Armed Conflict and the Dynamics of Engagement in Agrifood Systems in Ethiopia

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Motivation

- Armed conflicts impede economic development: destruction of infrastructure, collapse of institutions, disrupted investment and trade, eroded trust and social cohesion (Collier, 1999; Blattman and Miguel, 2010; Rohner and Thoenig, 2021; Abay et al., 2023; Nigus et al., 2026).
- Aggregate effects are well documented, but **differential impacts across sectors and population groups** have received little attention.
- Little is known about whether and how conflict affects **allocation of labor and livelihoods within the agrifood system** — the dominant source of employment for hundreds of millions of poor households in Africa.
- If sectors differ in vulnerability and resilience to conflict, such shocks reshape **structural transformation** by pushing labor across sectors — with efficiency and productivity consequences.

Research Questions

Objectives

1. How does armed conflict shape **participation** and **labor allocation** in the agrifood sector?
2. What do transitions **within and beyond** the agrifood system look like in response to **immediate** and **medium-term** exposure to armed conflict?
3. Who can **afford to shift livelihoods** in response to armed conflict — and are there **gender-related differences** and implications of conflict for agrifood systems?

Conflict and Agrifood Labor: Two Competing Forces

Agrifood Sector is Vulnerable

- Blocks **entry**: restricts access to seeds, fertilizer, land (George et al., 2020; Ayalew et al., 2026)
- Drives **exit**: production losses, suppressed productivity (George et al., 2021; Amare et al., 2025; Kafando and Sakurai, 2025)
- Disrupts value chains and markets, raises transaction costs (Abushama et al., 2023; Resnick et al., 2026)

But May Act as a Safety Net

- Non-ag. jobs collapse first — displacement and market fragmentation cut wage employment (Justino, 2006; Ahmed et al., 2026)
- Displacement raises reliance on agriculture in host communities (George and Adelaja, 2022)
- Agrifood chains absorb conflict-affected labor; may stir cash crops (Drost et al., 2014; Kafando and Sakurai, 2025)

Empirical question

Are agrifood job losses driven by blocked **entry** or accelerated **exit** — and does agrifood act as a **labor-absorbing buffer** when alternatives collapse?

Context: From Protests to Armed Conflict

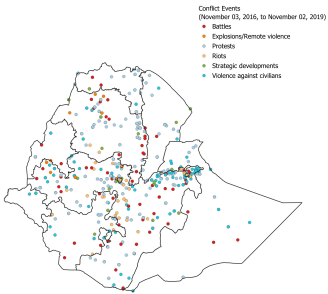
- Sustained anti-government protests from **2015**, driven by longstanding political and economic grievances; concentrated in **Oromia and Amhara** (Pinaud et al., 2017).
- **October 2016** state of emergency suppressed unrest but not grievances $\rightarrow$ leadership change in **2018**.
- Escalating disputes between the federal government and regional elites (notably the **TPLF**): postponed 2020 elections, competing claims to constitutional authority.
- Tensions culminate in the outbreak of the **Tigray War, November 2020**.

Context: Three Conflict Phases

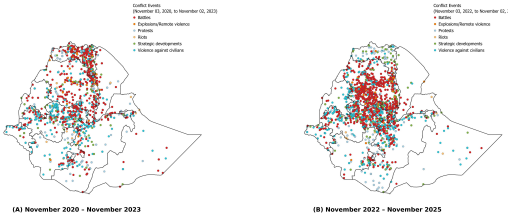
We divide the conflict period into **three phases**, based on survey-round timing and the nature of conflict events:

- **Phase 1 (2016–2019):** state of emergency to eve of war; battles present but **sparse** — low conflict prevalence.
- **Phase 2 (2020–2023): Tigray War** (2020–22), expanding to Amhara and Afar; destruction of agricultural and non-agricultural activity, displacement, market disruption, movement restrictions (Abay et al., 2023; Holden et al., 2024).
- Agrifood sector hit hard: **blockade and embargo** on production, distribution, input supply, and labor movement (Holden et al., 2024).
- **CoHA (Pretoria, Nov 2022)** ends the Tigray War; conflict subsequently **relocates to Amhara and Oromia** (Phase 3) — with renewed fears of resumption in Tigray.

