Concession Stands: How Mining Investments Incite Protest in Africa

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Abstract Foreign investment in Africa's mineral resources has increased dramatically. This paper addresses three questions raised by this trend: do commercial mining investments increase the likelihood of social or armed conflict? If so, when are these disputes most prevalent? And, finally, what mechanisms help explain these conflicts? I show, first, that mining has contrasting effects on social and armed conflict: while the probability of protests or riots increases (roughly doubling) after mining starts, there is no increase in rebel activity. Second, I show that the probability of social conflict rises with plausibly exogenous increases in world commodity prices. Finally, I compile additional geo-spatial and survey data to explore potential mechanisms, including reporting bias, environmental harm, in-migration, inequality, and governance. Finding little evidence consistent with these accounts, I develop an explanation related to incomplete information—a common cause of conflict in industrial and international relations. This mechanism rationalizes why mining induces protest, why these conflicts are exacerbated by rising prices, and why transparency dampens the relationship between prices and protest.

Foreign direct investment (FDI) to Africa now exceeds foreign aid flows, and much of that investment has been in extractive industries that aim to tap the region's mineral wealth.[1] Whether this new investment represents a boon for, or impediment to, economic and political development is contested. On the one hand, Farole and Winkler at the World Bank Group argue "that investment matters for economic growth … Gains from FDI can materialize through increases in investment, employment, foreign exchange, and tax revenues."[2] On the other, scholars working on the "resource curse" worry that heavy reliance on extractive industries handicaps manufacturing

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1. UNCTAD 2013b; World Bank 2012.
2. Farole and Winkler 2014, 9.

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and other export-oriented sectors, undermines political accountability, and engenders civil conflict.[3]

Motivated by this trend and ongoing debate, I address three questions: do commercial (non-oil) mining investments increase the likelihood of social or armed conflicts? If so, under what conditions do those disputes occur? And what mechanisms help to explain these conflicts?

Using geo-spatial, time-series data on the location of mines and incidence of conflict, I show that commercial mining investments have contrasting effects on social and armed conflict: the probability of a protest or riot more than doubles after mining (i.e., production) starts, yet the probability of rebel events or deadly armed conflicts remains low and unchanged. Both my focus on protests and null finding with respect to armed conflict contrast with earlier work on the resource curse, which concentrates on how natural resources can motivate or sustain rebellions.[4]

Not all mining projects are met with protests, and the likelihood of social conflict varies over the life of a mine. I investigate what types of companies are more likely to face protests, and how this propensity changes with plausibly exogenous fluctuations in world commodity prices. Despite concerns about unscrupulous business practices among Chinese companies or corporations based in tax havens, I do not find that areas hosting investors from these countries experience a larger increase in the probability of protest. I do, however, find that projects partially owned by the host government do not face disputes. Second, I estimate the effect of changes in world commodity prices on the likelihood of protests or riots in mining areas. Consistent with recent empirical work, I find that these conflicts increase with prices.[5]

Drawing on research into mining-related protests in Latin America and a more nascent literature in African politics,[6] I explore a set of mechanisms that might explain these results. Compiling additional geo-spatial and survey data, I look for evidence that grievances related to environmental hazards, in-migration and displacement, economic inequality, or corruption drive the increased likelihood of protests around mining projects. Failing to find empirical support for these accounts, I develop an alternative explanation related to incomplete information—a well-known source of bargaining failures and common explanation for conflict in industrial and international relations.[7] Communities have limited information about mining projects' profitability, which varies both across projects and over time.

3. See Ross 2015 for a recent review.

4. See, for example, Berman et al. 2017; Collier and Hoeffler 2004; Dube and Vargas 2013; Lujala, Gleditsch, and Gilmore 2005.

5. Berman et al. 2017.

6. On Latin America, see Bebbington et al. 2008; Bebbington and Williams 2008; Kopas and Urpaleinen 2016; Sexton 2018; on African states, Steinberg 2015.

7. Kennan and Wilson 1993; Walter 2009. The informational asymmetry I focus on resembles the problem facing workers who make wage demands and choose to strike, unsure about what their employers can actually afford. In the international relations literature, the informational problem is instead typically among adversaries who do not know each other's willingness or capacity to fight.

Nevertheless, they often have high expectations for what they stand to gain (especially when mineral prices are high) and make consonantly large demands. All companies are wont to claim that they cannot spare such expense; by claiming financial distress, they hope to mollify communities and retain a larger share of profits. While such talk is cheap, social conflicts that disrupt production extract a costly and thus more credible signal of projects' profitability: communities infer that only projects with meager margins and low opportunity costs would rather shut down than concede. Protests thus serve to separate projects that cannot afford large payouts from those that, without the threat of disruptive social conflict, would try to lowball their hosts.

This explanation for conflict resonates with qualitative accounts from mining communities and can rationalize both why mining induces protest and why these conflicts are exacerbated by rising prices. In short, research by industry analysts indicates that mines' input costs increased alongside prices during the commodity boom, limiting the growth of profits. When these costs received less attention than sharply rising prices, host communities formed heightened expectations about what mines were worth and what they stood to gain. When companies refused to meet increased demands, protests resulted.[8] As further evidence in support of this explanation, I show that the positive relationship between prices and protest is dampened by policies, such as the Extractive Industries Transparency Initiative (EITI), that promote transparency and may help correct the informational problem that I argue generates protest.

This paper contributes to several debates in political economy. First, for the last twenty years, civil wars have rightfully topped the research agendas of scholars working on conflict in Africa.[9] Yet such wars have become less frequent. According to the Uppsala Conflict Data Program, the number of armed conflicts resulting in 100 or more battle-related deaths fell from over thirty in 1997 to five in 2007 and just two in 2010.[10] While this is a positive development, it does not indicate an era of tranquility. The number of protests and riots doubled between 1997 and 2010—what Branch and Mampilly dub a "third wave."[11] This paper identifies one determinant of this increase in social conflict: mining areas make up just 0.3 percent of the rural population in Africa (localities with less than 100,000 people) but accounted for 22 percent of rural protests in 2009.

Second, research into the resource curse has similarly focused on whether and why natural resources, particularly oil and gas, provoke or sustain civil conflict.[12] Rebels,

8. This claim comports with several empirical studies of strike incidence in more developed countries, which find that industrial conflicts increase during high points in the business cycle. Harrison and Stewart 1994, 528.

9. Fearon and Laitin 2003; Roessler 2016; Weinstein 2007.

10. Melander and Sundberg 2012.

11. Branch and Mampilly 2015.

12. See Bazzi and Blattman 2014; Brückner and Ciccone 2010; Ross 2006 in addition to those cited earlier.

according to much of this work, view natural resources as an attractive source of funds and attack when the expected spoils exceed the opportunity cost of fighting. (Uncertainty over the precise size of the spoils—analogous to the informational problem I describe earlier—is not a necessary condition for such attacks.) I both qualify and extend this literature. I find that commercial mines in Africa do not incite rebel activity in their immediate vicinity or in surrounding areas. While rebels may capture small-scale and artisanal mines,[13] the capital-intensive projects in my sample largely escape direct predation by armed groups. This result suggests that the scale at which natural resources are produced may condition their effects on conflict—a finding that echoes recent work arguing that production methods or ownership structures moderate the symptoms of the "resource curse."[14] I show instead that these mining projects lead to social conflicts that have only recently started to garner academic attention (and primarily among Latin Americanists). While these protests are not as deadly as armed conflicts, they generate large economic losses: a widely cited estimate from Davis and Franks claims that protests at major mining operations entail productivity losses of 20 million dollars per week and deter subsequent investment.[15]

Third, much of the existing research on foreign investment focuses on its determinants, not its political or social consequences.[16] This literature emphasizes how hold-up problems deter investment to poorly institutionalized states. I make an empirical contribution by identifying the impact of one large set of foreign investment projects on conflict and a theoretical contribution by illustrating how informational asymmetries, like commitment problems, can strain investor-host relations.

Finally, by considering how communities use protests to bargain with firms, whether they target particular types of projects or owners, and the role of third-parties (like EITI) in preventing disputes, this paper addresses core questions from the "private politics" literature.[17] This body of work examines how individuals, interest groups, and firms resolve value conflicts without relying on the law. This is a salient question in many weakly institutionalized African countries, where commercial mining companies both outstrip the state's regulatory capacity and, at the same time, assume an outsized societal role by providing infrastructure and public services in their host communities. This study begins to correct the omission of these private politics, and the role of firms more generally, in studies of political and economic development in African countries.[18]

13. De la Sierra 2014.
14. See, for example, Andersen and Ross 2014; Luong and Weinthal 2006.
15. Davis and Franks 2014.
16. See, for example, Biglaiser et al. 2012; Jensen 2008.
17. Baron 2003; Baron and Diermeier 2007.
18. A decade of reports on the Millennium Development Goals (2005–2015) use the words *firm*, *company*, *industry*, and *corporation* (and their plurals) a total of sixteen times; for comparison, *education* appears nearly 500 times. To my knowledge, Chris Blattman first noted this disparity.

Do Mining Projects Cause Conflict?

Is Conflict Around Mines Inevitable?

