Macroeconomic Shocks and Conflict:

Evidence from Commodity Terms-of-Trade Shocks

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*The views expressed in this project are those of the authors and do not necessarily represent the views of the IMF, its Executive Board, or IMF management

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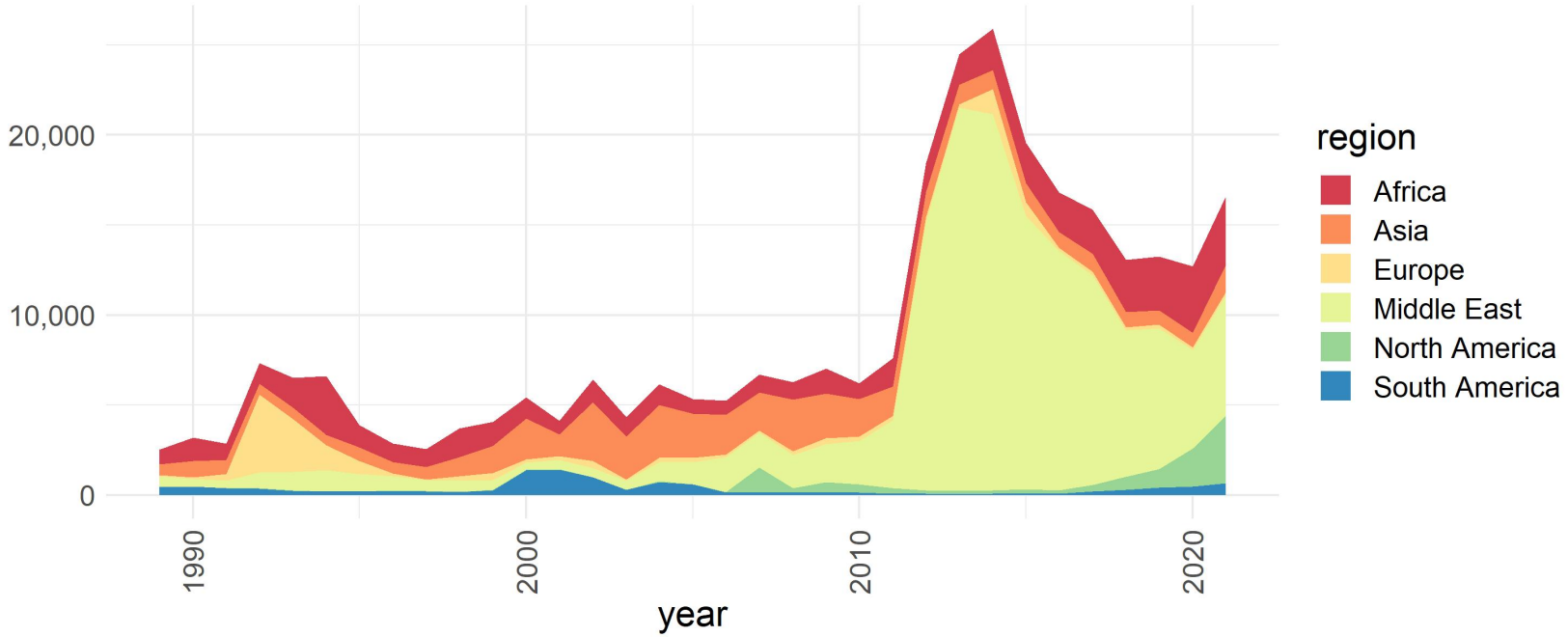
Introduction

Violence prevails in the fragmented world

- 17,000 conflict events occurred in 2021, resulting in 120,000 deaths.



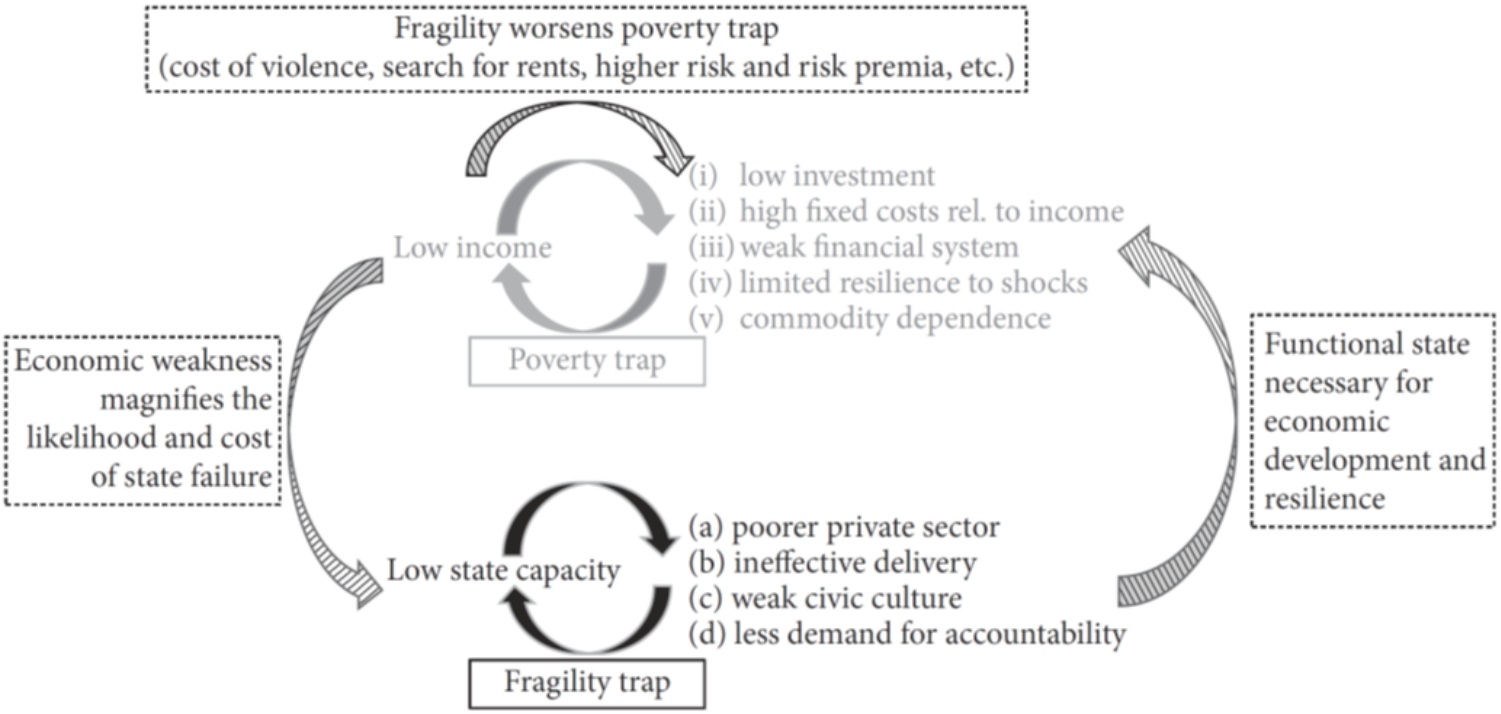
Source: Uppsala Conflict Data Program (UCDP).

Figure 1: Total number of conflict events

Note: The UCDP identifies "conflict events" as incidences of the use of armed force by an organized actor that result in at least one direct death

Do economic factors affect violent conflicts?

- Ample evidence on the economic cost of conflict in the literature.
- Less consensus on the economic origin of conflict $\Rightarrow$ this paper.



Source: Chami et al. (2020)

Figure 2: Fragility trap and poverty trap

Challenges in identifying the economic origin of conflict

- **Challenge 1.** Interactions of conflict and economic conditions requires "exogenous" economic shocks.

