This Mine is Mine!

How Minerals Fuel Conflicts in Africa

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Content

Existing Evidence and Conceptual Framework

- Civil wars have positive correlation with natural resources
- Resources increase feasibility
- Weak state capacity
- Impact of higher local income
- Role of foreign companies

Content

Data

1. Data

1.1 Conflict data

1.2 Mines data

1.3 Other data

2. Descriptive statistics

Conflict Data

- Armed Conflict Location Events Data

- Dummy variable= 1 when at least one event of conflict has occurred inside the given cell

- Bias due to coverage of conflict

Mines Data

- Raw Material Data

- Mkt= 1 when at least one mine is active inside the given cell during a given year

- Mkt: proxy to extraction area of a certain mineral

- Bias due to lack of data on small mines

Other Data

- World Bank Commodities
- Excluding diamonds
- Include:

cell-specific variables

country-specific variables

mineral-specific variables

Descriptive Statistics

TABLE 1—DESCRIPTIVE STATISTICS: CELL LEVEL

	Observations	Mean	Standard deviation	Median
Pr(Conflict > 0)				
all cells	144,690	0.06	0.23	0
if mines > 0	2,798	0.14	0.35	0
if mines = 0	141,892	0.05	0.22	0
battles	144,690	0.03	0.17	0
viol. against. civ.	144,690	0.03	0.17	0
riots and protests	144,690	0.02	0.12	0
Number of conflicts				
all cells	144,690	0.25	3.41	0
if > 0	7,980	4.61	13.79	2
Pr(Mine > 0)				
only cell	144,594	0.02	0.14	0
incl. 1st surrounding cells	144,690	0.09	0.29	0
incl. 1st and 2nd surrounding cells	144,687	0.17	0.38	0
Number of mines				
all cells	144,594	0.05	0.60	0
if > 0	2,702	2.57	3.55	1
Pr(number of mines > 2)				
all cells	144,690	0.01	0.09	0
if mine > 0	2,798	0.40	0.49	0

Descriptive Statistics

- 52 countries, 14 minerals

- Main minerals

- The conflict probability is much higher in cells with active mines, around 14 percent

- The presence of active mines is positively correlated with conflict incidence, both across and within cells

Content

Empirical Analysis

1. Methodological Issues
2. Baseline Results
3. Sensitivity Analysis
4. Country Characteristics and Mining-Induced Violence
5. Mineral Characteristics
6. The Nature of Mining-Induced Violence
7. Quantification

Methodological Issues

More valuable mines increase the search for local rents, leading to a higher probability of violence.

$$CONFLICT_{kt} = \alpha_1 M_{kt} + \alpha_2 lnP^w_{kt} + \alpha_3 (M_{kt} x lnP^w_{kt}) + FE_k + FE_{it} + \epsilon_{kt}$$

- FEkt are cell fixed effects
- FEit is an additional battery of fixed effects
- Conflictkt is the dependent variable
- Mkt is the main explanatory variable
- pkt w is the variable corresponds to the world price in year t

Methodological Issues: Significant Factors

1. Exogeneity of Prices:

- Some mines may be large enough to affect world prices; if a conflict were to occur in mining areas, prices could be affected.
- Omitted variables that vary over time could determine world prices and local violence in mining areas.

2. Endogenous Mining Activity.

$$CONFLICT_{kt} = \alpha_3(M_{kt} x ln P^w_{kt}) + FE_k + FE_{it} + \epsilon_{kt}$$

Methodological Issues: Significant Factors

3. Estimation Issues: Equations (1) and (2) were estimated using a Linear Probability Model in the reference specifications.

4. Spatial Correlation: Given the high spatial resolution of the data, it is important to take spatial correlation into account since both conflict and mines are clustered in space.

Baseline Results

TABLE 2—CONFLICTS AND MINERAL PRICES

Estimator	LPM					
Dependent variable	Conflict incidence					
Sample	All	$V(M_{kt}) = 0$		All	$V(M_{kt}) = 0$	
	(1)	(2)	(3)	(4)	(5)	(6)
mine > 0	0.112					0.048
	(0.065)					(0.065)
ln price main mineral	−0.029					0.028
	(0.032)					(0.019)
ln price × mines > 0	0.086	0.072	0.060		0.085	0.108
	(0.034)	(0.020)	(0.021)		(0.024)	(0.041)
ln price × mines > 0 (neighboring cells)			0.021			
			(0.006)			
ln price × mines > 0 (ever)				0.045		
				(0.014)		
Country × year fixed effects	Yes	Yes	Yes	Yes	No	No
Year fixed effects	No	No	No	No	Yes	Yes
Cell fixed effects	Yes	Yes	Yes	Yes	Yes	No
Neighborhood fixed effects	No	No	No	No	No	Yes
Observations	143,768	142,296	127,974	143,864	142,296	17,360