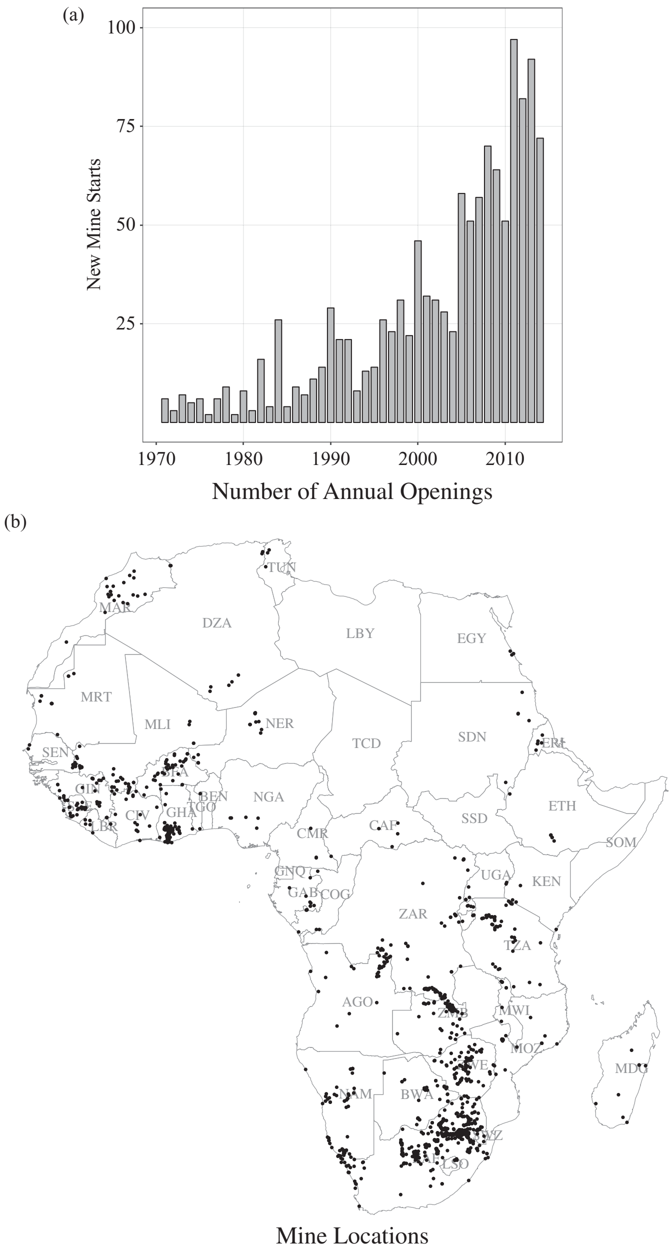
FDI in Africa has increased dramatically in the last three decades, going from almost nothing in 1980 to over 21 billion (in constant USD) in 2012. This is 16 percent more than foreign aid from all countries and multilateral institutions to the region in that same year.[19] Investments in extractive industries have propelled this upward trend.[20] As is apparent in Figure 1, mining activity across the region has shot up: in 2011 alone more new mines were brought online than in the 1970s. Companies based in Australia, Canada, China, Switzerland, the UK, and the US own over half of all projects in Africa.

These mining projects can benefit both investors and recipient communities. Companies receive access to exportable resources; communities, in return, enjoy increased development expenditure, employment, and land rents. Given the capital intensity of commercial mining, many communities and even governments in African states are unable to fully exploit their resource endowments. Allowing entry by foreign firms generates economic activity that would not otherwise occur—a win-win in theory if not in practice.[21]

To establish and operate a mining concession, investors need to coordinate with governments to secure a mining license and deliver royalty or tax payments. Critically, they also need to negotiate with the community hosting their project. Goldstuck and Hughes observe that "the most important and daunting challenge confronting any commercial mining operation is the securing of the support of local communities."[22] Between 2009 and 2013, the accounting firm Ernst and Young included maintaining a "social license to operate" among the top risks facing the sector.[23] To secure this social license, companies need to negotiate agreements with their host community, including how many workers will be employed and at what wage, compensation for resettlement, rents for land, or expenditure on infrastructure and public amenities (e.g., local clinics and schools).

Ideally, investors and their host communities amicably reach such agreements, and both parties share in any surplus generated by the project. Results from bargaining theory suggest that, if both the company and community know the project's surplus and each other's costs to delaying, then they should immediately settle on a mutually agreeable split of the pie.[24] The community simply proposes a split that

19. Baron 2003; Baron and Diermeier 2007.
20. UNCTAD 2013a.
21. Farole and Winkler 2014, 9.
22. Goldstuck and Hughes 2010, 6. *Community* is a term of art in the sector: "the *local* or *host* community is usually applied to those living in the immediate vicinity of an operation, being indigenous or non-indigenous people, who may have cultural affinity, claim, or direct ownership of an area in which a company has an interest" (qtd. in Evans and Kemp 2011, 1768).
23. Stevens et al. 2013, 23.
24. Osborne and Rubinstein 1990, 45.



Notes: (a) displays the number of mines opened (i.e., starting production) in every year from 1970-2014; (b) maps all unique mines with start dates. Data from IntierraRMG, SNL Metals and Mining, and Mining eTrack databases.

FIGURE 1. *Frequency and location of mining investments in Africa*

leaves the company indifferent between accepting today and counter offering after some costly delay. This result holds even if the government first reduces the surplus through observable forms of taxation (e.g., license payments or royalties). Prior bargaining with the central government (and the payment of royalties and taxes) is not enough to induce conflict between the company and its host community.

In Appendix E.1, I present a game of alternating offers played in continuous time between two informed parties: a community and a firm. The firm owns a mining project and is bargaining with its host community about how to split that project's profits. This complete-information game establishes the first-best outcome—the deal that the firm and community conclude in the absence of any bargaining problems. In this idealized setting, firms and communities immediately agree on how to split the project's proceeds (with the more patient party retaining a larger share). Costly delays, such as protests, riots, or work stoppages, do not occur in equilibrium—firms and their host communities "bargain away" conflict.[25]

While this null hypothesis may strike some readers as pollyannish, it comports with earlier work that found a null or negative relationship between foreign investment in mining and protest in poor countries.[26] For reasons specific to natural resource production, we might even expect to see fewer social conflicts in localities hosting mining projects. Rising mineral exports can increase exchange rates hurting other tradable sectors, a dynamic known as "Dutch Disease." If workers in the industries afflicted by Dutch Disease (e.g., manufacturing or agribusiness) protest in response to reduced employment or wage growth, then social conflict could increase outside of mining communities.

Do New Mines Raise the Probability of Social Conflict?

Using a difference-in-differences design, I demonstrate that protests increase in localities receiving new investments, rejecting the hypotheses that mining has a null or negative effect on protest.

First, I combine information from three private repositories of mining data (IntierraRMG, SNL Metals and Mining, and Mining eTrack) to geo-locate unique commercial mining projects and determine their start years.[27] Second, I employ several data sets that geo-locate protests, riots, and other low-level social conflicts: the Armed Conflict, Location, and Event Project (ACLED); the Social Conflict in

25. Fearon 1995. Prior research on the relationship between natural resources and armed conflict argues that rebels are greedy, seizing resource-rich areas and using the spoils to finance insurgent campaigns. Collier and Hoeffler 2004. These conflicts occur even with complete information about the profitability of mines: rebels expropriate assets upon seizing control; they do not conclude profit-sharing agreements with mine owners. Berman et al. 2017; Lujala, Gleditsch, and Gilmore 2005; Ross 2006. They attack if the spoils exceed the cost of attacking.

26. Rothgeb 1991. Robertson and Teitelbaum 2011, by contrast, find that FDI aggregated across sectors and industrial conflict positively covary across countries.

27. Global Data 2015; Intierra RMG 2015; SNL Financial 2015.

Africa Database (SCAD); the Global Database of Events, Language and Tone (GDELT); and the Integrated Crisis Early Warning System (ICEWS). I discuss the construction and limitations of these and other data sets in Appendix F. To conserve space, I focus on results using the widely cited ACLED data in the body of the paper.[28] I replicate the paper's main results across the four data sets (Appendix D).

I merge data on mines and protests using a spatial grid with cells that measure 5 × 5 kilometers at the equator. Within relatively small grid cells (25 square kilometers is smaller than the median city size across Africa), I can more confidently attribute changes in social conflict to nearby mining activity.[29]

To recover the effect of mining activity on social conflict, I employ a difference-in-differences design. I compare the change in the probability of protest after mining in areas that receive projects to the change in areas that do not host new projects. I estimate this difference-in-differences using a panel model with cell (α_i) and year (δ_t) fixed effects, and a indicator (D_{it}) for whether a cell contains an active (i.e., producing) mine in a given year:

$$y_{it} = \alpha_i + \delta_t + \beta D_{it} + \varepsilon_{it} \tag{1}$$

I use an indicator for social conflict as the outcome: for the ACLED data, the dependent variable captures whether a protest or riot occurred in cell i in year t.[30] I cluster the standard errors on cell, but my inferences are robust to clustering on larger geographic units, including country.

In Table 1, I find that the probability of protests or riots more than doubles after mining relative to the baseline probability of social conflict in those same cells. (The effect is orders of magnitude larger than the overall sample mean.) The levels alone are telling: in 2012 the probability of a protest across African cities with populations between 10,000 and 100,000 was 3.7 percent. By contrast, the median population in mining cells was less than 600 people yet the probability of protest was 4.2 percent.

In models 2 and 3, I modify equation 1 to demonstrate robustness. Model 2 includes country × year fixed effects, absorbing any country-specific shocks (e.g., national elections or currency fluctuations). Model 3 includes cell × period fixed effects, where periods are defined as the three six-year intervals in the study period. While I cannot estimate unit-specific time trends for this many cells, this model flexibly accounts for cell-specific temporal variation. The estimates just miss conventional significance cutoffs and should ameliorate concerns about cell--specific confounds that do not rapidly change within localities (e.g., slower-moving demographic variables).

28. Raleigh, Linke, and Dowd 2014.

29. As a point of comparison, the commonly used PRIO grid uses cells that are 3,025 square kilometers at the equator; the entire US contains roughly 19,300 incorporated places (e.g., cities and towns) and 4,900 PRIO cells.

30. I sometimes refer to these events simply as protests; according to ACLED, riots are just a subset of protests involving violence.