- **Challenge 2.** Different channels work in different directions.

  i. Opportunities cost (-): individuals with lower income easily engage in violent activities. e.g., foods.

  ii. State capacity (-): a country with limited capacity cannot control conflicts.

  iii. Predation effect (+): Higher income/profits can lead to conflict over the distribution of rent. e.g., natural resources.

▸ Literature

This paper

Research Questions

- Whether/how much macroeconomic shocks affect conflicts?
- What are the transmission channels?

Empirical Strategy

- Exploit a broad-based commodity terms-of-trade (ToT) as an exogenous income shock.
  - representing a windfall gain and loss of aggregate income.
  - less subject to individual commodity-specific effects.
- Investigate heterogeneity across country characteristics relevant for each potential channel.

Data and empirical strategy

Data

- Country-year panel dataset from 1989 to 2021 for 133 countries low- and middle-income countries. ◂ Descriptive stat.

- Conflict data: Uppsala Conflict Data Program (UCDP)
  - "Organized violence" defined as the incidence of the use of armed force by an organized actor against another organized actor, or against civilians, resulting in at least 1 direct death.
  - Measure the number of conflict events per population.

UCDP Conflict Map

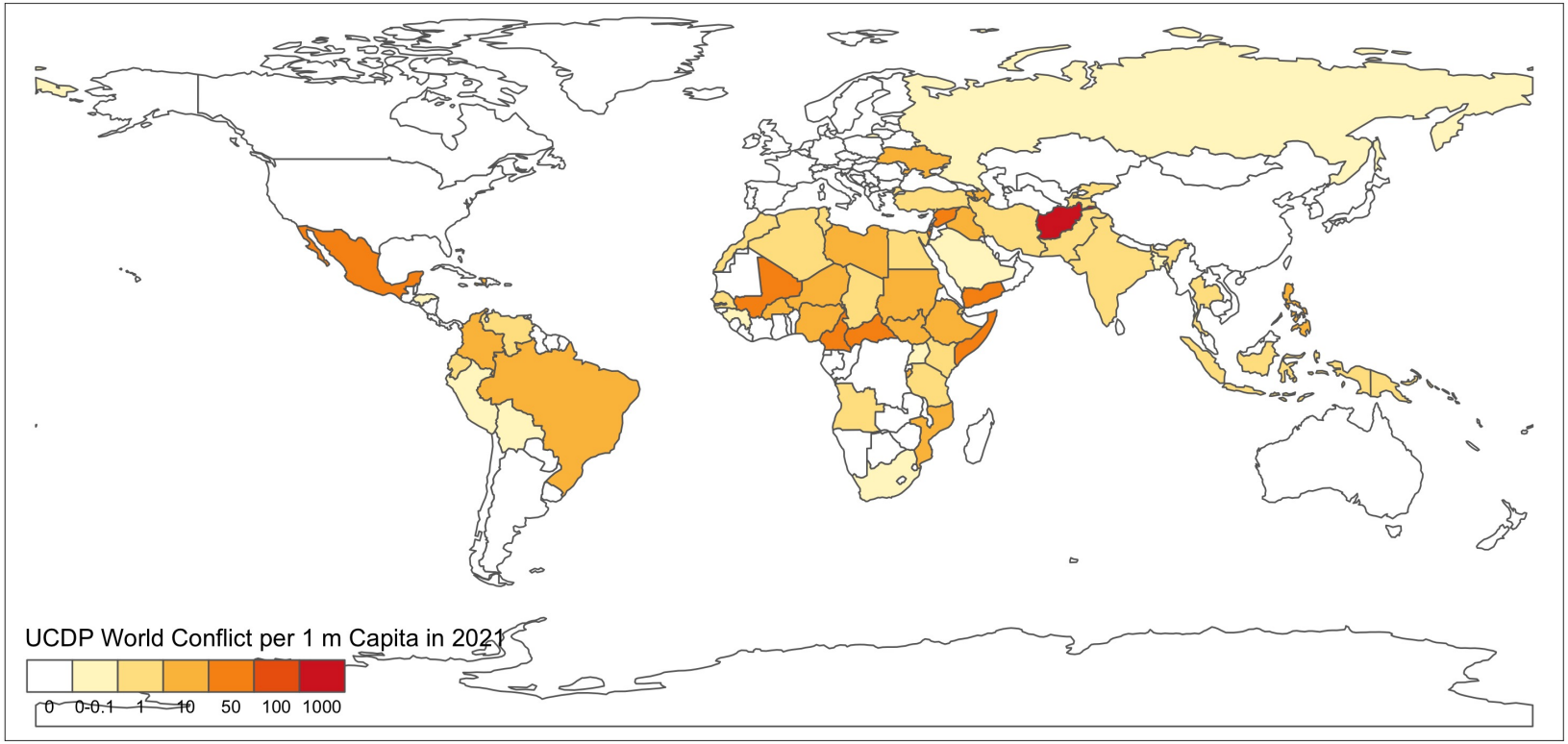


Figure 3: UCDP conflict events per one million population in 2021

Commodity ToT index: Gruss and Kebhaj (2019)

- A shift-share instrument

$$\Delta tot_{i,t} = \sum_{j=1}^{J} \underbrace{\Delta p_{j,t}}_{\text{global price}} \times \underbrace{w_{i,j,t}}_{\text{net exports share}}, \tag{1}$$

  - 45 world commodity prices ($J = 45$) (energy, metals, food, etc.) ▸ Details

- Weights reflect commodity- and country-specific time-varying net export shares.

$$w_{i,j,t} = \frac{1}{3} \sum_{\tau=1}^{3} \frac{x_{i,j,t-\tau} - m_{i,j,t-\tau}}{gdp_{i,t-\tau}}, \tag{2}$$

  where x: exports, m: imports, gdp: GDP.

- The index is intended to proxy "windfall gains and losses" of aggregate income arising from changes in world prices.