Sensitivity Analysis

Sensitivity controls

- Mining Activity
- Main Mineral and Mineral Prices
- Alternative Definitions of Violence
- Other Robustness Checks

Sensitivity Analysis

- Mining Activity

TABLE 8—ROBUSTNESS: ALTERNATIVE DEFINITIONS OF MINING AREAS

Estimator	LPM						
Dependent variable	Conflict incidence						
Def. mining area	$V(M_{kt}) = 0$	Ever 1997–2010	Mine $(t-1)$	1 from opening onward	Mine in 1997	Mine over 1992–1996	Mine over 1980–1996
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln price × mines > 0	0.072	0.043	0.033	0.050	0.056	0.056	0.050
	(0.020)	(0.014)	(0.032)	(0.016)	(0.019)	(0.020)	(0.019)
Cell fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	142,296	143,768	133,492	143,375	143,768	143,768	143,768

Sensitivity Analysis

- Main Mineral and Mineral Prices
- Other Robustness Checks

Sensitivity Analysis

- Alternative Definitions of Violence

TABLE 11—NUMBER OF EVENTS

Estimator	LPM			PPML			LPM	
Dependent variable	Number of events							
	All	Dropping top 5%	Dropping 2SD	All	Dropping top 5%	Dropping 2SD	$\log(x+1)$	Inverse hyperbolic
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample A. $V(M_{kt}) = 0$								
ln price × mines > 0	0.249	0.263	0.256	0.195	0.440	0.301	0.094	0.121
	(0.240)	(0.100)	(0.155)	(0.283)	(0.197)	(0.239)	(0.032)	(0.040)
Cell fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × year fixed effects	Yes	Yes	Yes	No	No	No	Yes	Yes
Year fixed effects	No	No	No	Yes	Yes	Yes	No	No
Observations	142,296	141,894	142,163	35,210	34,769	35,064	142,296	142,296
Sample B. All								
ln price × mines > 0 (ever)	0.245	0.216	0.217	0.253	0.395	0.289	0.070	0.089
	(0.136)	(0.079)	(0.100)	(0.264)	(0.172)	(0.194)	(0.022)	(0.028)
Cell fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × year fixed effects	Yes	Yes	Yes	No	No	No	Yes	Yes
Year fixed effects	No	No	No	Yes	Yes	Yes	No	No
Observations	143,864	143,361	143,634	35,980	35,472	35,771	143,864	143,864

Country Characteristics and Mining-Induced Violence

Is the abundance of valuable mines always a curse for political stability?

- Inequality and Diversity: How Does the Social Fabric Matter

(i) The Gini index of gross income distribution

(ii) Ethnic and religious division or polarization

(iii) The presence of an indigenous group in the cell

Country Characteristics and Mining-Induced Violence

TABLE 12—HETEROGENEOUS EFFECTS: CLEAVAGES

Estimator	LPM							
Dependent variable	Conflict incidence							
Sample	$V(M_{kt}) = 0$	All	$V(M_{kt}) = 0$	All	$V(M_{kt}) = 0$	All	$V(M_{kt}) = 0$	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln price × mines > 0	0.031		0.024		0.043		0.111	
	(0.026)		(0.028)		(0.032)		(0.054)	
ln price × mines > 0 (ever)		0.027		0.015		0.014		0.095
		(0.018)		(0.020)		(0.021)		(0.038)
× Gini	0.053	0.015						
	(0.043)	(0.022)						
× ethnic frac.			0.015	0.002				
			(0.040)	(0.025)				
× religious frac.			0.069	0.046				
			(0.038)	(0.023)				
× ethnic pol.					−0.017	0.015		
					(0.034)	(0.022)		
× religious pol.					0.081	0.042		
					(0.034)	(0.019)		
× indigenous							−0.044	−0.060
							(0.058)	(0.041)
Country × year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cell fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Country Characteristics and Mining-Induced Violence

- Domestic Institutions: Can Good Governance Stop the Guns?

TABLE 13—HETEROGENEOUS EFFECTS: INSTITUTIONAL QUALITY

Estimator	LPM					
Dependent variable	Conflict incidence					
Sample	$V(M_{kt}) = 0$	All	$V(M_{kt}) = 0$	All	$V(M_{kt}) = 0$	All
	(1)	(2)	(3)	(4)	(5)	(6)
ln price × mines > 0	0.077		0.039		0.090	
	(0.051)		(0.036)		(0.036)	
ln price × mines > 0 (ever)		0.032		0.053		0.050
		(0.029)		(0.028)		(0.024)
× ICRG	0.002	0.020				
	(0.059)	(0.033)				
× gov. effectiv.			−0.053	0.024		
			(0.046)	(0.034)		
× rule of law			0.027	0.030		
			(0.038)	(0.047)		
× voice and accoun.			0.107	0.004		
			(0.048)	(0.043)		
× control of corruption			−0.043	−0.064		
			(0.040)	(0.029)		
× polity IV					−0.027	−0.008
					(0.045)	(0.027)
Country × year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Cell fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Mineral Characteristics