TABLE 1. *Effect of mining activity on the Pr(protest or riot)*

	Dependent variable:						
	1 (Protest or Riot)						
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
D_{it}	0.01**	0.01**	0.004	0.01**	0.01**		
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)		
P_{it} (Placebo)						0.002	0.001
						(0.001)	(0.002)
Cell FEs	1,500,538	1,500,538		65,994	18,763	1,500,189	18,414
Cell-Period FEs			4,501,614				
Year FEs	18		18				
Country-Year FEs		1,008				1,008	
Area-Year FEs				18,864	18,864		18,864
Mean(y_{it})	0.0003	0.0003	0.0003	0.0023	0.0035	0.0003	0.0025
Sample	Full	Full	Full	Border ≤ 5	Border ≤ 2	Full	Border ≤ 2
Observations	27,009,684	27,009,684	27,009,684	2,273,094	471,402	26,997,974	443,971

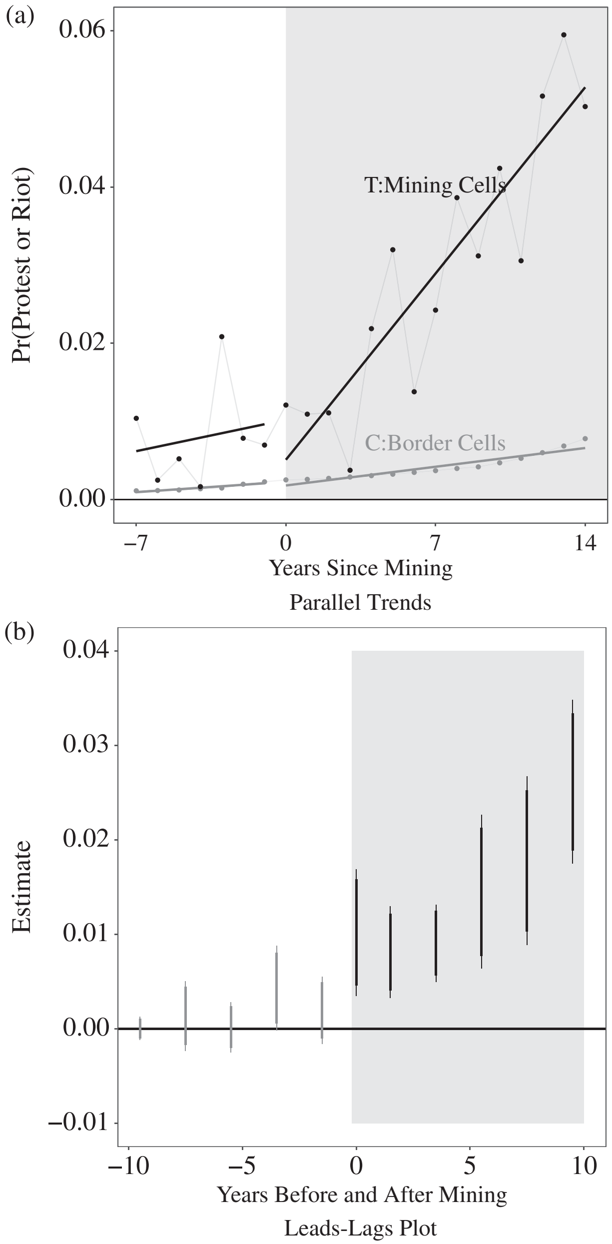
Notes: Robust standard errors clustered on cell; *$p < .10$; **$p < .05$. Models 1–7: linear probability models per equation 1. The unit of analysis is the grid cell-year. Models 4–5, 7: see Figure 3 for how border areas are defined. Models 6–7: P_{it} is a placebo indicator that turns on for a five-year period prior to mining. Data on mining fromIntierraRMG, SNL Metals and Mining, and Mining eTrack databases; outcome data from ACLED (see Appendix F).

Models 4 and 5 restrict the control sample to areas that border mining cells (concentric squares as defined in Figure 3(a)) and thus likely contain ethnically similar populations exposed to common local economic trends (had mining never occurred). Model 5, for example, contains only cells that fall in the first two border regions, that is, within fifteen kilometers of a mine. These models include area × year fixed effects, which absorb any shocks that affect a mine and its associated border area. Across these different model specifications, the difference-in-differences estimates remain consistent in magnitude and significant.

An identifying assumption for the difference-in-differences is that protest trends would have been parallel in mining and control cells in the absence of mining.[31] While this assumption is untestable, it seems unlikely that companies are selecting into those communities experiencing escalating conflict. Rather, if companies try to minimize political risk, they should seek out relatively docile communities, a selection process that pushes toward a null finding.

A data-driven approach for assessing the parallel-trends assumption looks at pretreatment trends. If treatment and control areas follow the same trajectory

31. I am not assuming the as-if random assignment of mines; mines are obviously endogenous to the presence and accessibility of minerals. However, these differences—and any other time-invariant characteristics of localities—will be absorbed by the cell fixed effects.



Notes: (a) is an event-study plot that displays the probability of protest in the years before and after mining. The control group (gray) are cells in the first two border areas (i.e., within 15 kilometers of a mine); (b) displays the point estimates and 95% (and thicker 90%) confidence intervals for five two-year leads and lags of the treatment indicator.

FIGURE 2. *Social conflict trends in mining and control areas*

immediately prior to mines starting, this suggests that treated localities are not undergoing changes unrelated to mining (e.g., urbanization) that also increase their likelihood of protest. Figure 2 offers two ways of seeing that the likelihood of social conflict is not increasing at a greater rate in treated cells prior to mining. First, the event-study plot (left) shows that mining areas and their immediately bordering cells follow roughly similar linear trends in the seven years prior to mining. Only after mining starts do we see a large increase in the probability of protest in mining cells. Second, I estimate the change in the likelihood of protests or riots in mining and control areas in the ten years before and after mining starts. More technically, I plot (right) the 95 percent (and thicker 90 percent) confidence intervals for five (two-year) leads and lags of the treatment indicator.[32] Again, I find no evidence of anticipatory effects, bolstering the parallel trends assumption. Finally, in the last two columns of Table 1, I report null results from "placebo tests" that recode treatment as the five-year period prior to the initiation of mining.[33] These checks all suggest that firms do not select into areas with escalating levels of social conflict.

Is the Result Caused by Reporting Bias?

One concern with these results might be that mining invites more media attention, increasing the likelihood that conflicts receive coverage and, thus, appear in the ACLED data.[34] Four pieces of evidence cast doubt on reporting bias as an explanation for the findings I present. First, using the GDELT data, another event data set that records social conflicts, I calculate the average number of stories written about protests and the average number of media sources covering protests in each cell-year. Estimating equation 1 using these measures of media coverage as dependent variables, I find no increase in reporting resources with the start of mining (see Table A.5). When protests occur they are not mentioned in more articles or covered by more sources if they occur in the vicinity of active projects. Second, it seems unlikely that media sources covering mining areas would not also report on events that occur in immediately surrounding border areas. In model 5 of Table 1, I restrict the control sample to cells within fifteen kilometers of mining cells and include area × year fixed effects. For reporting bias to confound this result, reporters would have to reallocate attention to protests in mining cells after production starts while simultaneously ignoring social conflicts that occur less than ten miles from

32. Autor 2003.

33. If a grid cell i receives a mine at time t, I code P_{it} as 1 for $t-6$ to $t-2$ (and missing thereafter). I then substitute P_{it} for D_{it} and reestimate the difference-in-differences.

34. ACLED data are not only based on media, but incorporate three types of sources: "(1) more information from local, regional, national and continental media is reviewed daily; (2) consistent NGO reports are used to supplement media reporting in hard to access cases; (3) Africa-focused news reports and analyses are integrated to supplement daily media reporting." Raleigh, Linke, and Dowd 2014, 17.

those same places. Third, I find no increase in armed conflicts recorded in ACLED. The upward bias implied by differential reporting is not apparent for other types of conflict in the ACLED data. Finally, the start of mining is typically proceeded by years of exploration activity (e.g., drilling and feasibility studies) and construction. If media attention increases with the announcement of a large investment, then that spike in interest occurs in the period prior to my treatment. Yet, Figure 2(b) does not indicate the anticipation effects implied by such a story. While media-sourced event data always warrant caution, the ancillary data on reporting resources and the research design limit concerns about reporting bias.

Do New Mines Raise the Probability of Armed Conflict?

Existing work on natural resources and conflict focuses not on protest or riots, but rather on armed conflict and rebellion.[35] These papers offer a compelling logic: mines, particularly during periods of high prices, represent an attractive source of income for rebels and their campaigns.

Using a design and data similar to this paper, Berman and colleagues find that mineral price increases are associated with more conflict events in Africa between 1997 and 2010.[36] The authors do not insist on a particular mechanism, offering a more qualified conclusion: "It is likely that mineral extraction relaxes the financing constraints of rebels, because armed groups can sell minerals illicitly on the black market."[37] In line with past research, they suggest that battles around mining sites likely represent attempts by rebel groups to seize or extort mines and use these operations to sustain or intensify their insurgencies.[38]

While Berman and colleagues focus on rebellion,[39] their dependent variable often includes different types of conflicts involving actors that are not associated with rebel groups.[40] According to ACLED data, "rebel forces" are only involved in 26 percent of all events: 52 percent of battles, less than 20 percent of events involving violence against civilians, and less than 0.1 percent of protests and riots. Across all the cells with active mines in my data from 1997 to 2014, I count sixty-seven events involving rebels forces and these take place in just seven cells. A recent quote from the CEO of

35. Berman et al. 2017; Collier and Hoeffler 2004; Dube and Vargas 2013.

36. Berman et al. 2017. The data used by Berman et al. differ in several respects: they rely on the IntierraRMG database, which includes only a subset of the projects in my sample; they omit more recent years in the ACLED time-series; they include prices for only fourteen minerals; and they perform their analysis at a much lower spatial resolution, cells that measure 55 x 55 km^2 at the equator.

37. Ibid., 1601.

38. Ibid., 1566.

39. The authors reiterate the mechanisms reviewed in Bazzi and Blattman 2014, a paper concerned with civil wars and coups.

40. ACLED event types include: (1) battle, no change of territory; (2) battle, nonstate actors overtake territory; (3) battle, government regains territory; (4) headquarters or base established; (5) nonviolent activity by a conflict actor; (6) riots/protests; (7) violence against civilians; (8) nonviolent transfer of territory; (9) remote violence. Raleigh, Linke, and Dowd 2014, 7–8.

Randgold, a major mining company, echoes this descriptive finding: despite the civil war in Ivory Coast, coup in Mali, and rebellions in the Democratic Republic of Congo, he says, "we've lived through them all. We've never—touch wood—had to stop operations."[41]

More systematically, when I estimate equation 1 using an indicator for events involving rebels, I find no effect of mining (see Table A.1). I find a very small increase in the likelihood of battles in some models—considerably smaller than comparable panel results reported in Berman and colleagues' Table A.4 (model 4).[42] I also replicate these null findings using the Uppsala Conflict Data Program's (UCDP) Georeferenced Event Data.[43] An event in the UCDP data involves "the use of armed force by an organized actor against another organized actor, or against civilians, resulting in at least one direct death."[44] Whether I look at all events or just those involving at least twenty-five battle deaths, I estimate precise null results (see Table A.3).