Geography of Conflict



Nov 2016 – Nov 2019



Nov 2020 – Nov 2023 (left); Nov 2022 – Nov 2025 (right)

Source: ACLED. Note the geographic relocation of conflict: Tigray (2020–22) → Amhara and Oromia (2023–25).

Data Sources

Household Panel Survey

- Three rounds: 2019, 2023, 2025
- Two-stage stratified cluster design; balanced panel of $\sim$**2,778 households**
- Covers farming, agrifood, non-agricultural, resource extraction, and wage employment

Climate Data

- CHIRPS rainfall (SPI, drought shock); ERA5-Land temperature
- Matched to household GPS via Google Earth Engine

Conflict Data (ACLED)

- Geo-referenced events; focus on **battles**
- Buffers of **10 and 15 km** around household GPS
- **Count** and **binary** exposure measures

Conflict Period Assignment

Survey Round	Conflict Window
Baseline (2019)	Nov 2016 – Nov 2019
Round 2 (2023)	Nov 2020 – Nov 2023
Round 3 (2025)	Nov 2022 – Nov 2025

Module B: Household Livelihood Activities

"Did you or any member of the household participate in the following livelihood activities over the last 12 months?" (Yes / No / Don't know)

1. Own production or sale of crops
2. Own livestock production, fattening, or sales (incl. dairy)
3. Own agricultural-based business (e.g. threshing services, aggregating crop byproducts, groundnut processing, fish mongering)
4. Agricultural work for money *within* the community
5. Agricultural work for money *outside* the community
6. Non-agricultural work for money *within* the community
7. Non-agricultural work for money *outside* the community
8. Salaried work
9. Petty trade: reselling items produced by others (grains, vegetables, gum, mobile cards, cigarettes)
10. Petty trade: selling homemade items (home-cooked foods, home-brewed beers)
11. Own non-agricultural business (e.g. stone cutting, hair braiding)
12. Sale of bush meat
13. Sale of wild fruits
14. Sale of other forest products (charcoal, firewood)
15. Honey production or sales
16. Rental of land, house, or room
17. Remittances
18. Gifts or inheritance
19. Government programs (safety net food or cash assistance)
20. Any other source (specify)

Items 1–15 define the five livelihood sectors; items 16–20 are non-labor income sources, excluded from the participation outcomes.

Classifications of Outcome Variables

Sector	Activities included
Farming	Crop and livestock production and trading (B1, B2); wild food for humans and animals, e.g., bush meat (B12), wild fruits (B13), grass and fodder; honey production and marketing (B15)
Agrifood	All farming activities *plus* post-harvest production, processing, distribution and trading of food products, e.g., agricultural-based business (B3), agricultural petty trade (B9), home-based food processing and trading (B10)
Non-agricultural	Non-agricultural wage work within and outside community (B6, B7); salaried work (B8); own non-agricultural business (B11)
Resource extraction	Forest products like charcoal and firewood (B14); wild food (B12, B13); timber and construction materials, minerals, etc.
Wage labor	Agricultural wage work (B4, B5); non-agricultural wage work (B6, B7); salaried work (B8) — within and outside community

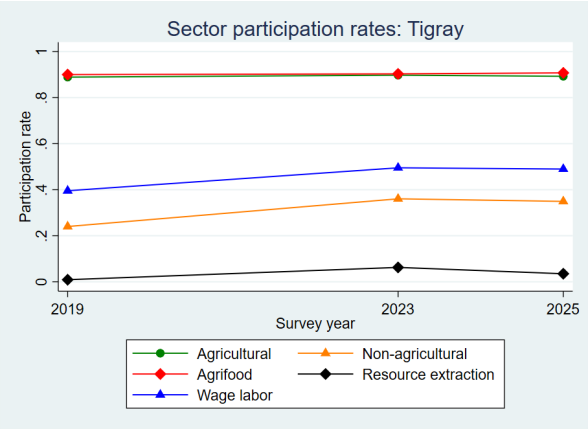
Note: Classification follows Campanhola and Pandey (2019) and Arslan et al. (2024); sectors are **not mutually exclusive**. Extensive margin = binary participation; intensive margin = number of distinct activities; total count proxies **diversification**. Entry/exit **transitions** across rounds capture sector vulnerability vs. resilience. Codes B1–B15 = survey livelihood modules.

