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# Resource Discovery and Conflict in Africa: What Do the Data Show?*

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**Abstract**

The empirical relationship between natural resources and conflict in Africa is not very well understood. Using a novel geocoded dataset on resource discovery and conflict we are able to construct a quasi-natural experiment to explore the causal effect of (giant and major) oil and mineral discoveries on conflict in Africa at the grid level corresponding to a spatial resolution of 0.5 x 0.5 degree covering the period 1946 to 2008. Contrary to conventional wisdom, we find no evidence of natural resources triggering conflict in Africa after controlling for grid-specific fixed factors and time varying common shocks. Resource discovery appears to have improved local income measured by nightlights which could be reducing the conflict likelihood. We observe little or no heterogeneity in the relationship across resource type, size of discovery, pre and post conclusion of the cold war, and institutional quality. The relationship remains unchanged at the regional and national levels.

**JEL classification**: D72, O11

**Key words**: Resource discovery; Conflict onset; Conflict incidence; Conflict intensity

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# 1 Introduction

Armed conflict has been part of human history since time immemorial. Eighteenth century political economist Thomas Malthus in his essay entitled *An Essay on the Principle of Population* noted that faced with resource scarcity, armed conflict is a key strategy for humans in their struggle for existence. Charles Darwin was also inspired by Malthus's work when he professed that conflict and competition over scarce resources are germane to the evolutionary strategies of species in their quest for survival in the natural world. Even though armed conflict is integral to the process of allocation of scarce resources, the interrelationship between the two is not very well understood. Provocative theories on the relative power of greed and grievances abound, the true causes of conflict in the resource rich regions of Africa remains largely unknown.

Until recently, research on the interrelationship between natural resources and intrastate civil conflict stood on the periphery of the economics discipline.[1] The past decade however witnessed a surge in research on conflict. Indeed, a large body of macro cross-country literature document positive relationship between natural resources and conflict.[2] The emphasis is on the role of economic motives as opposed to social motives in triggering conflict. For example, access to an oil rig or a mine could provide lucrative financial opportunities to rebel leaders to build and sustain rebel organisations which would encourage armed conflict. This could override atypical social motives such as inequality, political repression, and ethno-religious division.

Establishing causality has been the key motivation in this literature. Chilling examples of conflict in Angola, Democratic Republic of Congo, Rwanda, Sudan and other resource rich regions of Africa often tempt scholars to argue that resources cause conflict. Yet establishing causality has remained illusory largely due to the obvious limitations associated with cross-country studies. Furthermore, lack of useful data for Africa also limited the scope for adequately examining the causal link.

In this paper we aim to systematically explore the causal effect of giant and major oil and mineral discoveries on internal armed conflict onset and incidence in Africa at the grid level corresponding to a spatial resolution of 0.5 x 0.5 degree covering the period 1946 to 2008. Using geocoded data on resource (oil and mineral) discoveries and conflict we are able to construct a quasi-natural experiment to establish causality. In other words, we are able to test whether resource discovery as an exogenous news shock has

[1] Note that 'conflict' here implies 'intrastate civil conflict'. We do not analyse the relationship between natural resources and interstate wars. For a recent study on oil and interstate wars see Caselli et al. (2014).

[2] See Blattman and Miguel (2010) and Ross (2004, 2006, 2015) for a survey of this literature.

any bearing over conflict onset and incidence at the local level in Africa.

The paper makes the following original contributions. First, the paper uses a novel geocoded dataset of resource discovery at the grid level. In particular, the new dataset is able to distinguish between 11 different minerals and oil discoveries.[3] To the best of our knowledge, this is entirely new. Note that two existing cross-country studies Cotet and Tsui (2013) and Lei and Michaels (2014) use national level oil discovery data only and not minerals. Second, the paper uses grid level data on conflict in Africa and not many other scholars study conflict at the grid level in Africa.