Commodity ToT

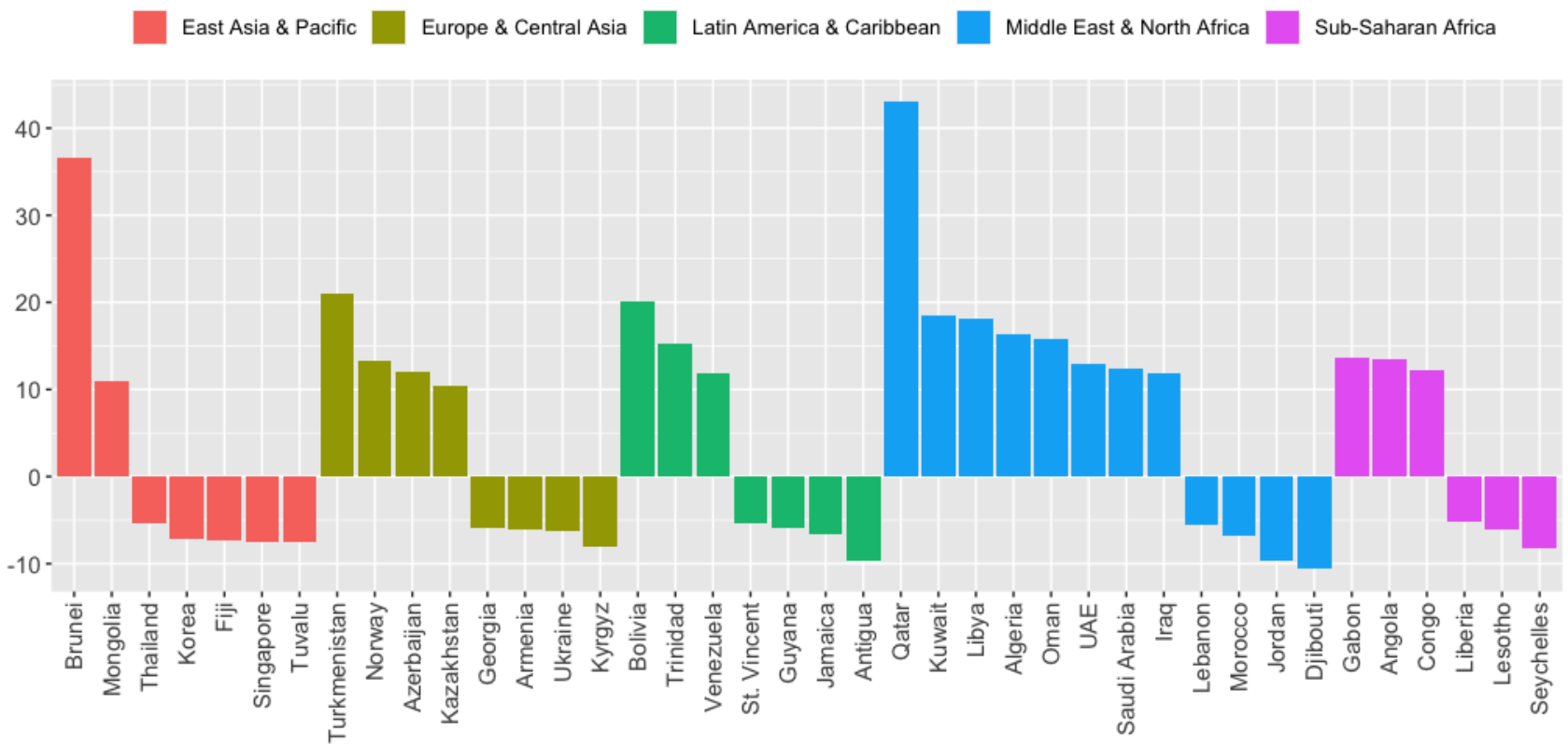


Figure 4: Commodity Terms-of-Trade (%yoy) in 2021

Empirical strategy

Local Projection Jordà (2005)

$$y_{i,t+s} - y_{i,t-1} = \beta_s \Delta tot_{i,t} + \sum_{\ell=1}^{L} \alpha_{\ell s} \Delta y_{i,t-\ell} + \sum_{k=1}^{K} \delta_{ks} \Delta tot_{i,t-k}$$

$$+ \mu_{i,s} + \nu_{r,t,s} + \varepsilon_{i,t,s}$$

- $y_{i,t+s}$: N. of conflict events per capita in country i at time $t+s$.
- $\Delta tot_{i,t}$: log difference of the commodity ToT.
- Lagged terms to control serial corr. (Montiel Olea and Plagborg-Møller 2021).
- $\mu_{i,s}$: country FE, and $\nu_{r,t,s}$: region-by-year FE.
- $\{\beta_s\}_{s=0}^{S}$ represents the impulse response function.

Empirical Results

Baseline result: Impact of a ToT shock on conflicts

- A negative commodity ToT shock leads to a significant and persistent increase in the number of conflicts.

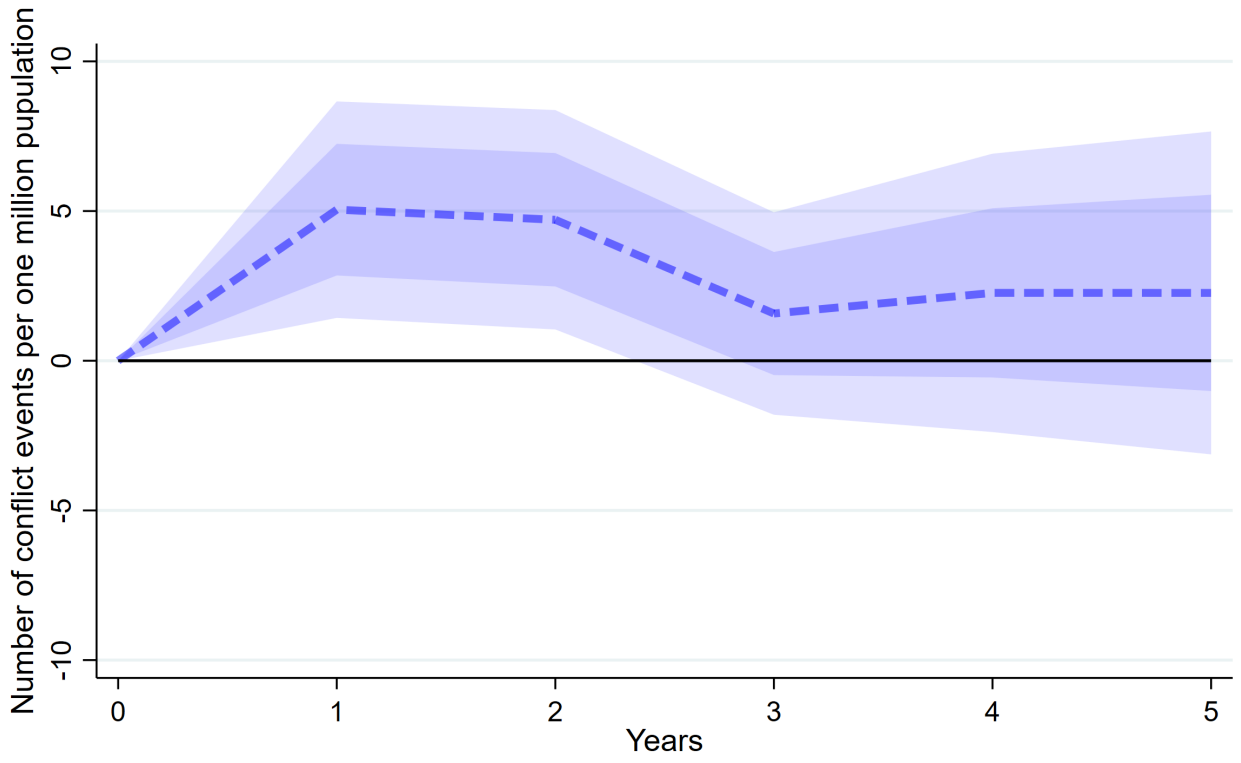


Figure 5: Baseline Specification

Notes: The sign of the estimated coefficients is flipped and multiplied by 100. A positive response in the figure indicates an increase in conflict events following a negative commodity ToT shock. Shaded areas indicate the 68 and 90 percentiles of the responses.

- Robustness check: ▸ Fatalities ▸ IV ▸ Excl. large exporters ▸ Additional controls

The impact is more severe in low-income countries (LICs)

- Heterogeneity

$$y_{i,t+s} - y_{i,t-1} = \left[\mathbb{1}_{i,t,j}\beta_{s,1} + (1 - \mathbb{1}_{i,t,j})\beta_{s,0}\right]\Delta tot_{i,t} + \ldots \qquad (3)$$

where $\mathbb{1}_{i,t,j}$ is a dummy var. for country characteristics (e.g., LICs, FCS).

- The impact for LICs and FCS is twice as large as the baseline.