Descriptive Statistics: Sectoral Participation

	2019		2023		2025	
Sectors	Mean	SD	Mean	SD	Mean	SD
Farming (%)	0.827	0.378	0.871	0.335	0.825	0.380
Agrifood (%)	0.846	0.361	0.887	0.316	0.854	0.353
Non-agricultural (%)	0.250	0.433	0.269	0.444	0.315	0.465
Resource extraction (%)	0.027	0.161	0.089	0.285	0.086	0.280
Wage labor (farm & non-farm, %)	0.456	0.498	0.435	0.496	0.495	0.500
No. of farm activities	1.305	0.764	1.497	0.830	1.364	0.820
No. of agrifood activities	1.430	0.860	1.703	0.998	1.598	1.002
No. of non-agricultural activities	0.346	0.674	0.351	0.668	0.427	0.704
No. of resource extraction activities	0.027	0.164	0.089	0.300	0.087	0.285
No. of wage labor activities (farm plus non-farm)	0.677	0.923	0.680	1.010	0.833	1.074
Total number of activities (diversification index)	2.087	1.305	2.337	1.511	2.389	1.570
Observations	2,778		2,778		2,778	

- **Steady rise** in non-agricultural participation (25.0% $\rightarrow$ 31.5%) and wage labor — but the *number* of such activities remains limited (means < 1).
- **Peak-and-decline** in agriculture-related sectors: farming, agrifood, and resource extraction **peak in 2023**, then fall back — yet mostly stay *above baseline* in 2025. Non-incremental paths under conflict.

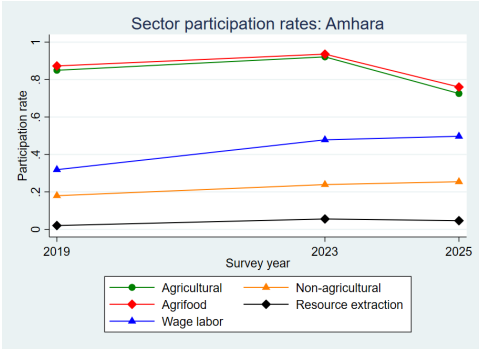
Sector Participation Trends: Tigray

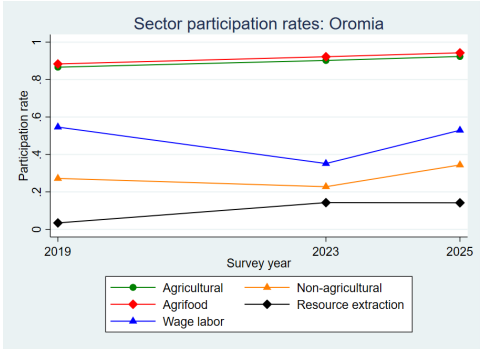


Note: Balanced panel, 2,778 households.

- Large-scale conflict concentrated in **2020–2022**.
- Non-agricultural work, wage labor, and resource extraction **rose during and immediately after the war**.
- All three **declined after 2023** — a *temporary* shift away from agricultural livelihoods, followed by **gradual reversion** as conditions stabilized.

Sector Participation Trends: Amhara and Oromia





- **Amhara** (intensifying 2023–25): farming/agrifood **fall sharply after 2023**; non-farm and wage work **rise throughout**.
- **Oromia** (protracted): farming/agrifood **gradually rising**; non-farm **dips early, recovers after 2023**.
- $\Rightarrow$ Escalating = exit agriculture (Amhara); post-conflict = re-engagement (Tigray); prolonged = agricultural resilience (Oromia).