The popular discourse both within the academy and the press is that competition over resource wealth in Africa is the root cause of armed conflicts. Several cross-national studies support this view (Collier and Hoeffler, 1998, 2004; Humphreys, 2005; Ross, 2006).[4] Yet this is not borne out in our grid level geocoded data. A quick snapshot of the continental map of mining and conflict locations in figure 1 reveal very little correlation between locations of resource discovery and armed conflict onset. In fact contrary to the conventional wisdom of resource riches triggering conflict in Africa, we find oil and mineral discoveries significantly reduce the likelihood of conflict onset up to ten years post resource discovery in a simple pooled cross-section set up with a sample of 47 African countries drawn from the Peace Research Institute Oslo Grid (PRIO-GRID) dataset over the period 1946 to 2008. The effect remains negative but statistically insignificant or weakly significant in most specifications when we control for grid-specific fixed factors and time varying common shocks. We observe little or no heterogeneity in the relationship across resource types (minerals or oil), size of discovery (giant or major), pre and post end of the cold war, and quality of national political institutions measured by Polity2 score. We also analyse the effect of resource discovery on conflict incidence using a panel of 47 countries covering the period 1989 to 2008. The smaller sample size here is due to the sparse temporal distribution of conflict incidence data. Even though the negative effect of resource discovery on conflict incidence remains in a pooled cross-section set up, the trajectory of the coefficient appears to be somewhat different once we control for grid and year fixed effects. The effect stays negative for the first four years post discovery and then it turns positive and peaks at eight years post discovery. This could be due to a decline in the incidence of ongoing conflict up to four years post discovery news shock. Beyond that point production starts in these newly discovered locations which trigger an increase in the conflict incidence. The heterogeneous effects of discovery and

[3]The minerals are gold, silver, platinum group elements (PGE), copper, nickel, zinc, lead, cobalt, molybdenum, tungsten, uranium oxide.

[4]Fearon (2005) and Brunnschweiler and Bulte (2009) however challenge this view.

production appear to be consistent with the observation made by Humphreys (2005) using cross-country data that the prospect of future production affects conflict onset and incidence less than the actual past production. Our results are robust to the inclusion of additional covariates, region fixed effects, country specific trends, and the use of the alternative Uppsala Conflict Data Program Geo-Referenced Event Dataset (UCDP GED).

The obvious question here is via what channel resource discovery affects conflict. Natural resource induced higher income at the local and national levels could improve state counter-insurgency capacity and reduce individual incentives to fight (Collier and Hoeffler, 1998; Fearon and Laitin, 2003). Alternatively, natural resource induced higher state revenue could incentivize capture and trigger conflict (Besley and Persson, 2011). Evidence appears to be favoring the former theory rather than the latter. We find that resource discovery (oil and minerals) improves luminosity at the grid level which in turn reduces conflict onset and incidence.[5]

Our identification strategy relies on the exogenous variation in the discovery dates of giant and major mineral deposits and giant oil deposits. Our dataset codes a mineral deposit as giant if it has the capacity to generate at least USD 0.5 billion of annual revenue for 20 years or more accounting for fluctuations in commodity price. Similarly, major mineral deposits are those which could generate an annual revenue stream of at least USD 50 million but not as long life as a giant reserve. A giant oil or/and gas (including condensate) field is defined as a field that contains at least a total of 500 million barrels of ultimate recoverable oil or gas equivalent. Even though it is possible to identify the area where minerals or oil are likely to be found using geological data, it is not possible to accurately predict the timing of giant and major discoveries. Therefore, the discovery dates of giant and major reserves are exogenous. One might argue that politicians and government could manipulate the announcement of the precise timing of discovery. Our data is immune to such possibility as the discovery dates are independently verified and documented using multiple sources.

Administrative boundary demarcation could be a potential source of endogeneity in a study of this nature. For instance, administrative boundary demarcations in a country could be determined by political, geographic and demographic characteristics of the area. This could in turn be correlated with both local conflict dynamics and natural resource extraction contaminating the coefficient estimate. This is unlikely to be a concern here as our unit of analysis is a grid cell. The grid level data by construction is independent of political, geographic and demographic characteristics and therefore is exogenous to con-

[5] Note that Bazzi and Blattman (2014) also find support in favor of the income theory of conflict using cross-country data.

flict and resource discovery. Nevertheless, we also check the effect of resource discovery on conflict at the region and country levels.

Another source of bias could be the fact that mines and oil rigs are often military targets in a conflict giving rise to a positive association between the two variables without any actual causal link. Again, this is unlikely to be a concern here as we are finding negative or no association between resource discovery and conflict.

The literature on natural resources and conflict is large. Recent theoretical studies argue that the likelihood of conflict is related to three key variables (Besley and Persson, 2009, 2011). The prize for the winner in a conflict is increasing in natural resource rent. Therefore resources increase the likelihood of conflict. Higher wages in contrast increases the opportunity cost of fighting and hence reduces the likelihood of conflict. Weak institutions and lack of state capacity to raise revenue compromises inclusivity of political institutions and hence increases the likelihood of conflict. In a nuanced general equilibrium model, DalBó and DalBó (2011) show that resource boom in the form of a favourable price or technology shock lower wages and reduce the opportunity cost of conflict.