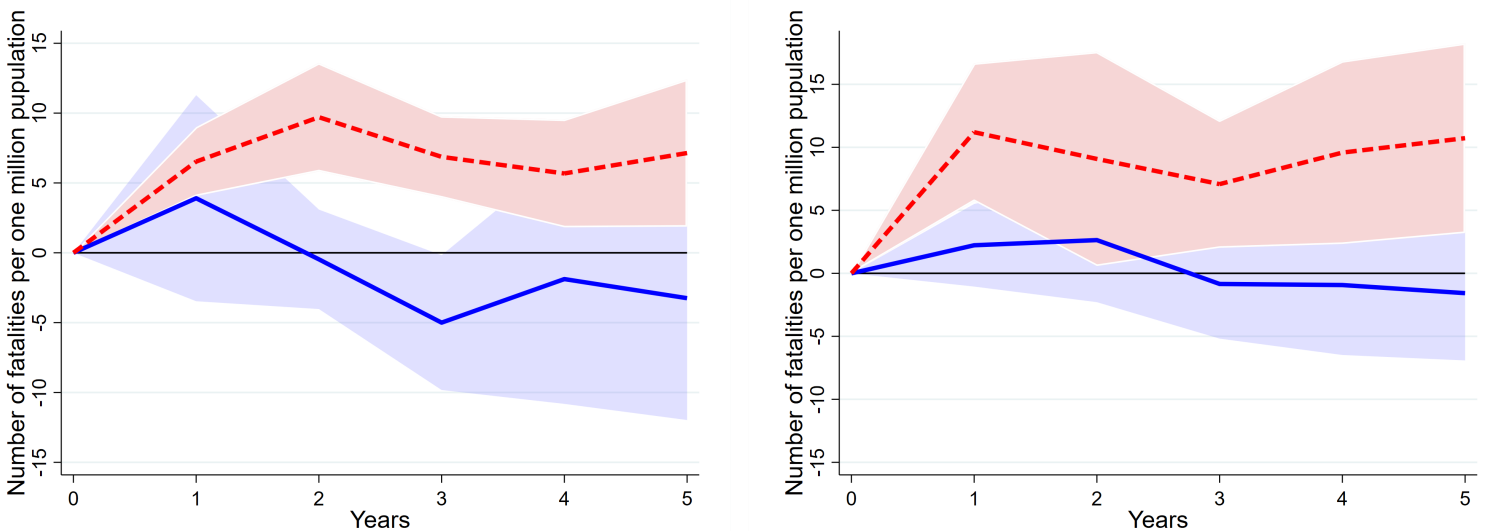


Figure 6: LICs and lower-MICs (left), FCS (right)

Note: Red lines show the IRs for LICs and lower MICs in the left panel and Fragile and Conflict-affected States (FCS) in the right panel. Income and FCS classifications follow those of the World Bank.

- Robustness check: ▸ PRGT-eligible countries

Entry and continuation of conflicts

- A negative ToT shock increases the likelihood of continuation of existing conflicts, whereas it is not strong enough to trigger a new conflict.

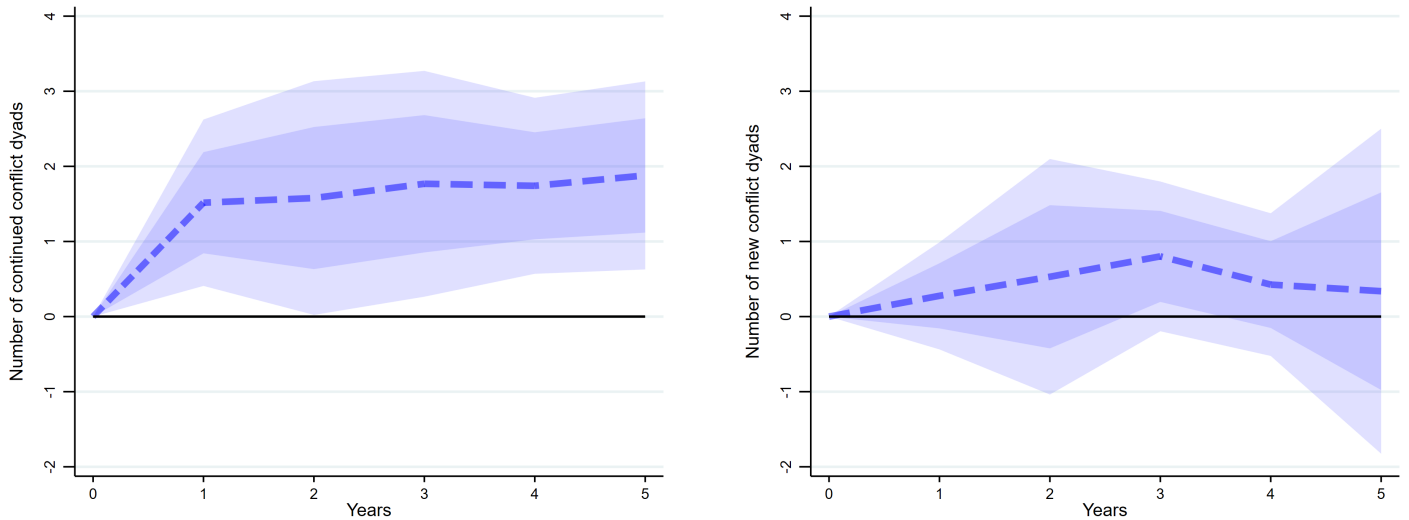


Figure 7: Continuation (left) and entry (right) of conflict dyads

Notes: We track "conflict dyads" defined as a pair of two opposing actors that are involved in conflict events and decompose them into those starting in a given year ("entry") and those continuing from a past year ("continuation").

Transmission channels

What are the transmission channels?

- We interact the ToT shocks with measures of (i) inequality and (ii) fiscal space to examine the channels in play.
  — Income level can represent both opportunity cost and sate capacity (Blattman and Miguel, 2010).

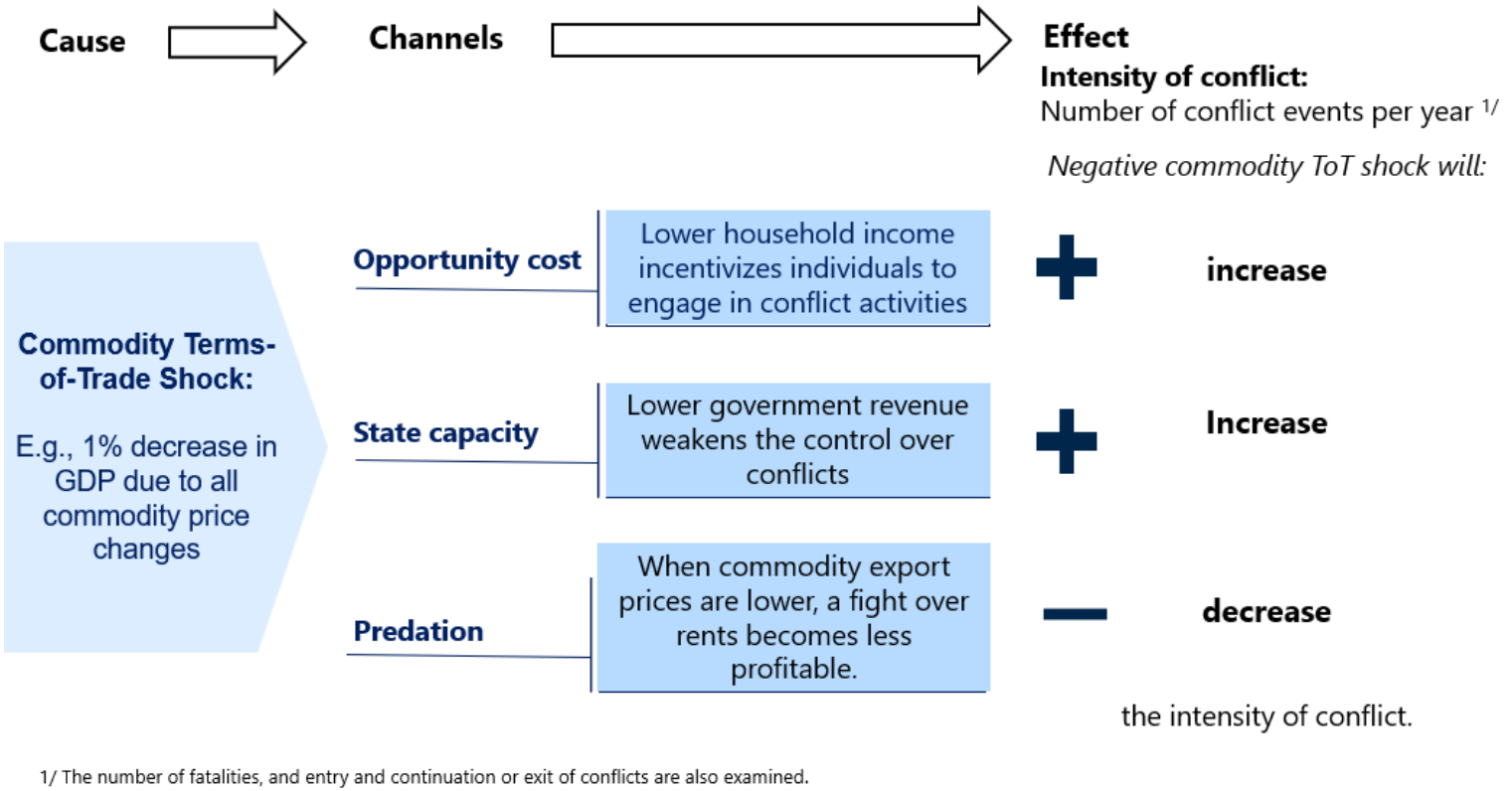


Figure 8: Potential channels

Inequality and fiscal space matter

- Higher inequality implies a larger fraction of poor population (lower opportunity costs).
- Higher external debt constrains state responses to shocks.