Econometric Specification

Baseline Two-Way Fixed Effects (TWFE):

$$E_{ht}^{s} = \alpha_h + \alpha^{s}\,\text{Conflict}_{ht} + \boldsymbol{\theta}'\mathbf{X}_{ht} + \lambda_t + \varepsilon_{ht} \tag{1}$$

- $E_{ht}^{s} = 1$ if household h participates in sector s at time t; estimated **separately for each sector** (same approach at the intensive margin).
- α_h: household FE — time-invariant household heterogeneity.
- λ_t: survey-round FE — absorbs **period-specific aggregate shocks** (macro fluctuations, nationwide policy changes) that could otherwise confound the conflict–employment relationship.
- $\mathbf{X}_{ht}$: time-varying household controls.

Immediate vs. Medium-Term Effects; Identification

Changing livelihoods takes time and investment — disaggregate exposure:

$$E^s_{ht} = \gamma_h + \gamma^1 \text{Conflict}_{ht-1} + \gamma^2 \text{Conflict}_{ht-2} + \boldsymbol{\gamma}' \mathbf{X}_{ht} + \gamma_t + \epsilon_{ht} \quad (2)$$

γ^1: battles in the last year (**immediate**); γ^2: battles two years prior (**medium-term**).

Identification and inference

Concern: conflict exposure not randomly assigned. **Assumption:** conditional on household FE, wave FE, and controls, the *timing* of conflict events near a household is uncorrelated with time-varying unobservables affecting employment or transitions. Plausible — conflict driven by political, ethnic, and military factors exogenous to household labor supply (Abushama et al., 2023; Resnick et al., 2026). We nonetheless interpret estimates as **associations**. SEs **clustered at the village level** (within-cluster correlation in both exposure and outcomes) in all models.

Results: Extensive Margin

Battle events and participation (10 km buffer)

	Farming	Agrifood	Non-ag.	Res. extr.	Wage lab.
Armed battles	−0.004***	−0.003**	0.003*	0.001	0.005***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
Obs.	7,810	7,811	7,812	7,807	7,812
FE / Controls	yes (all models)				

- Each additional battle: farming -0.4 pp, agrifood -0.3 pp; **wage labor** $+0.5$ pp, non-agricultural $+0.3$ pp.
- Combined non-farm gains **nearly offset** the agricultural losses.

Interpretation

Households do not exit the labor force — they **reallocate labor** away from agrifood toward non-farm and wage activities (Justino, 2011; Verwimp et al., 2019).

Table 3, with-controls columns. SEs clustered at village level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Results: Intensive Margin

Battle events and number of activities per sector

	Farming	Agrifood	Non-ag.	Res. extr.	Wage lab.	Diversif.
Armed battles	−0.009**	−0.008*	0.007***	0.001	0.013***	0.004
	(0.004)	(0.005)	(0.002)	(0.001)	(0.004)	(0.008)
Obs.	7,813 (all models)					
FE / Controls	yes (all models)					

- **Fewer** farming (−0.9 pp) and agrifood (−0.8 pp) activities per battle within 10 km.
- **More** non-agricultural (+0.7 pp) and wage (+1.3 pp) activities; overall diversification index unchanged.

Interpretation

Households **rebalance portfolios** toward wage-based, non-agricultural work under conflict — reducing dependence on conflict-sensitive agricultural income while smoothing consumption (Justino, 2011; Zetter and Verwimp, 2011; Verwimp et al., 2019).

Table 4, with-controls columns. SEs clustered at village level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Exposure vs. Intensity: Binary Measure (10 km)

≥1 battle within 10 km (vs. none)

	Farming	Agrifood	Non-ag.	Res. extr.	Wage lab.
Exposed (=1)	−0.033*	−0.044***	0.055***	0.012	0.077**
	(0.017)	(0.017)	(0.020)	(0.011)	(0.031)
Control mean	0.856	0.877	0.262	0.063	0.452
Obs.	7,810	7,811	7,812	7,807	7,812
FE / Controls	yes (all models)				

- Relative to control means: farming ≈ −**4%**; agrifood ≈ −**5%**; non-agricultural +**21%**; wage labor +**17%**.
- Mere **proximity** to conflict — not just its intensity — shifts households out of agriculture-dependent livelihoods: a risk-coping / income-smoothing response.