It could be that armed-conflict events, as opposed to protests, occur slightly further from mining areas; by conducting my analysis at a finer spatial resolution, I could be missing battles slightly further from mine locations. To address this concern, I separately estimate the effects of mining on protests and riots, battles, and rebel events in the cell that contains the mine, as well as in the surrounding border areas. More technically, I estimate the difference-in-differences for six separate treatment groups, each defined by their proximity to an active mining project (see Figure 3(a)). If $k \in \{0, 1, \ldots, 5\}$ indexes border areas (where $k = 0$ is the actual cell containing the mine), I define D_{it}^k as an indicator for whether cell i falls in area k and borders an *active* mine. I estimate:

$$y_{it} = \alpha_i + \delta_t + \sum_{k=0}^{5} \beta_k D_{it}^k + \varepsilon_{it} \tag{2}$$

I then plot the estimates ($\widehat{\beta}$) and associated confidence intervals for the three types of conflict in Figure 3(b).

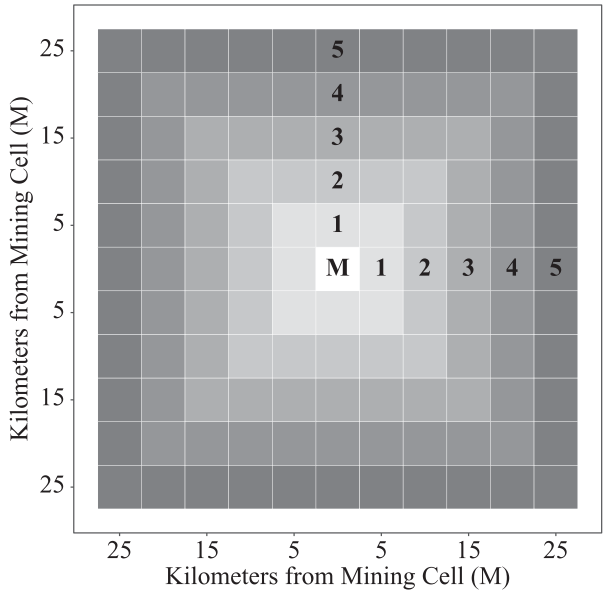
The start of mining does not increase the probability of rebel activity in the community hosting the mine or in border areas. There is a slight (insignificant) effect on the probability of a battle in the cell that contains the mine, but no indication of such conflicts increasing in surrounding areas. In sharp contrast, we see a significant increase in protests and riots both in the cell that contains the mine, as well as in the immediately surrounding border area. This effect decays with distance: once

41. Thomas Biesheuvel and Kevin Crowley, "Miners Work Through Civil Wars for Africa Gold Boom," *Bloomberg*, 3 November 2015.

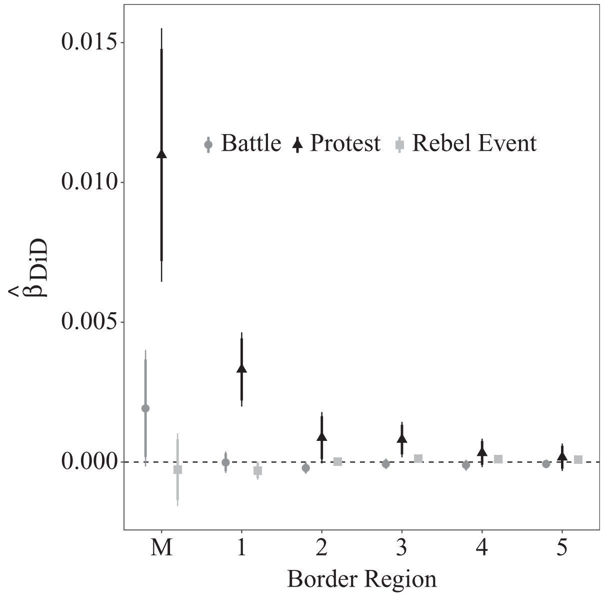
42. These positive results shift with the exclusion of a few countries. Algeria, Côte d'Ivoire, and Tanzania collectively account for only 5 percent of cell-years with active mines. Dropping any two of these countries halves the result in Table A.1 model 1, which loses significance; excluding all three attenuates the effect by an order of magnitude.

43. Melander and Sundberg 2012.

44. Ibid.



Defining Border Areas



Effects of Mining on Social vs. Armed Conflict

Notes: (a) defines border areas; (b) displays the estimates and 95% confidence intervals from equation for different conflict outcomes: protests or riots (black), battles (medium gray), rebel events (lightest gray).

FIGURE 3. *Contrasting effects of mining on social and armed conflict*

we move ten or more kilometers beyond the mining cell, the estimates approach zero, though they remain positively signed. This last finding suggests that geographic spillover attenuates my estimates in Table 1; there is no indication that protesters are simply moving their demonstrations from nearby towns to mining sites.[45]

Separating rebel activity from protests clarifies the type of conflicts confronting commercial mines. I find no evidence that rebel groups attempt to forcibly seize these operations.[46] Yet, this does not imply that mining never contributes to armed conflict: work in Colombia on the FARC's illegal gold mining or on illegal coltan mining by rebels in the Democratic Republic of the Congo demonstrates that some insurgent groups depend on revenues from small-scale mining.[47] It may just be that how natural resources are produced conditions the extent to which mining generates armed conflict: while rebels fight for control of artisanal diamond pits, seizing and operating a commercial kimberlite mine may not represent a viable strategy for the same groups.[48] These contrasting findings call for research into variables, such as production scale, that condition the severity of the "resource curse."

When Do Mining Projects Cause Social Conflict?

This first set of results averages across sites and over the life of mines. Before considering why these conflicts occur, I first describe what types of companies are more likely to face protests and evaluate how this propensity changes with commodity prices. While this heterogeneity does not confirm a particular mechanism, it does help to winnow the set of plausible stories: if (as I find) protests increase with commodity prices, then it seems unlikely that these conflicts reflect anger about layoffs and imminent mine closures.

Do Owners' Characteristics Moderate the Effect on Social Conflict?

Companies from Australia, Canada, South Africa, the UK, and US account for the bulk of mining investments. According to data from SNL Metals and Mining, companies from those five countries own over 75 percent of projects. Owners hailing from one of these countries are represented (i.e., own any share of a project) in over 65 percent of mining cell-years.[49]

While the Chinese own a comparatively small stake—less than 2 percent of all projects with ownership information in the SNL data—they have received special

45. This analysis also alleviates concerns about my choice of grid size; doubling the dimensions of the grid cells only increases the coefficient estimates.

46. Dube and Vargas 2013 describe rebels in Colombia kidnapping politicians and attempting to raid government coffers. This violence could occur in provincial capitals, far from the mine site.

47. De la Sierra 2014; Jamasmie 2013.

48. See Ross 2004 on the "lootability" of different minerals.

49. Owners' country of origin is missing for 9 percent of treated observations.

attention. Journalistic accounts have described a "clash of cultures" between Chinese investors and their employees, which have led to a proliferation of conflicts in Chinese mines.[50] Haglund's case study of Zambia articulates a concern that has motivated a burgeoning literature on Chinese investments in Africa: "certain corporate governance features prevalent among Chinese investors," he argues, "combined with the already weak regulatory frameworks of many African countries, risk undermining host country regulation and by extension sustainable development."[51] These concerns are not confined to Chinese-owned mines: a number of owners are headquartered in countries like the British Virgin Islands and Bermuda, which are known less for their mining sectors than their lax business regulations.

Table A.6 first explores (models 1 and 2) whether we see a heightened probability of protest in mining cells where a project is partially owned by a Chinese company.[52] While the sign on the interaction term is positive, the coefficient is both substantively small and cannot be distinguished from zero. This is not a well-powered test given Chinese companies' relatively small stake in African mining operations. That said, this small share serves to qualify claims about the scope of potential problems related to Chinese mines. Second, I see no indication that mining cells with owners based in tax havens experience a larger uptick in social conflict (models 3 and 4).[53] If owners based in China or tax havens have distinct corporate governance practices, these do not seem to exacerbate the likelihood of protests after mining starts. It could still be the case that such companies select into more conflictual business environments. Even so, different risk profiles do not imply that their business practices exacerbate protest activity.

Finally, I find that partial government ownership within a mining cell (which occurs in under 20 percent of treated observations) eliminates the effect of mining starts on protest (models 5 and 6).[54] While it is tempting to conclude that exclusively foreign investment provokes conflict, this heterogeneity does not permit a clear interpretation: government may invest in only the most lucrative projects (and thus be able to buy off would-be protesters) or may be protected by the repressive capacity of the state.[55] Steinberg, for example, develops a formal model where governments threaten repression to protect mines and thus maintain streams of royalty and tax revenues. It

50. Okeowo 2013.

51. See Brautigam 2009, chapter 11 for a broader, more auspicious overview.

52. By construction, it is not possible for $1(\text{China})_{it}$, $1(\text{TaxHaven})_{it}$, or $1(\text{Government})_{it}$ to be 1 when D_{it} is 0. Thus, this term is not separately estimated.

53. I classify the following countries as tax havens: Bahamas, Barbados, Bermuda, British Virgin Islands, Cayman Islands, Cyprus, Ireland, Luxembourg, Netherlands, Netherlands Antilles, Singapore, Switzerland.

54. Government ownership is coded using company names, which are available for a smaller number of mines than information on owners' country of origin. Hence, the smaller number of observations in models 5 and 6.

55. This finding comports with Berman et al. 2017, who find that the impact of commodity prices on ACLED conflicts attenuates with the share of domestically owned public firms in an area.

seems plausible that an ownership stake would only amplify governments' concerns about protests interrupting production.[56]

Do Changes in Commodity Prices Affect Social Conflict?

In addition to bolstering the parallel-trends assumption, Figure 2 indicates that the probability of protest varies over the life of a mine. Figure 2 suggests that exploration and construction activities (and the associated inflow of workers) that precede the start of actual mining do not increase the likelihood of protests. Moreover, conflict is not concentrated in the first years of production, suggesting that retrenchment to steady-state employment levels—mines typically require much larger workforces during their construction phases—is not the principal cause of disputes.

