Spatial Disaster Risk

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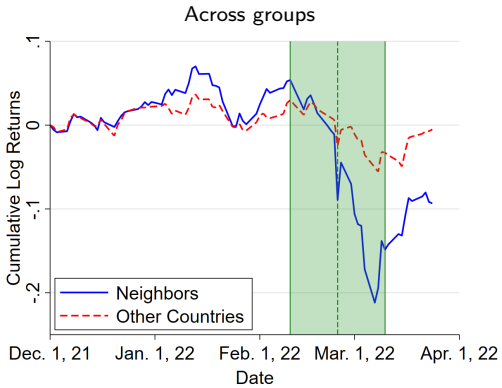
The stock market response to the war in Ukraine



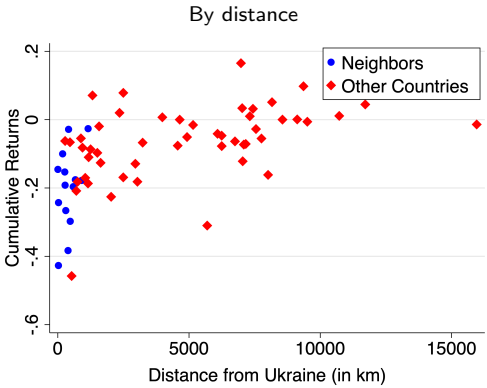


Figure: Federle et al. (2022)

Spatial fallout of disaster risk as a feature of war in Ukraine

The issue

Spatial fallout of disaster risk common feature of organized violence?

- Organized violence: Interstate wars, civil wars, major terror attacks, riots, coup d'états, ...

Why does proximity determine stock market responses?

- Trade: Distance is a key barrier to trade and material destruction in conflict site likely leads to trade disruptions
- Disaster risk: non-zero probability of **violence spreading across borders** (e.g., Arab Spring, nuclear fallout, current destabilization of Middle East, Syrian Civil War and uprising of ISIS)

What are the disaster spillovers of violent conflicts?

- Identify and geolocate sites of violent conflicts
- Establish and contrast market effects of firms headquartered in uninvolved countries based on their distance to sites

Related literature

Market response to conflict and policy uncertainty

- Leigh et al. (2003), Guidolin and La Ferrara (2007), Zussman and Nielsen, (2008), Caldara and Iacoviello (2022); Baker et al. (2016); Born et al. (2019)

Proximity as a determinant of conflicts and their spillovers

- Murdoch and Sandler (2002,2004), Verdickt (2020), Mueller et al. (2022), Federle et al. (2022, 2023)

Contagion of crises and disasters across borders

- Forbes (2012), Hassan et al. (2021)

Adverse spillovers from conflicts via trade and production networks

- Glick and Taylor (2010), Couttenier and Piemontese (2022), Korovkin and Makarin (2021)

Data

Market data

- Daily returns for **52,357 firms** headquartered across **146 countries** from Thomson Reuters Datastream between 1991 and 2022
- Match firms at zip code level with *GeoNames* to obtain coordinates of firms' headquarters

Trade data

- Harvard Atlas of Economic Complexity
- World Input-Output Database (Timmer et al., 2015)
- CEPII Trade and Production Database (Mayer et al., 2023; de Sousa et al., 2012)

Conflict data

- Georeferenced Dataset of UCDP (Sundberg and Melander, 2013; Davies et al., 2022)
- Own coding of conflict types based on various sources
- Distinguish between conflict **sites**, **belligerents**, and **neutral** countries

Event identification

Georeferenced UCDP Dataset

- Comprises more than **300k violent incidents** across **127 countries**
- Only civil war in Syria comprises more than 65k incidents
- **Problem**: Stock market reaction contingent on surprise component
- **Solution**: Focus on incidents which mark the start or sudden deterioration of conflicts

Identification:

(1) Aggregate incidents on same day in same country (e.g., 9/11)