In spite of the apparent theoretical clarity, estimating the causal relationship between natural resources and conflict has been challenging. Several macro cross-national studies Collier and Hoeffler (1998, 2004); Humphreys (2005) and Ross (2006) report robust positive relationship between resource dependence and conflict.[6] However, Fearon (2005) point out that these results cannot be interpreted as causal as they could be driven by omitted variables and endogeneity. Furthermore, Fearon and Laitin (2003) identify weak institutions as the main cause of conflict rather than natural resources.

Contemporary cross-national studies have used instrumental variables and exogenous news shocks to address endogeneity concerns and identify the causal effect. Miguel et al. (2004) use rainfall shocks as an instrument for economic shocks and find that negative economic shocks trigger conflict. Cotet and Tsui (2013) and Lei and Michaels (2014), both use giant oil discovery as an exogenous news shock to identify the effect of oil on conflict onset. The former reports no effect while the latter reports positive effect. Brunnschweiler and Bulte (2009) examine the effect of resource wealth and find that the same in fact reduce the probability of conflict. The overall direction of the cross-country evidence could be summed up as conflicting.

Conflict is often localised and cross-national studies by construction fail to capture

[6] Hegre and Sambanis (2006) and Sambanis (2004) find that the effect of resource dependence on conflict onset is not robust. More recently, Bazzi and Blattman (2014) revisit the question and find no robust relationship between commodity price shocks and civil war.

local effects. Yet disaggregated local level studies of natural resources and conflict are rare. Angrist and Kugler (2008) and Dube and Vargas (2013) study the effects of a surge in coca production and commodity price shocks on conflict respectively in Colombia. Maystadt et al. (2013) study the Democratic Republic of the Congo and find that mineral concessions have no effect on conflict at the lowest administrative unit, but significant effect at the higher administrative units.

More recently, Berman et al. (2014) study Africa at the grid level corresponding to a spatial resolution of 0.5 x 0.5 degree and covering the period 1997 to 2010. Using data from the Armed Conflict Location and Event Dataset (ACLED)[7], they find evidence that mineral price shifts trigger low-level as well as organized conflict incidents in Africa. In contrast we are able to use a much larger sample of georeferenced data covering the period 1946 to 2008. We are also able to exploit giant and major resource (oil and minerals) discovery as exogenous news shock to identify the effects of natural resources on conflict. This is unmatched by any other studies in the literature.

Our paper is also related to the resource curse literature. Auty (2001), Gylfason (2001) and Sachs and Warner (2001, 2005) note that resource rich countries on average grow much slower than resource poor countries. Subsequent studies have argued that natural resources may lower the economic performance because they strengthen powerful groups, weaken legal frameworks, and foster rent-seeking activities (Tornell and Lane, 1999; Besley, 2007). Others have argued whether natural resources are a curse or a blessing depends on country-specific circumstances especially institutional quality (Mehlum et al., 2006; Robinson et al., 2006; Bhattacharyya and Hodler, 2010, 2014; Bhattacharyya and Collier, 2014), natural resource type (Isham et al., 2005) and ethnic fractionalisation (Hodler, 2006).

The remainder of the paper is structured as follows: Section 2 discusses the empirical strategy and data. Section 3 presents evidence on the effects of resource discovery on conflict and discusses the mechanism. It separately examines the effect on conflict onset, conflict incidence, and conflict intensity. It also reports on any potential heterogeneity in the relationship across resource types (oil and minerals), pre- and post-cold war conclusion, size of discovery (giant and major), and quality of political institutions. Section 4 deal with robustness and section 5 concludes.

[7] Note that the ACLED dataset has been criticized by (Eck, 2012) and others for its uneven quality which can produce biased results.

## 2 Empirical Strategy

We use a panel dataset covering 10,257 grids from 47 African countries observed over the period 1946 to 2008.[8] The grids are the main units of observation here and they are constructed in GIS. However, we also estimate the model at the regional and national levels. We superimpose a grid of equally sized cells on the territory of interest. In other words, we divide the whole continent of Africa into a spatial resolution of 0.5 x 0.5 degrees latitude and longitude, which approximately amounts to 55 x 55 kilometers at the equator. The full spatial-temporal grid structure allows us to conduct a subnational analysis in Africa and is been used by several recent studies.[9] The grid is well matched with the standardized PRIO-GRID (Tollefsen and Buhaug, 2012).