One measurable, and plausibly exogenous, variable that changes over the course of operations is the world price of the mineral being mined. To explore the relationship between price changes and protest, I compile real unit prices for over ninety unique minerals from the World Bank, US Geologic Survey, and US Energy Information Administration up to 2013. As is apparent in Figure 4(a), the prices of several commodities increased dramatically between 1990 and 2013: iron and gold tripled, and platinum more than doubled. Yet, this commodity boom or "super cycle" was not uniform across commodities: bauxite, cobalt, gemstones, and zinc all declined in real value.

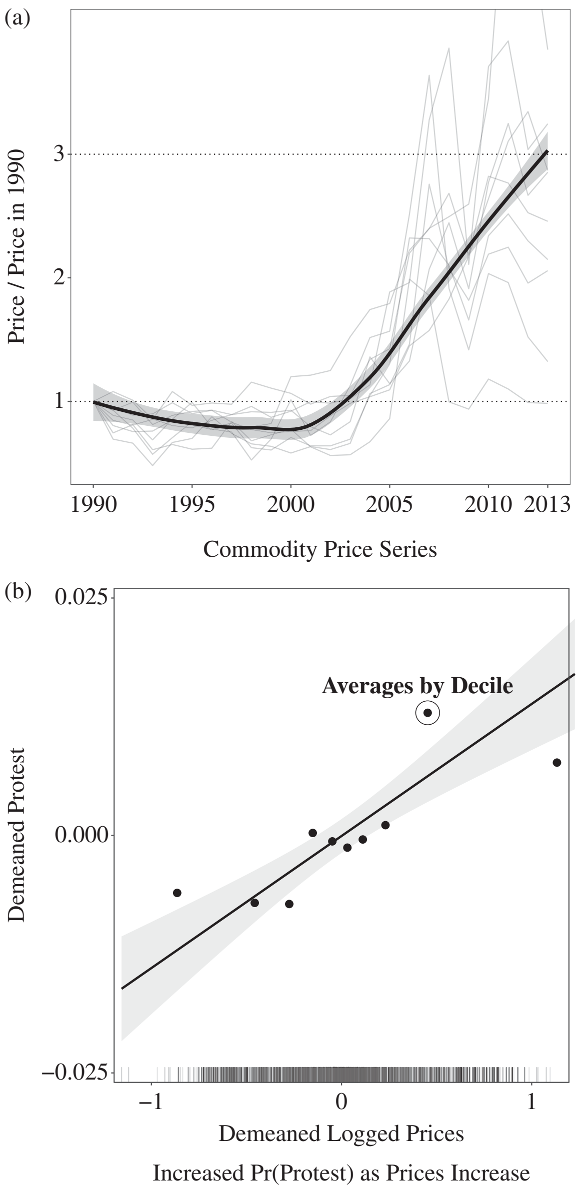
I exploit this variation, comparing changes in the likelihood of protest in mining areas differentially affected by price increases during the commodity boom. I start by simply plotting the relationship between prices and protests within mining areas after de-meaning both measures. Figure 4(b) displays both the bivariate linear relationship between de-meaned prices and protest, as well as the average change in protest (relative to the mean) for each decile of de-meaned prices. Above-average commodity prices correspond to above-average levels of protest.

While suggestive, this relationship could be confounded by unrelated upward trends in both prices and protest. To address this potential confound, I estimate the following difference-in-differences:

$$y_{it} = \alpha_i + \delta_t + \beta \log(\text{Price}_{it}) + \varepsilon_{it} \tag{3}$$

where i indexes cells and t year. While mines are regarded as price-takers, in robustness checks I also lag the price measure by a year to ameliorate concerns that the results are driven by protests affecting the world supply of a mineral (see Table A.4). I cluster the standard errors on cell, but clustering on country or commodity does not affect my inferences.

56. Steinberg 2015.



Notes: (a) displays mineral price series (indexed to 1990 values) from the World Bank from 1990-2013. The thicker loess smoother is weighted by the total number of cell-years producing each mineral. (b) estimates the bivariate, linear relationship between prices (logged) and protest after demeaning each variable at the cell-level. The raw data are also averaged by decile and plotted as points. The rug plot along the x-axis indicates the distribution of demeaned logged prices.

FIGURE 4. *Pr (protest or riot) increases with mineral prices*

TABLE 2. *Effect of world mineral prices on the Pr(protest or riot)*

	Dependent variable					
	1 (Protest or Riot)					
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
$\log(\text{Price})_{it}$	0.010*	0.018**	0.008*	0.011	0.012**	0.011**
	(0.005)	(0.007)	(0.005)	(0.007)	(0.004)	(0.004)
Cell FEs	940	940	284	284	1,499,840	1,499,840
Year FEs	17		17		17	
Country-Year FEs		608		532		952
$\text{Mean}(y_{it})$	0.0133	0.0133	0.0099	0.0099	0.0002	0.0002
Mining Cell-Years Only	✓	✓	✓	✓		
$\text{Var}(D_{it}) = 0$			✓	✓	✓	✓
Observations	8,776	8,776	4,851	4,851	25,497,303	25,497,303

Notes: Robust standard errors clustered on cell; *$p < .10$; **$p < .05$. Models 1–6: linear probability models per equation 3. Models 1–4: sample only includes cell-years with active mines. Models 3–6: sample restricted to cells with no change in mining status (D_{it}) from 1997–2013. Models 5–6: sample includes non mining cells, imputing a price of zero to those areas. Commodity prices compiled from the World Bank, USGS, and US EIA; outcome data from ACLED (see Appendix F).

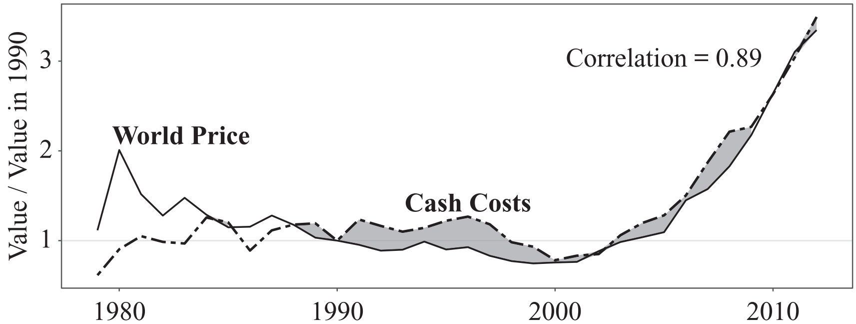
I find in Table A.2 that rising commodity prices raise the likelihood of protest. Between 1997 and 2007, the price of gold increased by almost one log point; the coefficient in model 1 implies that price change would roughly double the average probability of protest in mining cells. The estimated effect is relatively stable using different specifications and samples: even-numbered models include country-year fixed effects; models 3 to 6 restrict attention to cells that see no change in their mining status (D_{it}) between 1997 and 2013; models 5 to 6 impute a price of zero to nonmining cells, which increases the precision of the estimates. These findings align with recent results from Berman and colleagues in Africa, as well as from Kopas and Urpaleinen in Brazil and Sexton in Peru.[57] In Appendix A, I replicate this analysis using indicators for battles or rebel events as outcomes and find no effect of commodity prices on armed conflict.

Looking at this finding, one is tempted to conclude that protesters strike when the iron is hot, holding up mining projects when they are most profitable. Yet, this intuition is misleading. If firms and communities bargain with complete information (as in the earlier game), simply changing the size of the surplus has no effect on the likelihood of protest (i.e., costly delay). In fact, the parties should be especially keen to avoid work stoppages given the rising opportunity cost of shutting down a project as prices surge.

More surprising, it simply was not the case that companies' profits increased in lock-step with commodity prices during the boom. While headlines focused on

57. Berman et al. 2017; Kopas and Urpaleinen 2016; Sexton 2018.

record prices during the super cycle, industry analysts noted a "growing disconnect" between prices and mining projects' performance. In their 2011 annual report, PricewaterhouseCoopers (PwC) observed that "over the last five years mining stocks have underperformed the prices of the major mining commodities, a trend which accelerated in 2011."[58] The 2012 report echoed this analysis: "in recent years, gold equities declined despite steady gold price increases … Gross margins plummet[ed] from 49 percent [in 2010] to 29 percent [in 2012]. At the end of the day, while high gold prices are generally good news for gold miners, margins matter even more."[59]



Notes: The time-series plot presents both the world price and cash costs of cold mining indexed to 1990 values. The price data come from the World Bank; data on cash costs were compiled by Christie 2013. The gray-shaded areas indicate periods when *indexed* cash costs exceeded the world price.

FIGURE 5. *Correlation between prices and cost in gold mining*

Why were profits not increasing at the same rate as commodity prices? First, shortages of skilled labor and specialized equipment raised input costs. According to Accenture, "the costs of mining operations have increased considerably faster than the Consumer Price Index over the last ten years. This is in large measure an outcome from the boom years when supply constraints resulted in increased input prices."[60] Figure 5 illustrates the striking correlation ($\rho = 0.89$) between the price of gold and the cash costs of gold mining (both indexed to their 1990 values). The World Gold Council actually proposed changing the industry convention for how they report costs, fearing that reporting cash costs "had aggravated matters by making the gold industry appear more profitable than was actually the case."[61] Second, in an effort to meet rising demand (largely from China and India), companies

58. PwC 2012, 4.
59. PwC 2013, 11.
60. Accenture 2011, 15.
61. Humphreys 2015, 169. Cash costs exclude capital expenditure, exploration, corporate costs, and cash taxes.

drilled deeper and exploited less productive deposits. “When commodity prices picked up three years ago, the industry rushed to bring capacity online … Head grades have fallen, mines have deepened, and new deposits are in riskier countries … Moderate price increases will not be enough to claw back lost margin.”[62] Cost increases and productivity declines in the sector placed downward pressure on profits—an accounting detail that was rarely reported alongside news of steadily rising commodity prices, a common topic in communities that depend on mining.

For both theoretical and empirical reasons, rising profitability seems an unlikely explanation for protests. What then explains why mining sparks protest, and why the likelihood of such social conflicts increases with commodity prices?

What Mechanisms Help Explain Mining-Related Protests?