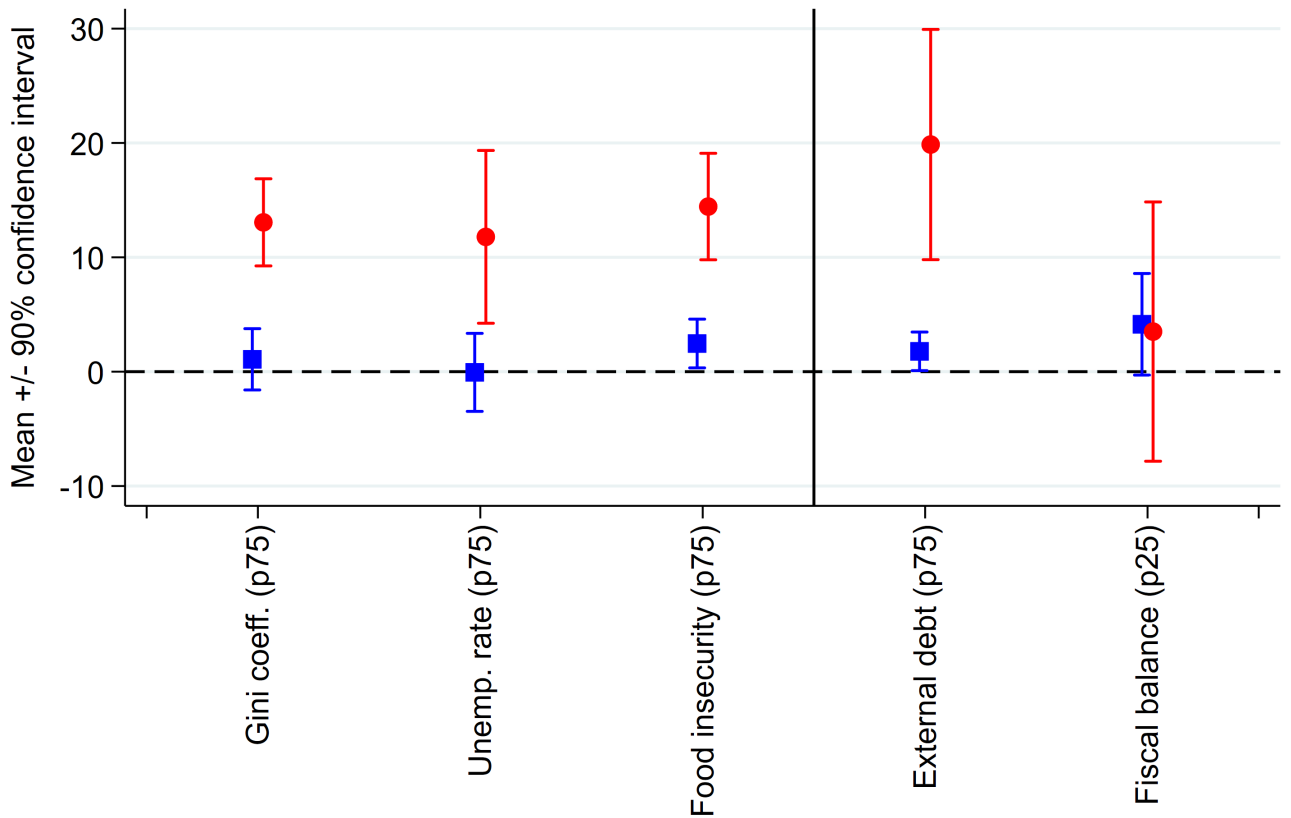


Figure 9: Heterogeneity across inequality and fiscal space

Notes: The figure shows the peak impact of the IR. Red markers are the impacts of country groups with higher inequality or lower fiscal space (bottom 25 percentile).

Reconcile previous studies

- The opportunity-cost and state-capacity channels work for food&bevarages and energy. Predation appears relevant for metals.