- Labor- versus Capital-Intensiveness

TABLE 14—HETEROGENEOUS EFFECTS: MINERALS' CAPITAL INTENSITY

Estimator	LPM					
Dependent variable	Conflict incidence					
Sample	$V(M_{kt}) = 0$	All	$V(M_{kt}) = 0$	All	$V(M_{kt}) = 0$	All
	(1)	(2)	(3)	(4)	(5)	(6)
ln price × mines > 0	0.119		0.089		0.069	
	(0.119)		(0.026)		(0.022)	
ln price × mines > 0 (ever)		0.087		0.078		0.041
		(0.048)		(0.023)		(0.014)
× open cast	0.078	−0.042				
	(0.650)	(0.119)				
× energy intensity			−0.000	−0.000		
			(0.000)	(0.000)		
× mine age					0.001	0.002
					(0.002)	(0.002)
Country × year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Cell fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	141,344	141,946	141,782	142,192	142,221	143,789

Mineral Characteristics

- Rents, Lootability, and Bulkiness

TABLE 15—HETEROGENEOUS EFFECTS: MINERALS' LOOTABILITY

Estimator	LPM					
Dependent variable	Conflict incidence					
Sample	$V(M_{kt}) = 0$	All	$V(M_{kt}) = 0$	All	$V(M_{kt}) = 0$	All
	(1)	(2)	(3)	(4)	(5)	(6)
ln price × mines > 0: low price	0.046					
	(0.027)					
ln price × mines > 0: high price	0.065					
	(0.025)					
ln price × mines > 0 (ever): low price		0.021				
		(0.020)				
ln price × mines > 0 (ever): high price		0.044				
		(0.017)				
ln price × mines > 0			0.117		0.088	
			(0.050)		(0.024)	
ln price × mines > 0 (ever)				0.027		0.054
				(0.048)		(0.017)
× high rents			−0.061	0.010		
			(0.054)	(0.050)		
× ore concentration					−0.174	−0.166
					(0.059)	(0.056)
Country × year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Cell fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	142,674	144,356	142,674	144,356	142,170	143,262