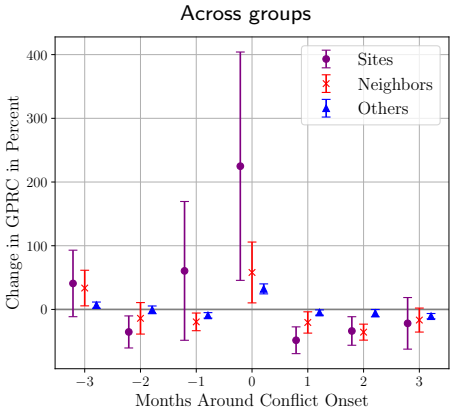
(2) All incidents with more than 100 casualties are event candidates

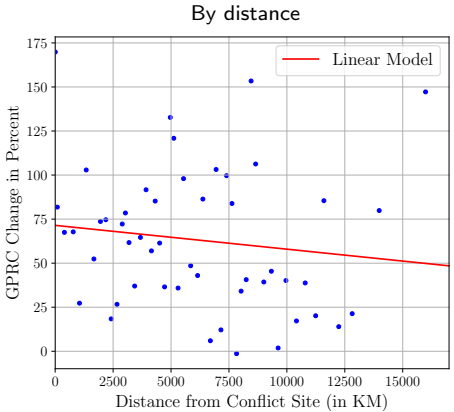
(3) Only consider those event candidates taking place in countries without any documented incident with more than 25 deaths in prior year

Identified **45 largely unanticipated events** that took place across **40 countries**

Anticipation Effects

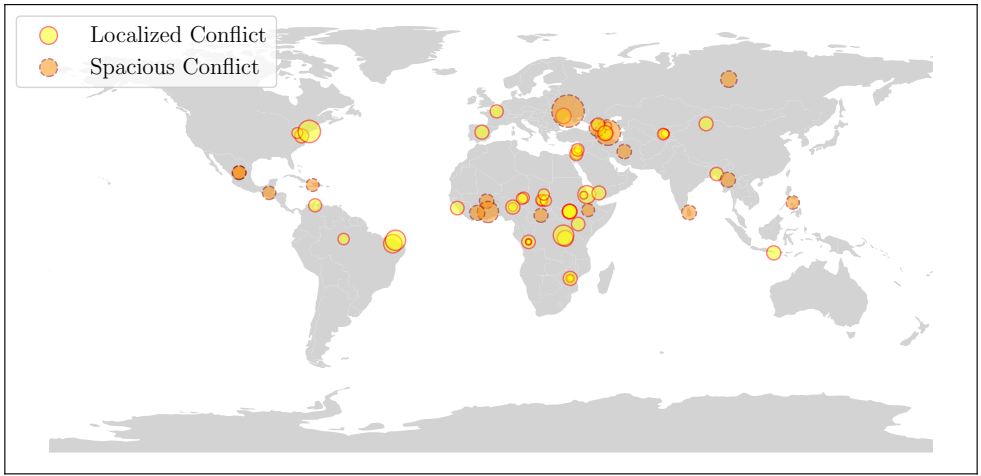
Geopolitical risk index (Caldara and Iacoviello, 2022) around identified conflicts