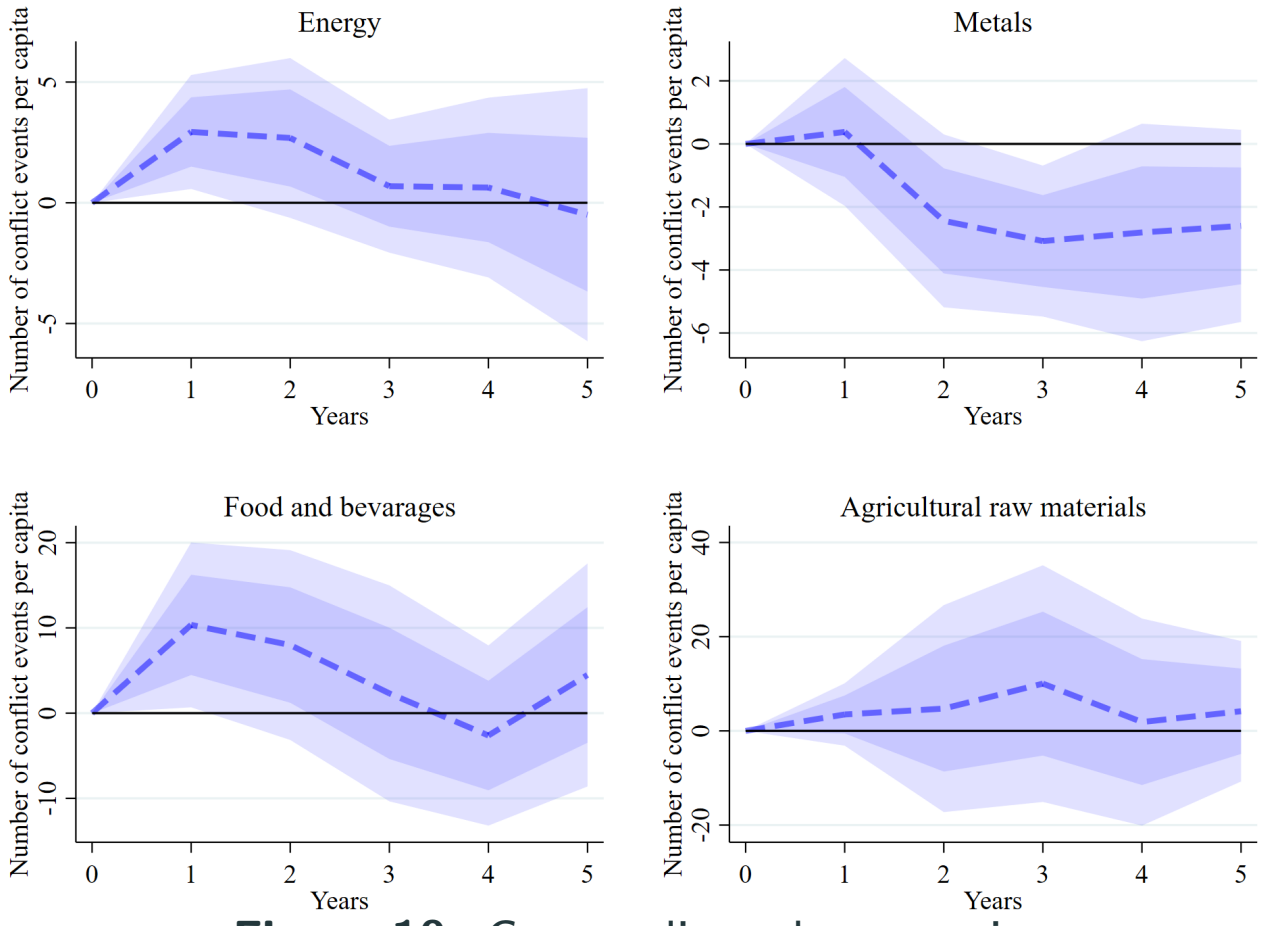


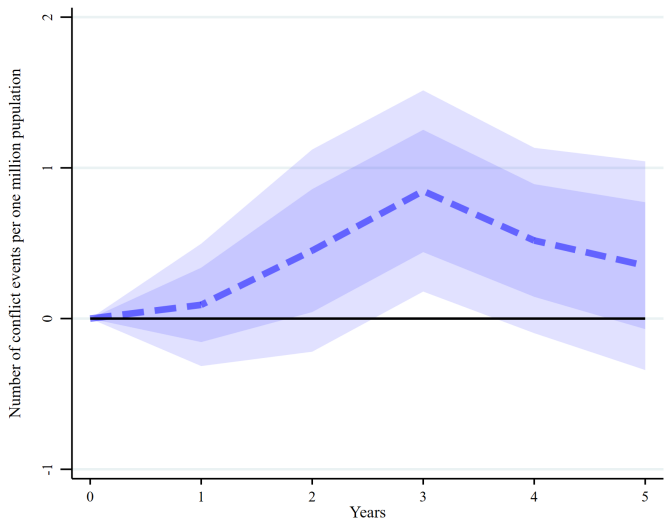
Figure 10: Commodity sub-categories

Spillover

Shocks spillover to neighboring countries

- Construct a conflict index of neighboring countries: $\sum_{i' \neq i} \kappa_{i'} \Delta y_{i',t}$; $\kappa_{i'}$: distance between country i and i'.
- A rise in neighboring countries' conflicts leads to an increase in own countries' conflicts with lag.

(a) Baseline



(b) IV

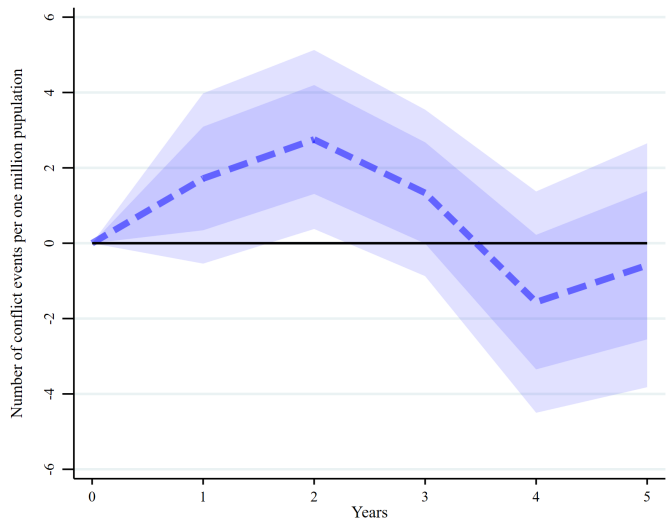


Figure 11: Spillover Effect

Notes: In Panel (b), a distance-weighted commodity ToT index of other countries (the first to third lagged) are used as instruments.

Conclusion

Takeaways

Key findings

- A negative commodity ToT shocks increase conflicts significantly and persistently.
- The adverse impact is more severe in low-income countries.
- Opportunity cost and state capacity appear relevant.
- There is a second-round effect though spillover.

Implications and future research

- Our results imply the presence of a vicious feedback loop between weak economic performance and conflicts.
- Policies matter for the link between macroeconomic shocks and conflicts: e.g., inclusive growth; adequate fiscal buffers.
- Further analysis at a granular level, e.g., violent vs. non-violent events, political economy considerations.

Appendix

Selected literature review

- Economic impact of conflict: Collier (1999); Cerra and Saxena (2008); Besley and Persson (2008b); Rother et al. (2016); Hadzi-Vaskov et al. (2021); Novta and Pugacheva (2021)
- Economic origin of conflict:
  - Survey: Elbadawi and Sambanis (2002); Blattman and Miguel (2010); Koubi et al. (2014); Ross (2004); World Bank and United Nations (2018)
  - Commodity price shocks: Bazzi and Blattman (2014); Bellemare (2015); Berman and Couttenier (2015); Besley and Persson (2008a); Dal Bó and Dal Bó (2011); McGuirk and Burke (2020)
  - Climate shocks: Miguel et al. (2004); Ciccone (2011); Hsiang et al. (2013); Diallo and Tapsoba (2022)
- Measurement of conflicts:
  - Likelihood of conflict or civil war: Miguel et al. (2004)
  - Outbreak of conflict Collier and Hoeffler (2004); Brückner and Ciccone (2010)
  - Duration of conflict Collier et al. (2004); Buhaug et al. (2009); Akanbi et al. (2021)
  - Conflict events: McGuirk and Burke (2020)

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Descriptive statistics

Variable	N. of observations	Mean	Median	Standard Deviation	10th percentile	90th percentile
Conflict Variables and Commodity ToT						
All Sample						
N. of conflict events (per million population)	4,412	3.19	0.00	32.54	0.00	3.31
N. of fatalities (per million population)	4,412	51.74	0.00	1392.17	0.00	32.82
N.of new conflict dyads	4,765	0.90	0.00	2.22	0.00	3.00
N.of continuing conflict dyads	3,232	1.08	0.00	2.45	0.00	3.00
Commodity ToT index	4,072	100.23	101.59	10.07	90.65	107.95
LICs and lower-MICs						
N. of conflict events (per million population)	2,696	3.98	0.00	34.78	0.00	4.95
N. of fatalities (per million population)	2,696	75.06	0.00	1774.51	0.00	56.70
N. of new conflict dyads	3,049	1.17	0.00	2.58	0.00	4.00
N. of continuing conflict dyads	2,336	1.21	0.00	2.69	0.00	3.00
Commodity ToT index	2,585	100.33	101.66	9.27	91.55	107.71
Upper-MICs						
N. of conflict events (per million population)	1,749	1.95	0.00	28.38	0.00	1.67
N. of fatalities (per million population)	1,749	14.83	0.00	183.87	0.00	4.60
N. of new conflict dyads	2,092	0.36	0.00	1.14	0.00	1.00
N. of continuing conflict dyads	992	0.70	0.00	1.56	0.00	2.00
Commodity ToT index	1,611	99.87	101.28	11.33	88.04	108.42
Other Economic Variables						
GDP per capita (US$)	4,196	2,710.29	1,576.14	2,901.54	331.82	6,955.94
Gini coefficient	4,026	41.39	40.50	8.29	31.70	53.40
Unemployment rate (percent)	4,290	8.75	6.90	7.13	1.80	19.03
Food insecurity (percent of population)	2,574	37.82	36.50	22.18	11.20	72.50
External debt (percent of GDP)	4,323	62.03	42.56	77.63	-7.67	119.70
Fiscal balance (percent of GDP)	4,521	-2.77	-2.31	14.36	-37.59	2.73

Figure 12: Descriptive statistics

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Commodity Terms-of-Trade

- The commodity ToT index is composed of 45 individual commodity prices including:
  1. **Energy**: coal, crude oil, and natural gas.
  2. **Metals**: aluminum, copper, gold, iron, ore, lead, nickel, tin, uranium,zinc.
  3. **Food and Beverages**: bananas, barley, beef, cocoa, coffee, corn, fish, fish meal, groundnuts, lamb, olive oil, oranges, palm oil, poultry, rapeseed oil, rice, shrimp, soybean meal, soybean oil, soybeans, sugar, sunflower seed oil, swine meat, tea and wheat
  4. **Agricultural raw materials**: cotton, hard logs, hard sawnwood, hides, natural rubber, soft logs, soft sawnwood, and wool.
- We use the net export shares with the rolling weights of past three years to exclude potential import and export changes in response to the commodity price fluctuations.

