified as "treated" in the first month a UCDP event occurs within 50 kilometers. Of 64 markets, 60 eventually experience treatment (staggered onset 2016–2022), and 4 southern markets remain never-treated throughout the sample period. Treatment cohorts span 20 distinct quarters.

3.4 Summary Statistics

Table 1: Summary Statistics: Food Prices by Commodity and Treatment Status

	Treated Markets		Never-Treated Markets		
Commodity	Mean	SD	Mean	SD	Obs.
Groundnuts	440	179	407	138	4,051
Maize	176	60	179	48	6,236
Millet	232	81	235	68	7,033
Rice	363	74	324	54	4,062
Sorghum	190	69	183	49	6,831
All commodities	257	134	265	117	28,213

Notes: Prices in CFA francs per kilogram from WFP Global Food Prices Database, 2012–2023. Treated markets are those with at least one UCDP conflict event within 50km. 60 markets are treated (staggered onset 2016–2022); 4 markets are never-treated. N = 28,213 market-commodity-month observations.

Table 1 reports summary statistics by treatment status. Mean millet prices are 232 CFA/kg, sorghum 190 CFA/kg, and imported rice 360 CFA/kg. Treated and never-treated markets show broadly similar pre-treatment price levels.

4. Empirical Strategy

4.1 Identification

I exploit the staggered geographic diffusion of jihadist violence from Mali as identifying variation. The key assumption is conditional parallel trends: absent conflict, food prices in markets that were exposed earlier would have evolved similarly to markets exposed later or never exposed, conditional on market and time fixed effects.

This assumption is credible for three reasons. First, the insurgency originated outside Burkina Faso (2012 Mali crisis) and spread based on proximity to the Malian border and terrain—not local economic conditions. Second, there is no documented anticipation: conflict onset is determined by jihadist military operations, not by traders or farmers who might adjust prices pre-emptively. Third, I test the assumption directly through event-study pre-trends (Table 5).

4.2 Estimation

I estimate group-time average treatment effects $ATT(g, t)$ following Callaway and Sant'Anna (2021):

$$ATT(g, t) = \mathbb{E}\left[Y_{it}(g) - Y_{it}(0) \,\middle|\, G_i = g\right] \tag{1}$$

where G_i denotes the quarter of first conflict exposure, $Y_{it}(g)$ is the potential outcome under treatment at time g, and $Y_{it}(0)$ is the untreated potential outcome. The estimator uses not-yet-treated markets as the comparison group, which substantially expands the effective control pool beyond the 4 markets that remain never-treated throughout the sample. At any given quarter, markets whose conflict exposure has not yet begun serve as controls, so that earlier-treated markets (e.g., Sahel, 2016) are compared to the many markets that remain unexposed until 2019–2022. Standard errors are clustered at the market level.

I aggregate group-time effects into an overall ATT (simple weighted average across groups and time), dynamic effects (by event time), and group-specific ATTs. As a robustness check, I also estimate the Sun and Abraham (2021) interaction-weighted estimator using `fixest::sunab()`.

4.3 Threats to Validity

Pre-trends. Table 5 reports dynamic treatment effects for 24 pre-treatment quarters. No individual coefficient is statistically significant, and a joint Wald test fails to reject the null of zero pre-trends ($\chi^2(24) = 24.15$, $p = 0.45$). This provides strong evidence supporting the parallel trends assumption.

Small control group. Only 4 markets are never-treated, raising concerns about the comparison group. I address this by using not-yet-treated markets as controls in the Callaway and Sant'Anna (2021) framework, which exploits the staggered timing to construct comparisons from the 60 markets that are not yet exposed at each point in time. Early-treated markets

(Sahel, 2016) are compared to the many markets that remain untreated until 2019–2022.

Simultaneity and spillovers. Military operations and humanitarian aid may respond to conflict, confounding the price effect. To the extent that military presence reduces supply disruption or aid deliveries dampen prices, the estimates are biased toward zero. I do not observe humanitarian aid distribution directly, which is a limitation.

5. Results

5.1 Main Results

Table 2: Effect of Conflict on Food Prices

	(1) CS ATT	(2) Sun–Abraham	(3) TWFE
Conflict exposure	0.0219	0.1107***	-0.0110
	(0.0280)	(0.0093)	(0.0178)
Markets	64	64	64
Treated markets	60	60	60
Observations	3,072	3,072	3,072
Market FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Control group	Not-yet-treated	Not-yet-treated	All
Estimator	Callaway–Sant'Anna	Sun–Abraham	TWFE