Many explanations of social conflict focus on grievances, a catch-all term that includes different sources of discontent: economic and status inequality, real or perceived injustices, or unsatisfied policy demands (see Shadmehr for a recent review and formal rationalization of grievance-based accounts).[63] In work focused on the relationship between natural resources and conflict, grievance-based accounts focus on environmental harm[64] and, to a lesser extent, displacement,[65] inequality,[66] and governance.[67] Much of the work to date has focused on Latin America (principally, Peru). I look for evidence that one or more of these sources of discontent account for the protests observed around new mining projects in Africa, especially during periods of high prices. This analysis is descriptive: the moderators used here do not exogenously vary; other (omitted) variables correlated with these moderators could account for the reported heterogeneity (or lack thereof).

Finding little empirical support for these grievance-based accounts, I develop an alternative explanation related to incomplete information—a well-known source of bargaining failures and common explanation for strikes in other industrial settings[68] and inter- and intra-state conflict.[69] Both qualitative accounts and evidence on the effects of transparency initiatives suggest that informational problems contribute to protest.

62. PwC 2012, 12.

63. The model in Shadmehr 2014 implies that protest does not monotonically increase with grievances as often argued. Rather, he predicts a U-shaped relationship between grievances and mobilization.

64. Bebbington and Williams 2008; Kopas and Urpaleinen 2016; Sexton 2018.

65. Bebbington et al. 2008.

66. Collier and Hoeffler 2002.

67. Bebbington et al. 2008, 892.

68. Card 1990; Tracy 1987.

69. Fearon 1995; Walter 2009.

Environmental Hazards

Mining can degrade the environment of host communities, both by polluting water and soil or straining already-scarce water resources. Several works have argued that these environmental harms motivate protest activity around mining sites. In the well-studied case of Peru, Sexton argues that protest results from the failure to mitigate pollution around commercial mines; Bebbington and Williams note that communities worry about the effects of mining on both water quality and supply.[70] These arguments suggest that mining-related protests should be particularly likely in host communities with a heightened risk of environmental hazards.

I compile several additional data sets to evaluate this mechanism. First, I code whether or not active projects in a cell-year use surface mining methods, which are widely perceived to pose a greater environmental risk. Evans and Kemp observe that "large-scale open-pit and strip mines can result in more visible manifestations of mining activity in the form of spoil piles and waste dumps and can be more disruptive to other land uses such as agriculture. Underground mines generally employ more selective mining methods and produce less waste."[71] Second, I measure the great-circle distance between each cell and the closest environmentally protected area according to the World Database on Protected Areas (WDPA).[72] According to the WDPA, African countries contain over 6,000 designated, terrestrial protected areas, covering over 370 million square kilometers.[73] Third, I spatially merge cross-sectional information from the World Resource Institute's Aqueduct Global Maps on "baseline water stress," which measures total annual water withdrawals as a percentage of the total available flow.[74] Higher values indicate greater competition for water among users. Finally, I incorporate country-year indicators of environmental quality from the Environmental Performance Index (EPI).[75] I focus on environmental risk exposure, a summary measure of the health burden of environmental risk factors (e.g., unsafe water, air pollution).[76]

In Table A.7, I interact these measures with my indicator for whether a cell-year contains an active mine (D_{it}).[77] Across all of these measures of environmental risk or scarcity, I do not find evidence to suggest that environmental concerns

70. Bebbington and Williams 2008; Sexton 2018. In Steinberg's model, environmental externalities affect the amount of compensation communities demand from firms; protest, however, results because of an informational problem (2015, 1513).

71. Evans and Kemp 2011, 1771.

72. Compiled by the United Nations' World Conservation Monitoring Centre, the WDPA is "the most comprehensive global database of marine and terrestrial protected areas." UNEP-WCMC 2016, 6.

73. This calculation subsets to designated protected areas that are state- or expert verified. I do not subset when performing the minimum distance calculation, though doing so is inconsequential for the results.

74. Gassert et al. 2014, 8.

75. Hsu 2016.

76. This measure is available in 1990, 1995, 2000, 2005, 2010, and 2013. I impute the most recent past measure of this variable for intervening country-years.

77. With the exception of environmental risk exposure (which varies by country-year), the measures are not time varying; thus, the direct effects are absorbed by the cell fixed-effects.

systematically increase the likelihood that mining generates protest. Surface mines, mines near protected areas, or those in areas with high levels of water competition do not account for the first set of results. The only marginally significant interactions point in the wrong direction: the probability of protest increases *less* when mining occurs in country contexts with greater environmental health hazards.

Perhaps these environmental concerns are especially salient during periods of high prices when mines look to enlarge their footprints. Yet, interacting commodity prices (logged) with these moderators tells the same story: these measures of environmental risk or scarcity do not amplify the effect of prices on social conflict in mining areas (see Table A.8).

In-migration and Displacement

Seeking jobs in the mine, migrants may flock to host communities, and these inflows could be especially large during periods of high prices. Long-time residents may resent these new arrivals, and such anger can boil over into protest.[78]

To assess this explanation, I combine over 800,000 household surveys from over seventy Demographic and Health Surveys (DHS) conducted in thirty sub-Saharan African countries that include geo-coordinates for the survey locations. I follow the approach of Kotsadam and Tolonen to spatially merge the DHS, mining, and protest data: first, I construct circular buffers around each active mine (using radii of ten or twenty kilometers); second, if a survey location (or protest) falls within a mine's buffer, then I associate the respondents at that location (or protest) with that mine.[79] This generates repeated cross-sections at the mine level; I amend equations 1 and 3 to analyze these data, substituting mine fixed effects for the grid cell indicators.

In Table A.9, I first estimate the effect of mining or rising prices on the proportion of households that report having ever moved.[80] I then look at whether this proportion appears to increase with mining or rising commodity prices. Using both the ten- and twenty-kilometer buffers, I find no compelling evidence that more households report having moved after mining starts or as prices increase. Table A.10 then regresses an indicator for whether a protest or riot occurred near a mine (i.e., within its buffer) on the proportion of households that report having moved. Changes in mobility (as measured in the DHS) have no discernible effect on the likelihood of protest in areas around mines. Figure 2 foreshadowed this result: much of the migration to mining areas occurs prior to the start of mining when we see no uptick in protest.[81]

78. The mining sector in South Africa has been anecdotally linked to xenophobic violence. Jamasmie 2015. However, the prevailing narrative suggests that such violence has been exacerbated by *falling* commodity prices and cutbacks in employment, which generates more competition between local and foreign workers.

79. Kotsadam and Tolonen 2013.

80. This is the only measure of migration in the DHS and is available for only a subset of survey waves.

81. Labor demand at mining sites peaks during the site design and construction phases that immediately precede production (International Council on Mining & Metals, Oxford Policy Management, and Raw Materials Group 2014, 7).

Why is there no relationship between in-migration and protest? Anger and violence directed at migrants might take the form of targeted harassment (e.g., assaults and vandalism) rather than public protests. Of all riots and protests in the ACLED data, less than 0.1 percent mention the words *xenophobia*, *immigrant*, or *migrant*. According to the DHS, there does not appear to be a material basis for such resentment: in areas with active mines, households that report having moved—or moved after mining starts—do not appear wealthier (based on their household assets) than permanent residents (see Table A.10).

Bebbington and colleagues' qualitative work focuses on grievances related to displacement and dispossession: "resistance is understood as a defense of livelihood."[82] While these authors conceptualize dispossession quite broadly,[83] commercial mines can directly threaten the livelihoods of artisanal miners who are unable to dig in concession areas. Protests or riots could then reflect discontent among these smaller-scale miners. If true, we would expect the increase in protest to be concentrated around mines producing commodities that can also be mined artisanally. Across sub-Saharan Africa, gold and diamonds represent the largest subsectors of artisanal mining. Yet, dropping commercial gold and diamond mines from the sample does not affect the difference-in-differences estimates from Table 1. The timing of protests over the life of the mine is also difficult to reconcile with this explanation: artisanal miners are typically displaced in advance of mining; companies establish and police the perimeters of their sites during earlier exploration or construction phases.

Inequality

Motivated by Gurr's notion of "relative deprivation," many scholars have used inequality as a measure of grievances.[84] In seminal work on the topic of natural resources and armed conflict, Collier and Hoeffler observe that "a high degree of economic inequality is therefore some indication that the poor are atypically marginalized."[85] The onset of mining or rising prices may enrich some households (e.g., workers or local authorities) while delivering relatively little to others. This increased inequality could produce grievances related to inequality and, consequently, protests.

I use information on household assets from DHS surveys and the procedure outlined by McKenzie to construct a measure of inequality for each mining area for every year in which DHS data are available.[86] McKenzie demonstrates that this provides a good proxy for inequality in living standards.

82. Bebbington et al. 2008.

83. These authors write, "[movements] emerge to contest patterns of resource control and access, and to challenge the institutions, structures, and discourses that determine the social distribution of assets, as well as their relative productivity, security and reproducibility." Ibid., 2890.

84. Gurr 1971.

85. Collier and Hoeffler 2004, 13.

86. McKenzie 2005, 7–8. I take the first principal component of household assets, compute the standard deviation for each mine, and divide by the standard deviation for the full sample.

The results in Tables A.12 and A.14 suggest that mining and rising commodity prices do not exacerbate economic inequality. And I cannot reject the null hypothesis that increased inequality has no effect on the likelihood of protest (see Table A.13). This result echoes a large set of null results, including that of Collier and Hoeffler (albeit for a different measure of conflict). Shadmehr observes that "a decade-long academic debate concluded that higher grievances (in particular, more income inequality) do not translate into more violence."[87] These results offer further support for that conclusion.

Governance

Citizens may believe that mining only enriches local officials, and anger about bribes or other forms of rent seeking could boil over into protests.[88] A recent paper by Knutsen and colleagues geocodes data on perceptions of corruption from the Afrobarometer.[89] Using an empirical design similar to my own analysis of the DHS data, they do not find that the onset of mining significantly increases reports of bribes for permits or perceptions of local corruption among respondents that live within fifty kilometers of a mine (see Table 2, where these authors include mine fixed-effects).[90] The authors do find evidence that bribes to police increase; officers, they argue, take advantage of increased economic activity to extract more bribes. Given that perceptions of corruption do not increase after mining, it seems unlikely that anger about rent seeking by local officials would motivate protests.[91]

Can Informational Problems Help Explain These Conflicts?