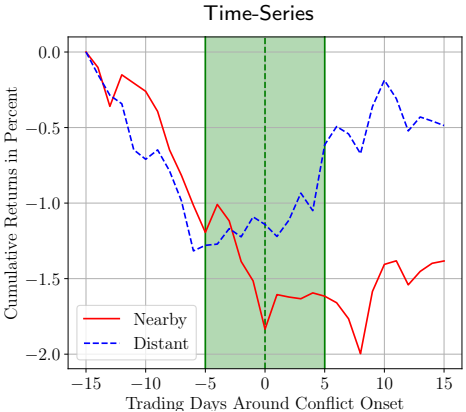
Descriptive statistics

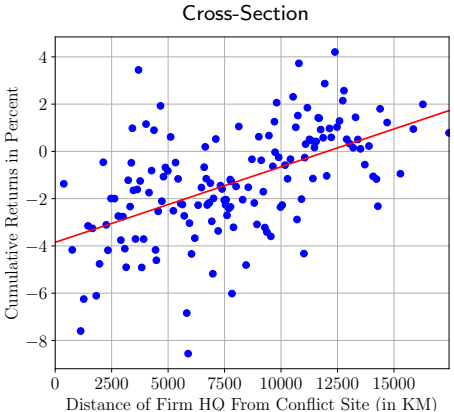
Identified events



Descriptive statistics

Pattern remains when turning to all conflicts





Descriptive statistics

Proximity penalty persistent across all conflict types

Conflict Type	#	Proximity Penalty		Example Conflict...		
		Mean	Median	Site	Year	Name
International Wars	10	2.63 p.p.	2.1 p.p.	Ukraine	2022	Russo-Ukrainian War
Rebel Fights	8	0.27 p.p.	-0.01 p.p.	Philippines	2013	Zamboanga City Crisis
Ethnic Violence	6	0.97 p.p.	0.24 p.p.	South Sudan	2011	Lou Nuer v Murle
Terror Attacks	6	2.7 p.p.	1.55 p.p.	France	2015	Paris Attacks
Riots	5	4.2 p.p.	3.43 p.p.	China	2009	Ürümqi Riots
Civil Wars	3	2.82 p.p.	1.73 p.p.	Congo	1997	Congo Civil War
Coup D'États	2	0.41 p.p.	0.15 p.p.	Haiti	2004	Haitian Coup D'État
Others	5	1.75 p.p.	1.59 p.p.	Brazil	2017	Comando Vermelho

Empirical framework

Simple finance event study

$$R^m_{i,t} = \alpha + \gamma * N_{i,t} + \rho * N_{i,t} * distance_{i,t} + controls_{i,t} + u_{i,t}\,,$$

- t indexes time; i either indexes countries, country-industries, or firms
- $R^m_{i,t}$: (abnormal) returns according to market model m, $m \in \{Raw, CAPM, Carhart, FF5\}$
- $N_{i,t}$ dummy whether an event took place in which country i is not involved
- $distance_{i,t}$: distance to closest conflict site (in 1,000 km)
- Controls for trade and participation in conflicts
- Standard errors clustered at time level to alleviate concerns regarding cross-sectional dependence

Then,

- ... γ yields average effect on stock market return of uninvolved neighbor
- ... ρ yields average effect of increase in distance from conflict site

Results

Country-level evidence, coefficients denote cumulative effects in two-week window around conflict onsets

	(1)	(2)	(3)	(4)	(5)
$N_{i,t}$	-0.279	-1.487**	-2.221***	-1.827***	-1.845***
	(0.604)	(0.706)	(0.751)	(0.679)	(0.682)
$N_{i,t} \times distance_{i,t}$		0.206***	0.24***	0.178**	0.178**
		(0.075)	(0.083)	(0.074)	(0.074)
$z(trade_{i,t}^{site})$			-1.161***	-1.166***	-2.12**
			(0.442)	(0.44)	(0.942)
$z(trade_{i,t}^{belligerents})$				-1.399*	-1.384
				(0.843)	(0.843)
$z(commodities_{i,t}^{site})$					0.975*
					(0.589)
$z(commodities_{i,t}^{belligerents})$					0.143
					(0.129)
Obs.	430,163	429,869	425,621	425,197	425,197
Countries	97	97	97	97	97
Conflicts	45	45	39	38	38

Further analyses

Main results hold across a number of alternative specifications

- Country-, country-industry-, and firm-level — at the firm-level *within* neighbor countries
- Option-implied risk reversal shows strong and spatially differentiated fears of market participants regarding major downturns in asset prices
- Adjustment of returns according to different market models
- Calendar-time portfolios to further account for cross-sectional dependence
- Varying event windows
- Different event identification thresholds

Conclusion

Markets respond quickly to violent conflicts

- Not only at the country, but also at the firm level *within* countries

Geography matters for the economic spillovers of conflicts

- Proximity penalty which reflects risk of military escalation/rare disasters
- Proximity to conflict shapes its spillovers via market expectations