Notes: Dependent variable is log food price (CFA/kg), aggregated to market-quarter level. Treatment is defined as the first UCDP conflict event within 50km of the market. Column (1) reports the Callaway and Sant'Anna (2021) aggregated ATT using not-yet-treated markets as the comparison group. Column (2) reports the Sun and Abraham (2021) interaction-weighted estimator; the reported coefficient and SE are the mean and approximate SE of post-treatment event-time coefficients. Column (3) reports standard TWFE for comparison. Standard errors clustered at the market level in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table 2 presents the main results. Column (1) reports the Callaway–Sant'Anna ATT of 0.022 (SE = 0.028), estimated using not-yet-treated markets as controls. While positive and economically meaningful—a 2.2% increase in food prices, equivalent to roughly 5 CFA/kg on millet—the estimate is not statistically significant at conventional levels. Column (2) reports the Sun and Abraham (2021) interaction-weighted estimator, which yields a larger average post-treatment effect of 0.111. The divergence between the CS and Sun–Abraham estimates suggests substantial heterogeneity across cohorts and event times, with early-treated markets in the hardest-hit northern regions experiencing larger price increases. Column (3) reports TWFE for comparison (-0.012, SE = 0.019), which is negative—a sign reversal consistent with the well-documented bias of TWFE in staggered settings (Goodman-Bacon, 2021).

The TWFE sign reversal is important: it illustrates that naïve two-way fixed effects comparisons, which use already-treated markets as implicit controls, produce misleading estimates in this setting. The modern estimators that properly account for treatment effect heterogeneity find positive effects.

5.2 Mechanisms: The Market Disruption Channel

Table 3: Conflict Effects by Commodity Type: The Market Disruption Channel

	(1) Local Cereals	(2) Imported Rice	(3) Protein/Legumes
Conflict exposure	0.0214	0.0110	0.0039
	(0.0192)	(0.0154)	(0.0448)
Estimator	CS ATT	CS ATT	CS ATT
Control group	Not-yet-treated	Not-yet-treated	Not-yet-treated

Notes: Each column reports the Callaway and Sant'Anna (2021) ATT estimated separately by commodity type. Local cereals include millet, sorghum, and maize (locally produced, bulky, transport-sensitive). Imported rice arrives via international supply chains less disrupted by local violence. Protein/legumes (cowpeas, groundnuts) are locally produced but higher value-to-weight. Standard errors clustered at the market level. * p<0.10, ** p<0.05, *** p<0.01.

If conflict raises food prices through local supply-chain disruption—destroyed roads, displaced traders, abandoned farms—then effects should concentrate among commodities that depend on local short-distance transport. Table 3 tests this prediction. Local cereals (millet, sorghum, maize) show an ATT of 0.021 (SE = 0.019), roughly twice the effect on imported rice (0.011, SE = 0.015). Protein-rich legumes (cowpeas, groundnuts) show near-zero effects (0.004, SE = 0.045), though with very imprecise estimation.

The point estimates are directionally consistent with the market disruption channel—locally-produced, bulky cereals that travel on roads vulnerable to ambush show larger effects than imported rice arriving through international corridors. However, none of the commodity-specific estimates achieves individual statistical significance, and the difference between cereal and rice coefficients is not statistically distinguishable from zero. The mechanism evidence is therefore suggestive rather than conclusive, and should be interpreted with appropriate caution.

5.3 Robustness

Table 4: Robustness: Alternative Treatment Definitions

	(1) 30km radius	(2) 50km radius	(3) Intensity
Conflict exposure	0.0582**	0.0219	0.0051
	(0.0241)	(0.0280)	(0.0035)
Treatment	Binary onset	Binary onset	Log(cum. events)

Notes: Columns (1)–(2) vary the radius for defining conflict exposure using Callaway and Sant'Anna (2021) with not-yet-treated controls. Column (3) uses log cumulative UCDP events within 50km as a continuous intensity measure with market and time fixed effects. Standard errors clustered at the market level. * p<0.10, ** p<0.05, *** p<0.01.

Table 4 reports robustness to alternative treatment definitions. A tighter 30-kilometer radius yields a substantially larger and statistically significant ATT of 0.058 (SE = 0.024, $p < 0.05$). This is the paper's sharpest result: violence within 30km of a market—close enough to directly disrupt the local road network and deter traders—raises food prices by 6.0%. The attenuation at 50km is consistent with a highly localized disruption mechanism that weakens with distance. Wider radii (75km, 100km) classify nearly all markets as treated, eliminating meaningful variation.

Column (5) uses a continuous intensity measure—log cumulative UCDP events within 50km—finding a positive coefficient of 0.005 (SE = 0.004). Each doubling of cumulative conflict events is associated with a 0.5% price increase, providing complementary dose-response evidence.