In contrast to these grievance-based accounts, labor economists have argued that industrial conflicts—protests or strikes that result in work stoppages—can result from bargaining failure caused by incomplete information.[92] And this logic has been offered by political scientists as a rationale for interstate and civil conflicts.[93] Extending the argument to this setting, if host communities are uncertain about the

87. Including the quadratic term suggested by Shadmehr's 2014 does not confirm his prediction; if anything, the coefficients suggest an inverted-U relationship between inequality and protest.

88. Recent work by Axbard, Poulsen, and Tolonen 2015 in South Africa finds that commercial mining and rising commodity prices do not exacerbate crime in mining areas—another governance problem that could mobilize residents.

89. Knutsen et al. 2016.

90. Because the Afrobarometer data used by Knutsen et al. 2016 cannot be released, I am unable to reanalyze the data to look at whether perceived corruption increases with commodity prices changes.

91. In their first table, Knutsen et al. 2016 report that perceptions of corruption significantly increase when they omit mine fixed-effects from their models. While significant, the magnitude of the effects on perceived corruption (model 3) remain quite small: 0.12 on a four-point scale or less than 10 percent of the mean of the dependent variable.

92. For a review, see Kennan and Wilson 1993.

93. Fearon 1995; Walter 2009.

returns generated by mining projects, then we are no longer assured of the amicable, first-best solution I described earlier. Rather, protests that interrupt production (i.e., costly delays) can occur in equilibrium.[94] I present a formal argument and proof of this claim in Appendix E.2.[95]

I focus here on the intuition for this theoretical result. Mining is often preceded by claims that a new project will both enrich investors and promote local economic development. Boosters hype a project's potential value both to raise capital and win entry from communities and governments. Yet, while most projects begin with this optimistic outlook, actual profitability varies dramatically: expensive and prolonged exploration can fail to discover deposits; even productive mines differ in profitability depending on ore amounts and quality, as well as production costs; global commodity prices and capital costs fluctuate. Entering negotiations, communities and workers cannot be certain where their local mine falls in this distribution of profitability. Boosters' optimistic initial claims can engender outsized and, ultimately, unmet expectations in some host communities.

How do these mismatched expectations lead to social conflict? Suppose a community overestimates a project's value and makes a demand that the company is unwilling to meet. The company could trumpet their inability to pay, but this is cheap talk: if the community takes the company at its word, then even companies with the most profitable projects would have an incentive to plead poverty to retain a larger share of surplus. Because communities cannot rely on firms to honestly disclose their margins, protests offer a strategy for separating firms with low-profit projects from those attempting to low-ball the community. This separating equilibrium exists because projects with meager margins face low opportunity costs to pausing production and would, thus, rather shut down than immediately concede to the community. Firms with more profitable projects quickly capitulate, wanting to keep production humming.[96]

Qualitative accounts provide numerous examples of this bargaining dynamic. In 2012, protests occurred in Bumbuna, Sierra Leone, a community hosting a large iron mine. Protesters were angry, believing that the project's profits had recently

94. Commitment problems have been the focus of research on the impediments to investment in states with weak property rights. Vernon 1971; Williamson 1979. Without denying that holdup problems deter investment, they do not help to rationalize protests. Firms, who are the party losing power because of the so-called "obsolescing bargain," cannot enlarge their stream of future profits by preemptively initiating conflicts.

95. The formal model extends Admati and Perry 1987, who consider a bargaining game between an incompletely informed buyer and seller, whose valuations fall in a discrete-type space.

96. Incomplete information is not necessary—and is not mentioned in past work—to explain armed conflicts in resource-rich areas. Rebels may, of course, be uncertain about how lucrative a given territory is. But this does not dramatically change their calculus: they attack if the expected spoils exceed the costs. Relative to a world with complete information, uncertainty could increase or decrease the number of attacks: if the expected spoils exceed the cost, then rebels now always attack; if the expected spoils fall below the costs of attacking, then violence abates. Given existing accounts of rebel behavior, incomplete information about mines' profitability is unlikely to improve our predictions about whether or how frequently armed conflict occurs.

increased, but that this had not translated into better wages or improved living conditions for households resettled as a result of mining.[97] This frustration is echoed in interviews for a 2014 Human Rights Watch report on the protest: "After the exploration period was over, the company went into mining and production [in 2009–2010] and told the workers that they would get more and that everything would change for the better … We came into mining and it was no better."[98] Later in the report, an employee at the mine states, "In 2011, management promised that 'when we start exporting, that's when things will change. We have to be patient; the investors don't have profits yet.' All the workers were fed up with this game."[99] Despite these beliefs among community members, the project's actual finances remained precarious: the mine's owner, African Minerals, posted an operating loss of over 225 million USD in 2012; in 2015, the company was put into receivership. The protest in Bumbuna arose because the community held exaggerated expectations about the project's profits and did not feel that their wages or development expenditure reflected a "fair" split.

Gold mines in Tanzania also became sites of conflict when skyrocketing prices generated high expectations about projects' profitability. Goldstuck and Hughes write that "the assumption that mining companies in Tanzania are making huge profits and are cash flush reinforces the public's perception that the mining sector's contribution to the economy should be greater."[100] In interviews near Barrick Gold's conflict-ridden North Mara Mine, the authors discovered "the community feels duped and deceived by the way in which the mine was established." The company that preceded Barrick made "a number of promises to community leaders, local government officials, and ministerial officials … Many of these reported promises and commitments failed to materialise."[101] Protests at the North Mara Mine, in part, reflect a belief that the community should be benefiting more given both the high price of gold and past promises about the mine's contribution to local development.

Finally, strikes in South Africa's platinum sector illustrate how rising prices can lead to conflicts over the scale of profits and how these should be split with workers. In 2014 70,000 workers halted production, demanding a more than doubling of entry-level wages. The action reflected resentment in the platinum belt about poor living conditions despite a massive increase in platinum prices. Workers cited research from Isaacs and Bowman, which argued that workers' wage demands were reasonable given platinum mines' profits over the past decade.[102] To the contrary, companies insisted that falling commodity prices and increased production costs made the proposed wage hikes unsustainable:

97. Author's interviews, May 2014. IRB Protocol #28040.
98. Human Rights Watch 2014, 39.
99. Ibid., 47.
100. Goldstuck and Hughes 2010, 13.
101. Ibid., 61.
102. Isaacs and Bowman 2014.

> None of the companies have said that the housing and living conditions or socio-economic opportunity of employees is what it could or should be … But the [union's] demand … is simply not affordable and it would be irresponsible of companies to agree … Rather than how can we better split the profits we are not making, … [let us] focus on how we can work together to … reward all our stakeholders.[103]

Workers eventually settled for a 20 percent annual increase in wages. One way to interpret this prolonged social conflict is as a costly signal by platinum companies that they could not afford workers' initial wage demands.

Disputes often center on how profits are split and whether host communities regard that as fair.[104] In their global study of prolonged instances of company-community conflicts surrounding mining projects, Davis and Frank find that "socio-economic issues, particularly the distribution of project benefits" were among the most common causes.[105] These disagreements can lead to protests when communities or workers do not know what a project is worth but have expectations that exceed what the company is currently able or willing to pay.[106] This insight is summarized in a recent report from Stevens and colleagues:

> In practice, *parties have little choice other than to negotiate contractual arrangements with incomplete knowledge and with different expectations* about project risks and future prices. Under these conditions, information asymmetries and differences in bargaining power become key determinants of contractual outcomes. *With expectations and assumptions on both sides often far apart, this creates potential tensions and disputes as the project gets under way*. (emphasis added)[107]

As communities' expectations increase about what they stand to gain from hosting a mine, so too do the demands that they put to firms. If profits fail to keep pace with these expectations, the probability of protest increases, as a larger proportion of projects would rather disrupt production than agree to more demanding terms.[108]

This explanation can not only account for protests around mining projects but also helps to rationalize the positive relationship between commodity prices and

103. "Sipho Kings, Super-profits, But Not for Mineworkers," *Mail and Guardian*, 6 June 2014.
104. See also Mensah and Okyere 2014, who argue that company-community conflicts in Ghana result from the failure of companies to meet communities' expectations regarding local development.
105. Davis and Franks 2014, 14.
106. This mechanism underlies advice offered by management scholars working on extractive industries. Henisz argues: "Stakeholders must understand not only your constraints but also how you ascertain what you can and cannot do on their behalf. Without transparency on this topic, people will doubt you." 2014, 122.
107. Stevens et al. 2013, 98–99.
108. Appendix E.3 extends the model to incorporate inflated expectations on the part of communities by allowing communities' prior beliefs about projects' profitability to diverge from the true distribution.

protest.[109] As I noted earlier, profits did not move in lock-step with commodity prices. And yet, communities' expectations increased dramatically during the boom years. Stevens and colleagues observe that "the phenomenon of higher mineral and oil prices in recent years (the price cycle) has increased … the expectations of societies in resource-producing countries."[110] Higher commodity prices generated more and louder "calls for the country to receive its 'fair share' of the profits."[111] While industry analysts lamented sharply increasing production costs, such concerns failed to pervade the public debate: gold companies in Tanzania were thought to be immensely profitable "based on the assumption that companies' profits are calculated on the basis of gold production multiplied by the gold price."[112] Booming prices outpaced profits, leading to heightened expectations and—this model would predict—the increased probability of protest we observe in the data.[113]

If protests result from an informational problem, then transparency should have a pacifying effect and mitigate the relationship between commodity prices and protest. Where communities have alternative sources of information about mining projects, they may be less dependent upon world prices as a noisy predictor of profitability. The adoption of the Extractive Industries Transparency Initiative (EITI) provides an opportunity to assess whether transparency has this effect. The EITI requires that companies in member countries "disclose information on tax payments, licenses, contracts, production and other key elements around resource extraction."[114] EITI claims that increased transparency "enhance[s] trust and stability in a volatile sector … Citizens and civil society benefit from receiving reliable information about the sector."[115] The first countries were admitted as candidates to EITI in 2007 and, as of 2014, there were twenty-six countries globally (sixteen African countries) considered compliant members of the EITI in good standing. A recent metastudy from Rustad, Le Billion, and Lujala finds that EITI has succeeded in garnering attention and increasing transparency around revenues.[116] Roughly 7,000 articles were written about the initiative between 2003 and 2015; and, in one of the few nationwide polls, a 2008 survey in Liberia (a year after the country became a candidate) found that over 41 percent of respondents claimed to have

109. The focus on bargaining might suggest that protests should proceed mining. But as with any other investment, negotiations over corporate social responsibility, land rents, or wages are ongoing and frequently revisited (especially in contexts with weak contract enforcement). Moreover, qualitative accounts suggest that communities often defer their demands until production starts, recognizing that mining projects make only losses during exploration and construction phases. If, prior to export, communities believe projects have no surplus to share, then we should not expect them to protest demanding a larger cut.