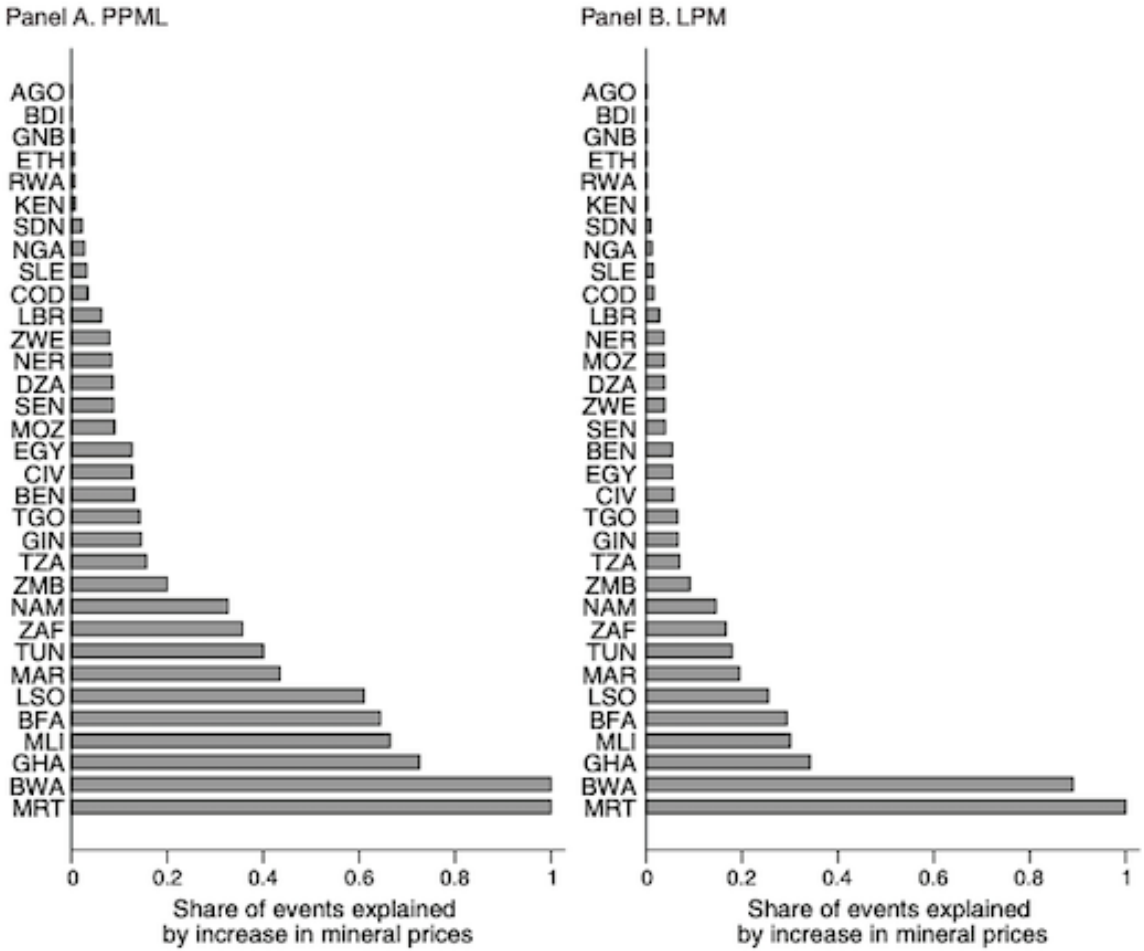
The Nature of Mining-Induced Violence

TABLE 3—MINERALS PRICE AND TYPES OF CONFLICT EVENTS

	LPM					
Conflict incidence var.	Battles		Violence against civ.		Riots/protests	
Sample	$V(M_{kt}) = 0$	All	$V(M_{kt}) = 0$	All	$V(M_{kt}) = 0$	All
	(1)	(2)	(3)	(4)	(5)	(6)
ln price × mines > 0	0.016		0.040		0.044	
	(0.008)		(0.014)		(0.018)	
ln price × mines > 0 (ever)		0.002		0.034		0.038
		(0.006)		(0.010)		(0.011)
Country × year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Cell fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	142,296	143,864	142,296	143,864	142,296	143,864

Quantification

How large is the effect of mineral price variations on the probability of conflict?



Content

Feasibility and the Diffusion of Violence

A) Mines located in ethnic homelands

B) Changes in territory

Mines Located in Ethnic Homelands

- How conflict incidence at the rebel group-country level is affected by mineral prices in the ethnic homeland of the group

- Unit of analysis is a rebel group country of operation year triplet (g, i, t)

Mines Located in Ethnic Homelands

$$\text{CONFLICT}_{git} = \beta_1 \ln p_{gt}^W + \beta_2 \ln p_{gt}^W \times M_g + \mathbf{FE}_{gi} + \mathbf{FE}_{it} + \varepsilon_{gt},$$

- Conflict git dummy coding for the incidence of a conflict involving group g in country of operation i during year t
- ln pw world price of the main mineral produced by mines located in the homeland of the main ethnicity of rebel group g (the mineral observed in the largest number of cells
- Mg number of mines producing this mineral in the homeland at the beginning of the period
- B2 proxy for the mining-related financial capacity of the group

Changes in Territory

- The idea is to test whether a change in territory has more effect on future rebel activity elsewhere if the territory is a mining area

$$(3)\quad \text{ONSET}_{gkt} = \alpha \times \text{BATTLE}^{0}_{gt-1} + \beta \times \text{BATTLE}^{m}_{gt-1} + \mathbf{FE}_{gk} + \mathbf{FE}_{it} + \varepsilon_{gkt},$$

- ONSETgkt binary variable equal to 1 if group g is involved in an event in year t in a cell k that was at peace in t 1; it is 0 if the cell is still in peace in year t
- BATTLEm total number of battles won by group g in t 1 in mining areas
- FEitcountry of operation x year xed effects
- FEgk group x cell xed effects

Content

Breaking the Resource Curse: The Role of Mining Companies

A) Companies' characteristics: Does Mine Ownership Matter?

B) Promoting Good Practices: Does Transparency Matter?

Companies' Characteristics: Does Mine Ownership Matter?

- Conflict may be escalated by companies propensity to finance
- Colonial ties
- Firms from the ex-colonizing power continue to benefit from privileged relationships with the new rulers after decolonization

Promoting Good Practices: Does Transparency Matter?

- Transparency and traceability
- No hard evidence on conflict diminishing
- Corporate Social Responsibility

Content

Conclusion

- Impact of mining activities on the probability of conflict incidence
- The sharp increase in mineral prices and the average violence observed in African countries
- The results contradict configurations that claim that natural resources can reduce conflict by generating higher local incomes
- Mines operated by companies that comply with CSR were found to have less risk of fueling violence
- Gaining territorial control of a mining area implications on violencethe diffusion by rebel group

References

[1] Berman Nicolas, Couttenier Mathieu, Rohner Dominic, and Thoenig Mathias. *This Mine is Mine! How Minerals Fuel Conflicts in Africa*. American Economic Review 2017