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Robustness check

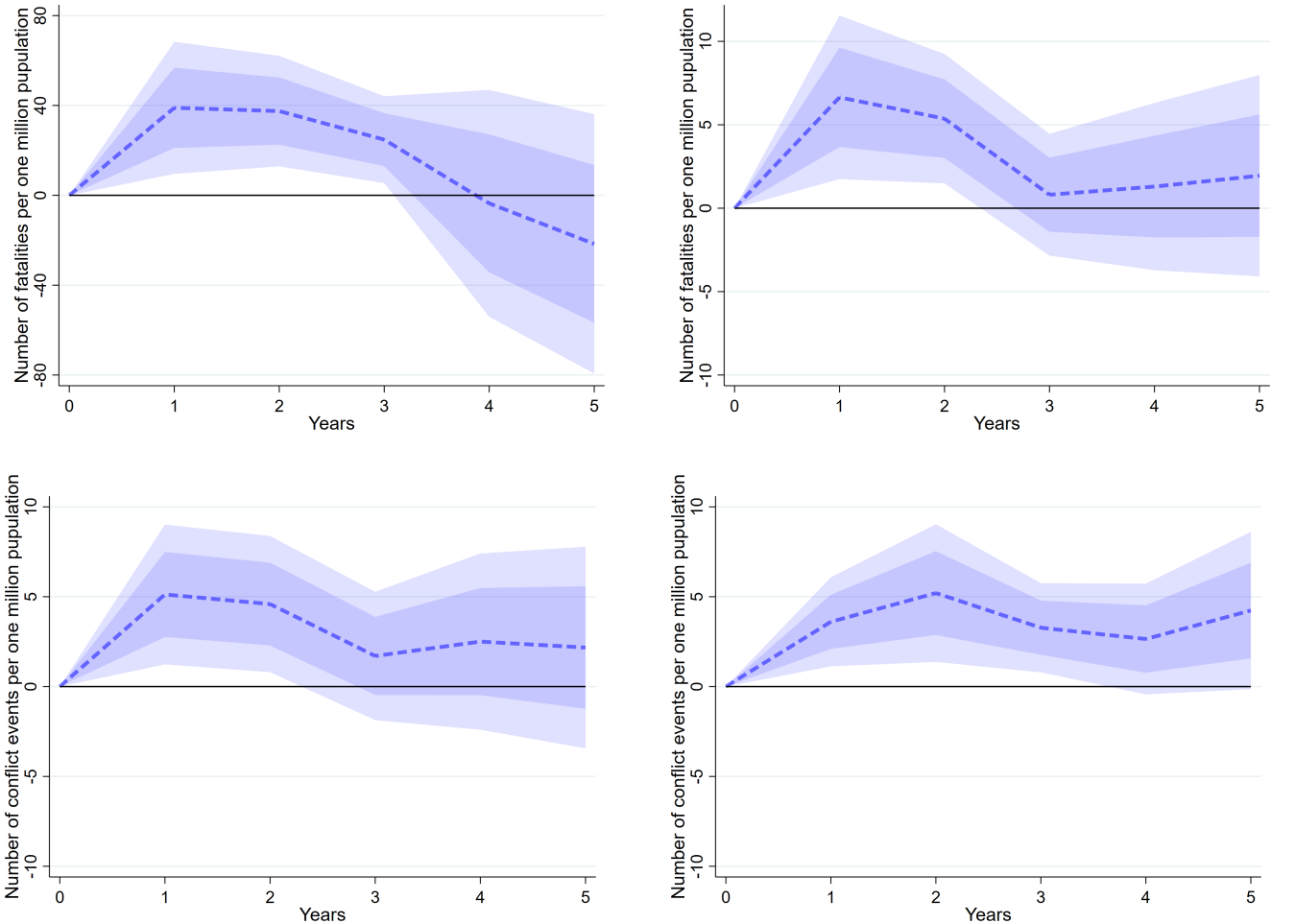

Figure 13: Number of fatalities (top left); IV for GDP growth (top right); excl. top commodity exporters (bottom left); and excl. middle eastern countries (bottom right)

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Robustness check (cont.)

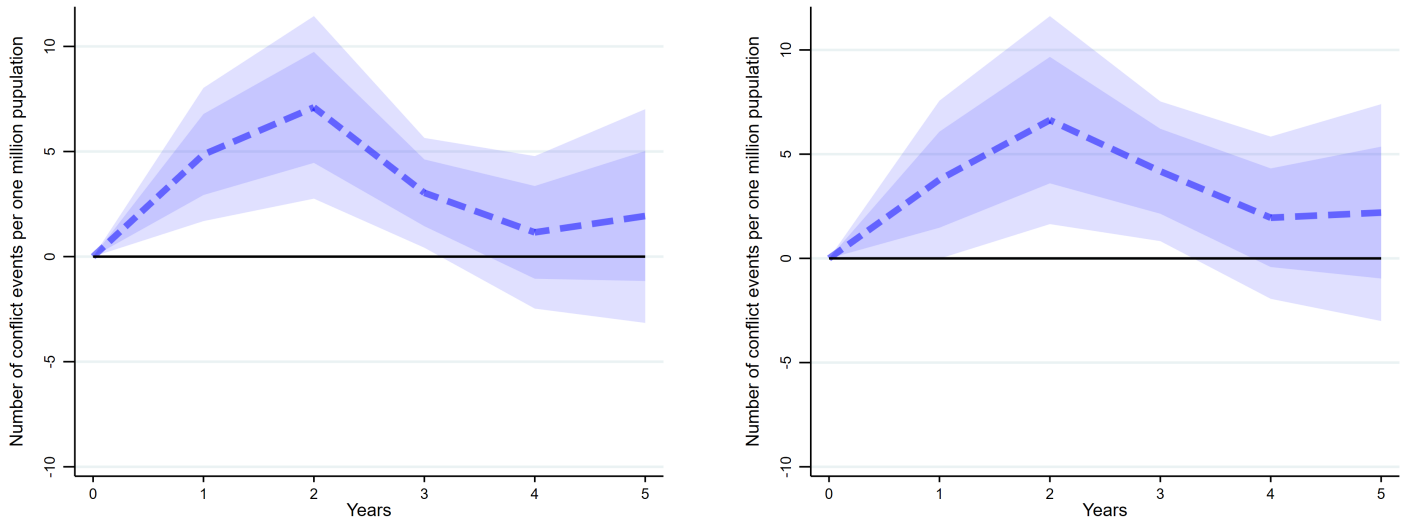

Figure 14: Additional controls

Notes: Controls include 9 macroeconomic and policy variables (per capita GDP growth, unemployment rate, CPI inflation, current account balance, fiscal balance, gross external debt, foreign reserve, USD-local currency exchange rate, and broad money); 1 social indicator (Gini coefficient); 4 indicators of political instability (the number of major cabinet changes, the number of successful, attempted, and planned coups); and 1 indicator of political regime (polity score). The left panel includes lagged control variables, whereas the right panel includes both lagged and current variables.