SEs clustered at village level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Immediate vs. Medium-Term Effects

		Farming	Agrifood	Non-ag.	Res. extr.	Wage lab.
10 km	Immediate	−0.013**	−0.010*	0.008	0.004	0.017*
		(0.006)	(0.006)	(0.008)	(0.006)	(0.009)
	Intermediate	−0.003	−0.002	0.002	0.000	0.003
		(0.002)	(0.002)	(0.002)	(0.001)	(0.003)
15 km	Immediate	−0.007*	−0.006	−0.001	0.001	0.003
		(0.004)	(0.004)	(0.005)	(0.003)	(0.006)
	Intermediate	−0.001	−0.002	0.003**	0.000	0.004**
		(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
20 km	Immediate	−0.005**	−0.004*	−0.000	0.000	0.004
		(0.003)	(0.002)	(0.003)	(0.002)	(0.004)
	Intermediate	−0.001*	−0.001*	0.002***	0.000	0.003***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	Observations	7,810	7,811	7,812	7,807	7,812
	FE / Controls	yes (all models)				

- **Immediate** battles depress farming and agrifood participation across all buffers.
- **Intermediate** battles drive the shift toward non-agricultural and wage work (15/20 km) — changing livelihoods takes time and investment.

Table 6, with-controls columns. Cluster-robust SEs in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Heterogeneity: Gender Asymmetries

Participation at the extensive margin, by gender (10 km)

	Farming	Agrifood	Non-ag.	Res. extr.	Wage lab.
Females (N = 1,739)					
Armed battles	−0.009***	−0.008***	0.000	−0.002	0.001
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
Males (N = 4,981)					
Armed battles	−0.004**	−0.003	0.003*	0.001	0.006***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
FE / Controls	yes (all models)				

Key Takeaway

Conflict **disrupts women's primary livelihoods more severely** (−0.9 vs. −0.4 pp in farming) while women show **no significant movement** into non-agricultural or wage alternatives — the coping mechanisms available to men are structurally foreclosed to women (Verwimp et al., 2019; Stojetz and Brück, 2024; FAO, 2025).

Table 8, with-controls columns. 15 km similar. SEs clustered at village level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Robustness

	Farming	Agrifood	Non-ag.	Res. extr.	Wage lab.
Battles (15 km)	−0.002***	−0.002***	0.003***	0.000	0.004***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Battles (20 km)	−0.002***	−0.002***	0.002***	0.000	0.003***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Protests (10 km)	0.008	0.004	0.009	−0.000	0.008
	(0.007)	(0.007)	(0.005)	(0.002)	(0.007)
Riots (10 km)	−0.005	−0.012**	0.000	0.002	−0.008
	(0.005)	(0.006)	(0.006)	(0.003)	(0.008)
Battles, controlling for protests and riots					
10 km	−0.004***	−0.004**	0.003**	0.001	0.006***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
15 km	−0.002***	−0.002***	0.003***	0.000	0.005***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Observations	7,810	7,811	7,812	7,807	7,812
FE / Controls	yes (all models)				

- Battle associations **robust at 15 and 20 km**, weakening with distance — disruption is localized.
- **Protests: no association**; violent riots depress agrifood participation.
- Battle coefficients **essentially unchanged** once protests and riots are controlled for.

Tables 8–10, with-controls columns. Cluster-robust SEs in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Conclusion

Findings

- Conflict **reduces** farming & agrifood participation; **raises** non-agricultural & wage employment.
- Conflict **suppresses entry into** and **raises exit from** agrifood — undermining both job creation and retention; non-farm and wage sectors show the opposite pattern, acting as a **buffer** for displaced labor.
- **Gender asymmetry**: women's farming/agrifood losses are larger, yet women show **no movement** into the non-farm and wage alternatives men access.

Policy Implications

- **Protect agrifood value chains during conflict**: transport corridors, local markets, processing, input networks, storage.
- Center recovery on **agrifood employment creation**; support **re-entry** (credit, inputs, business support).
- **Gender-sensitive design**: women-led agrifood enterprises and ALMPs addressing mobility, safety, and time constraints.
- Effects **spill over** beyond violence sites $\Rightarrow$ rebuild geographically *broader* market linkages and infrastructure.

Thank You!

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