110. Stevens et al. 2013, 80.

111. Ibid., 47.

112. Goldstuck and Hughes 2010, 11.

113. Empirically, I find no evidence that commercial mining increases the likelihood of armed conflict or that commodity price changes affect armed conflict, either the probability of battles or rebel events (see Table A.2).

114. Individual companies cannot select into or out of EITI.

115. Frequently Asked Questions, EITI, <https://eiti.org/FAQ>.

116. Rustad, Le Billon, and Lujala 2017, 156.

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TABLE 3. *Mineral prices, EITI, and Pr(protest or riot)*

	Dependent variable						
	1 (Protest or Riot)						
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
$\log(\text{Price})_{it}$	0.010*	0.013**	0.015**	0.012**	0.012**	0.015**	0.012**
	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
$1(\text{Candidate})_{c,t-1}$		0.020	0.013	0.020			
		(0.019)	(0.010)	(0.017)			
$\text{Corruption}_{c,t-1}$				0.002			−0.0003
				(0.015)			(0.014)
$\log(\text{Price})_{\text{it}} \times 1(\text{Candidate})_{c,t-1}$		−0.002*	−0.001*	−0.002*			
		(0.001)	(0.001)	(0.001)			
$\log(\text{Price})_{it} \times \text{Corruption}_{c,t-1}$				−0.001			−0.0004
				(0.001)			(0.001)
$1(\text{Compliant})_{ct}$					0.056	0.027	0.053
					(0.040)	(0.023)	(0.035)
$\log(\text{Price})_{\text{it}} \times 1(\text{Compliant})_{c,t-1}$					−0.005*	−0.003*	−0.004**
					(0.003)	(0.002)	(0.002)
Cell FEs	940	927	927	925	927	927	925
Year FEs	17	16	16	16	16	16	16
$\text{Mean}(y_{it})$	0.0133	0.015	0.015	0.0152	0.015	0.015	0.0152
Mining Cell-Years Only	✓	✓	✓	✓	✓	✓	✓
Country-specific Trends			✓			✓	
Observations	8,776	7,450	7,450	7,236	7,450	7,450	7,236

Notes: Robust standard errors clustered on country; $^*p < .10$; $^{**}p < .05$. Model 1: linear probability model per equation 3. Models 2–7: price (logged) interacted with an indicator for whether a country was an EITI candidate (models 2–4) or compliant member (models 5–7) in the previous year. Models 3, 6: country-specific linear time-trends included. Models 4, 7: interaction of price (logged) with a measure of the control of corruption from the Worldwide Governance Indicators included. Commodity prices compiled from the World Bank, USGS, and US EIA; outcome data from ACLED (see Appendix F).

heard or read about EITI. The authors continue, "overall, EITI seems to have increased timely reporting on revenues … many of the studies argue that the EITI has improved or at least partly improved transparency through the reporting."[117]

Table 3 reports the heterogeneous effects of commodity prices on the probability of protest, depending on whether a mining area falls in a country that is an EITI candidate (models 2 to 4) or compliant country (models 5 to 7) in a given year. I lag countries' EITI status because reporting by EITI secretariats typically lags implementation. I find that EITI candidacy reduces the relationship between logged prices and protest by roughly 15 percent. As we would expect, this effect increases (roughly doubling) with full compliance.[118] This pacifying effect of transparency bolsters this theoretical account of protest. However, these results do not imply that EITI eliminates social conflict; EITI only dampens the effect of rising prices on protests in mining areas. These modest effects will not surprise critics of EITI, who rightfully note that the initiative has only partially succeeded in engaging the public and has had negligible effects on corruption.[119]

The research design helps to rule out some sources of endogeneity. First, the cell fixed effects absorb any time-invariant features that might explain differences in social conflict across countries that do and do not become EITI candidates. Second, including country-specific, linear time trends (models 3 and 6) ameliorates concerns that EITI adoption reflects differential trends in the likelihood of protest. Third, and most reassuringly, EITI does not track overall improvements in governance. In fact, existing studies point to "the lack of adoption by many of the most resource-rich (and corrupt) countries. They suggest that [EITI] adoption is mostly driven by incentives or external pressure—such as foreign aid dependence or the need for diplomatic and security support."[120] Figure A.1 reports the pooled bivariate correlations—all of which are zero or negative—between EITI candidacy and measures from the Worldwide Governance Indicators (WGI).[121] Consistent with the earlier studies, candidacy is not associated with less corruption or more effective regulation. Models 4 and 7 of Table 3 include the WGI's control of corruption variable (both directly and interacted with prices); the pacifying effect of EITI remains unchanged.[122]

Despite these robustness checks, this analysis suffers from the limitations that plague most efforts to gauge policy impacts. Even after accounting for differences across mining areas and time-varying changes in governance, EITI candidacy or

117. Ibid., 159.

118. Berman et al. (2017, 1598) report results that point in the same direction; however, as they note, their sample ends in 2010 and thus includes very few EITI candidate or compliant country-years.

119. Rustad, Le Billon, and Lujala 2017, 160.

120. Ibid., 156.

121. Kaufmann, Kraay, and Mastruzzi 2010. The WGI covers 1996 to 2013 and includes measures of voice and accountability, political stability, government effectiveness, regulatory quality, the rule of law, and control of corruption. Higher scores indicate higher-quality governance.

122. Control of corruption can be substituted with any of the other WGI indicators without changing the magnitude and significance of the interaction term of prices and EITI candidacy.

compliance could still coincide with unmeasured reforms to the regulation of extractive industries. If true, these heterogeneous effects would then reflect a bundle of interventions that improve transparency and, potentially, other aspects of oversight.

The relationship between prices and protests, I argue, is mitigated by policies that promote transparency and thus help correct the one-sided informational asymmetry that leads to mismatched expectations and, ultimately, social conflict. However, there could also be uncertainty on the part of companies who are unsure whether communities can solve their collective action problem and mobilize.[123] While this alternative theory does not rationalize the relationship between prices or protest or account for the moderating effect of EITI, it remains an internally consistent account of social conflict in mining areas. Lacking a measure of communities' collective action potential or, better still, firms' prior beliefs about this potential, I leave an empirical exploration of this mechanism to future work.

Conclusion

Foreign investment in sub-Saharan Africa, particularly in natural resources, has increased dramatically over the last three decades. Using fine-grained data on mining projects and protests across Africa, I show that the probability of a protest or riot more than doubles with mining. To bolster the credibility of my empirical design, I confirm that areas receiving investments do not have differential trends prior to mining. Moreover, the result is robust to limiting the control sample to areas that immediately border mining areas and thus would have experienced similar demographic or economic trends (absent mining).

My focus on social conflict departs from a resource curse literature that has concentrated on how natural resources can provoke or sustain armed conflicts and rebellion. I find, to the contrary, that areas hosting these commercial mining projects are largely immune from rebel attacks or deadly armed conflicts. Both in the vicinity of the mine and in surrounding areas, the likelihood of protests and riots increases while the probability of battles or events involving rebels does not. This null finding with respect to armed conflict could, I speculate, relate to the scale of these investments: unlike panning for gold, large commercial mining projects may be difficult for rebel groups to seize and productively operate. This argument implies that the "resource curse" may emerge only under certain conditions (e.g., certain production scales). Enumerating those conditions represents a productive path forward.[124]

Not all mining projects are met with protests, and the likelihood of demonstrations varies over the life of a mine. I investigate, first, whether mine owners' characteristics moderate the likelihood of social conflicts. Despite concerns about labor practices or corporate governance at mines with Chinese owners or owners based in tax havens, I

123. See, for example, Steinberg 2015.
124. Ross 2015.

find no evidence that these owners' country of origin amplifies the increased probability of protests. I do, however, find that mining areas where the domestic government is a partial owner are largely immune from these disputes. Second, I look at how plausibly exogenous changes in world commodity prices affect the likelihood of social conflict over the life of mines. Consistent with other recent empirical work, I find that the likelihood of protest increases with prices.

I consider a set of mechanisms that might explain these results, looking for evidence that grievances related to environmental harm, in-migration and displacement, inequality, or corruption drive the increased likelihood of protest around mining projects. Compiling and merging additional data sets on, for example, protected areas, water stress, migration, and inequality, I do not find evidence to suggest that grievances associated with these measures drive the observed relationships between mining or commodity prices and protest. Finding little empirical support for these accounts, I develop an alternative explanation related to incomplete information—a well-known source of bargaining failures and common explanation for conflict in industrial and international relations. This mechanism is consistent with qualitative accounts and can rationalize both why mining induces protest and why these conflicts are exacerbated by rising prices: the price "super cycle" led to heightened and often unmet expectations among communities regarding their development dividend from the commodity boom. I also show that the relationship between prices and protests is mitigated by policies, such as EITI, that promote transparency and thus help correct the informational asymmetry that I argue generates conflict.

While the private sector has been largely omitted from recent research in African politics, firms play an important political role in research on more developed countries. The literature on private politics considers how individuals organize outside of the state to influence firms' activities. This question is particularly salient in weak states like Liberia or Angola, where central governments lack the capacity to regulate commercial operations, and where foreign mining companies often find themselves supplanting the state, building roads or schools. In these places, the politics of development—how societies foster growth and distribute its costs and benefits—center on firms' negotiations with their workers and host communities. This paper illustrates how conflicts can arise when this bargaining takes place in low-information environments.

Supplementary Material

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