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Robustness check: PRGT-eligible countries

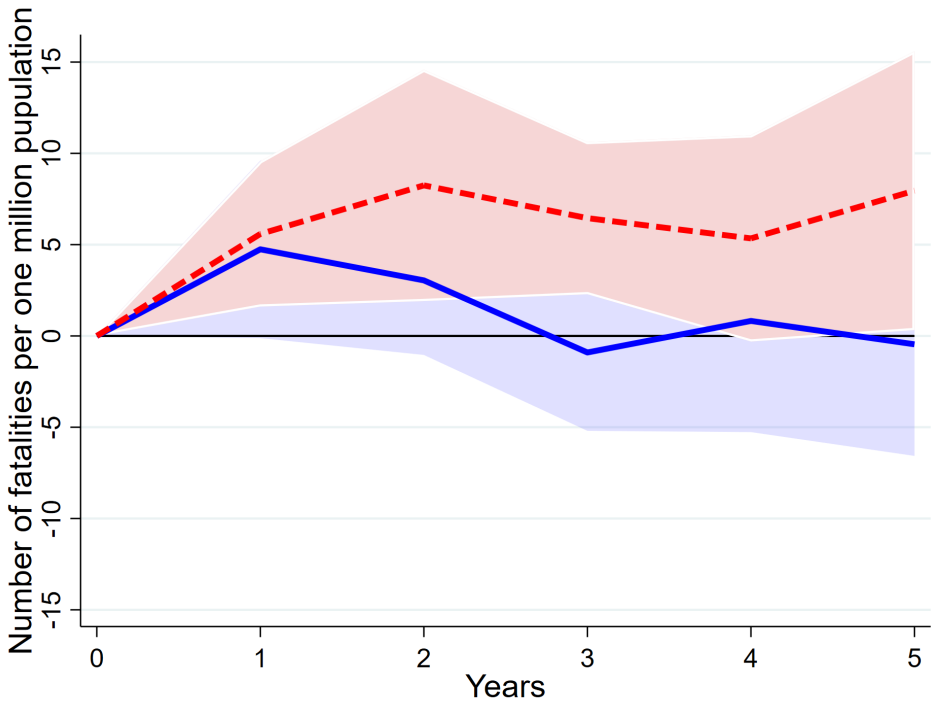

Figure 15: Heterogeneity, PRGT-eligible countries

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References

Akanbi, Olusegun Ayodele, Nikolay Gueorguiev, Mr Jiro Honda, Paulomi Mehta, Mr Kenji Moriyama, Keyra Primus, and Mouhamadou Sy, *Avoid a Fall or Fly Again: Turning Points of State Fragility*, International Monetary Fund, 2021.

Bazzi, Samuel and Christopher Blattman, "Economic shocks and conflict: Evidence from commodity prices," *American Economic Journal: Macroeconomics*, 2014, *6* (4), 1–38.

Bellemare, Marc F, "Rising food prices, food price volatility, and social unrest," *American Journal of Agricultural Economics*, 2015, *97* (1), 1–21.

Berman, Nicolas and Mathieu Couttenier, "External shocks, internal shots: the geography of civil conflicts," *Review of Economics and Statistics*, 2015, *97* (4), 758–776.

Besley, Timothy and Torsten Persson, "The incidence of civil war: Theory and evidence," Technical Report, National Bureau of Economic Research 2008.

__ **and** __ , "Wars and state capacity," *Journal of the European Economic Association*, 2008, *6* (2-3), 522–530.

Blattman, Christopher and Edward Miguel, "Civil war," *Journal of Economic Literature*, 2010, *48* (1), 3–57.

Reference ii

Bó, Ernesto Dal and Pedro Dal Bó, "Workers, warriors, and criminals: social conflict in general equilibrium," *Journal of the European Economic Association*, 2011, *9* (4), 646–677.

Brückner, Markus and Antonio Ciccone, "International commodity prices, growth and the outbreak of civil war in Sub-Saharan Africa," *The Economic Journal*, 2010, *120* (544), 519–534.

Buhaug, Halvard, Scott Gates, and Päivi Lujala, "Geography, rebel capability, and the duration of civil conflict," *Journal of Conflict Resolution*, 2009, *53* (4), 544–569.

Cerra, Valerie and Sweta Chaman Saxena, "Growth dynamics: the myth of economic recovery," *American Economic Review*, 2008, *98* (1), 439–457.

Chami, Ralph, Raphael Espinoza, and Peter J. Montiel, "Macroeconomic Policy Issues in Fragile States: A Framework," in Ralph Chami, Raphael Espinoza, and Peter J. Montiel, eds., *Macroeconomic Policy in Fragile States*, Oxford University Press, 2020, chapter 10, pp. 1–38.

Ciccone, Antonio, "Economic shocks and civil conflict: A comment," *American Economic Journal: Applied Economics*, 2011, *3* (4), 215–227.

Collier, Paul, "On the economic consequences of civil war," *Oxford Economic Papers*, 1999, *51* (1), 168–183.

__ **and Anke Hoeffler**, "Greed and grievance in civil war," *Oxford Economic Papers*, 2004, *56* (4), 563–595.

__ **,** __ **, and Måns Söderbom**, "On the duration of civil war," *Journal of Peace Research*, 2004, *41* (3), 253–273.

Reference iii

Diallo, Y. and Rene Tapsoba, *Climate Shocks and Domestic Conflicts in Africa*, International Monetary Fund, 2022.

Elbadawi, I. and N. Sambanis, "How Much War Will We See? Explaining the Prevalence of Civil War," *The Journal of Conflict Resolution*, 2002, *46* (3), 307–334.

Gruss, B. and S. Kebhaj, *Commodity terms of trade: A new database*, IMF Working Paper WP/19/21, International Monetary Fund, 2019.

Hadzi-Vaskov, M., S. Pienknagura, and Ricci L. A., *The Macroeconomic Impact of Social Unrest*, IMF Working Paper WP/21/135, International Monetary Fund, 2021.

Hsiang, Solomon M, Marshall Burke, and Edward Miguel, "Quantifying the influence of climate on human conflict," *Science*, 2013, *341* (6151), 1235367.

Jordà, Òscar, "Estimation and inference of impulse responses by local projections," *American Economic Review*, 2005, *95* (1), 161–182.

Koubi, Vally, Gabriele Spilker, Tobias Böhmelt, and Thomas Bernauer, "Do natural resources matter for interstate and intrastate armed conflict?," *Journal of Peace Research*, 2014, *51* (2), 227–243.

McGuirk, Eoin and Marshall Burke, "The economic origins of conflict in Africa," *Journal of Political Economy*, 2020, *128* (10), 3940–3997.

Miguel, Edward, Shanker Satyanath, and Ernest Sergenti, "Economic shocks and civil conflict: An instrumental variables approach," *Journal of Political Economy*, 2004, *112* (4), 725–753.

Reference iv

Novta, Natalija and Evgenia Pugacheva, "The macroeconomic costs of conflict," *Journal of Macroeconomics*, 2021, *68*, 103286.

Olea, José Luis Montiel and Mikkel Plagborg-Møller, "Local projection inference is simpler and more robust than you think," *Econometrica*, 2021, *89* (4), 1789–1823.

Ross, Michael L, "What do we know about natural resources and civil war?," *Journal of Peace Research*, 2004, *41* (3), 337–356.

Rother, Björn, Gaëlle Pierre, Davide Lombardo, Risto Herrala, Ms Priscilla Toffano, Mr Erik Roos, Mr Allan G Auclair, and Ms Karina Manasseh, *The economic impact of conflicts and the refugee crisis in the Middle East and North Africa*, International Monetary Fund, 2016.

World Bank and United Nations, *Pathways for Peace Inclusive Approaches to Preventing Violent Conflict* 2018.