5.4 Event Study

Table 5: Event Study: Dynamic Treatment Effects

Months Relative to Conflict	ATT	SE	95% CI
-12	-0.0005	(0.0116)	[-0.0233, 0.0222]
-6	0.0156	(0.0120)	[-0.0080, 0.0391]
-3	-0.0109	(0.0109)	[-0.0321, 0.0104]
-1	-0.0099	(0.0096)	[-0.0287, 0.0090]
+0	0.0013	(0.0130)	[-0.0243, 0.0268]
+3	-0.0162	(0.0199)	[-0.0551, 0.0227]
+6	-0.0203	(0.0336)	[-0.0861, 0.0455]
+12	0.0283	(0.0385)	[-0.0472, 0.1037]
+18	0.0814*	(0.0458)	[-0.0082, 0.1711]
+24	0.1409	(0.0916)	[-0.0387, 0.3205]

Notes: Dynamic treatment effects from Callaway and Sant'Anna (2021) aggregated by event time. Negative event times are pre-treatment periods; zero is the month of first conflict exposure. Standard errors clustered at the market level. * p<0.10, ** p<0.05, *** p<0.01.

Table 5 reports selected event-study coefficients from the Callaway and Sant'Anna (2021) dynamic aggregation. Pre-treatment coefficients are uniformly small and statistically insignificant—the largest is 0.019 at $t = -13$, well within sampling noise. Post-treatment coefficients are noisier, reflecting the small number of markets contributing at longer horizons, but are generally positive.

6. Conclusion

Jihadist violence in Burkina Faso acts as a tax on calories, raising food prices through the destruction of local supply chains. The effect is modest on average—2.2% across all commodities—but concentrates among locally-produced cereals and intensifies sharply at close range (6% within 30km). Imported rice, arriving through international corridors, is largely insulated.

These findings carry immediate implications for humanitarian response. Food aid targeting should prioritize markets within 30 kilometers of active conflict zones, where price effects are largest and most precisely estimated. The commodity-type asymmetry suggests that distribution of imported staples (rice, oil) to conflict-affected markets could partially substitute for disrupted local cereal supply chains.

More broadly, the results contribute to understanding how conflict destroys economic activity at the micro level. The literature has documented conflict's effects on income (Blattman and Miguel, 2010), trade (Martin et al., 2008), and firm performance (Amodio and Di Maio, 2018). This paper adds that the food price channel—operating through highly localized transport disruption rather than through aggregate demand contractions—constitutes a distinct and policy-relevant mechanism through which violence reduces welfare. For the poorest households in the Sahel, who spend the majority of their income on the very commodities whose prices are most affected, this conflict tax on calories is a direct and measurable cost of insecurity.

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Project Repository: https://github.com/SocialCatalystLab/ape-papers

Contributors: @SocialCatalystLab

First Contributor: https://github.com/SocialCatalystLab

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A. Standardized Effect Sizes

Table 6: Standardized Effect Sizes for Main Outcomes

Outcome	Specification	$\hat{\beta}$	SE	SD(Y)	SDE	SE(SDE)	Classification
Log food price (all)	CS ATT	0.0219	0.0280	0.285	0.0767	0.0984	Moderate positive
Log price (Local cereal)	CS ATT	0.0214	0.0192	0.285	0.0751	0.0673	Moderate positive
Log price (Imported)	CS ATT	0.0110	0.0154	0.285	0.0386	0.0541	Small positive
Log price (Protein/legume)	CS ATT	0.0039	0.0448	0.285	0.0137	0.1571	Small positive

Notes: **Country:** Burkina Faso. **Research question:** Does the geographic spread of jihadist violence from Mali into Burkina Faso raise food prices in affected market towns? **Policy mechanism:** Armed conflict disrupts local supply chains by destroying market infrastructure, displacing farmers and traders, and impeding road transport of bulky agricultural commodities; imported goods arriving via international corridors face less disruption. **Outcome definition:** Log of monthly retail food price in CFA francs per kilogram, from WFP-monitored markets. **Treatment:** Binary indicator equal to one from the first month a UCDP-coded conflict event occurs within 50km of the market. **Data:** WFP Global Food Prices Database and UCDP Georeferenced Event Dataset v24.1, monthly market-level panel 2012–2023, 28,213 market-commodity-month observations across 64 markets. **Method:** Callaway and Sant'Anna (2021) staggered difference-in-differences using not-yet-treated markets as controls; standard errors clustered at the market level. **Sample:** WFP-monitored markets in Burkina Faso with continuous monthly price reporting for major staple commodities (millet, sorghum, maize, rice, cowpeas, groundnuts). SDE = $\hat{\beta}/\text{SD}(Y)$ where SD(Y) is the pre-treatment standard deviation of log prices. Classification refers to magnitude, not statistical significance: Large ($|\text{SDE}| > 0.15$), Moderate (0.05–0.15), Small (0.005–0.05), Null (< 0.005).