The advantage of grid level disaggregation as opposed to subnational administrative boundaries is that the former contains apolitical entities and therefore exogenous to armed civil conflicts. In contrast, the latter is endogenous by construction. In particular, administrative boundary demarcations in a country are typically determined by political, geographic and demographic characteristics of the area and therefore could influence local conflict dynamics.

To estimate the local effects of resource discovery on conflict, we use the following model:

$$Y_{git+j} = \alpha_g + \beta_t + \gamma_1 RD_{git} + \gamma_2 YD10_{git} + \epsilon_{git} \tag{1}$$

where $Y_{git+j}$ is the outcome variable (conflict onset, conflict incidence, and conflict intensity) in grid $g$, country $i$ in year $t$, $\alpha_g$ is a grid dummy variable accounting for grid fixed effects, $\beta_t$ is a year dummy variable controlling for time varying common shocks, $RD_{git}$ is an indicator of resource discovery in grid $g$, country $i$ in year $t$, and $YD10_{git}$ is the number of years with resource discoveries in the last ten years (from $t$ - 10 to $t$ - 1). We estimate this model for different leads $j$, where in most cases $j \in \{2,4,6,8,10\}$.

In order to check robustness of the coefficient estimate of interest, we include additional covariates in the extended version of this specification. The additional covariates include grid level characteristics (distance to the border in km, distance to national capital in km, travel time to nearest urban center in minutes, mountainous terrain as share of grid area, forested terrain as share of grid area, average precipitation in grid-year in mm,

[8] Due to data limitations, most but not all specifications cover 47 countries and 10,257 grids. In most specifications, the panel is unbalanced. Appendix A1 presents a list of countries included in the sample.

[9] See for example, Alesina et al. (2012); Besley and Reynal-Querol (2014) and Michalopoulos and Papaioannou (2013).

and mean temperature in grid-year in mm), ethnic level characteristics (ethnic size as a proportion to total population, ethnic total population, and ethnic level GDP per capita), and country specific trends.

Our main interest here is the effect of a change in $RD_{git}$ on $Y_{git+j}$. The point estimate $\gamma_1$ presents the effect of resource discovery on conflict. If the popular perception of African conflicts being natural resource driven is accurate then we would expect $\gamma_1$ to be positive and statistically significant. In other words, resource (oil and minerals) discovery should be triggering conflict in Africa. Any indication otherwise would serve as a refutation of the conventional wisdom.

Our main dependent variable civil conflict onset is a dummy variable which takes the value 1 for each grid-cell hosting the first recorded battle location for each intrastate armed conflict. Our armed conflict onset is a rare event with 84 instances of battles with more than 25 fatalities and 2257 instances of battles with more than 1 fatality.

Note that civil conflict onset is our main measure of conflict. However, we also estimate the effect of resource discovery on conflict incidence and conflict intensity. Conflict incidence is a dummy variable which takes the value 1 for grid years when there is an intrastate armed conflict with more than 25 fatalities. Conflict intensity is measured by the number of conflict events with more than 1 fatality observed in a grid-year. Even though widely used in some circles, both of these measures are criticized because of the lack of uniformity in their definitions. Fearon (2011) and Ciccone (2011) argue that both conflict incidence and conflict intensity are aggregate measures of conflict onset and persistence. Conflict onset and continuation are disparate outcome variables potentially driven by widely different factors. Hence, there is very little logic in combining the two and assuming that resource discovery would affect them in the same way.

The conflict dataset is sourced from the Uppsala Conflict Data Program Geo Referenced Event (UCDP GED) dataset and the PRIO-GRID conflict attribute table. The former is an event-based organized violence in Africa dataset developed by Sundberg and Melander (2013). The latter is derived from the UCDP/PRIO Armed Conflict Dataset developed by Tollefsen and Buhaug (2012). Both datasets specify that conflict events must adhere to the general and established Uppsala Conflict Data Program (UCDP) definitions. According to UCDP, an armed conflict is defined as 'a contested incompatibility between a government and one or more opposition groups that result in at least 25 battle deaths in a year'. In addition to recording 25 battle deaths in a year, UCDP GED also record conflict events with at least 1 fatality in an events-based format. We construct our conflict dummy variables based on at least 25 battled-related fatalities as well as 1 battled-related fatality. The former acts as our main measure while the latter is used mainly as robustness test. Following some notable recent studies (Ciccone, 2011; Cotet and Tsui, 2013) we use the terms 'armed conflict' and 'civil conflict' interchangeably.

An alternative data source is the Armed Conflict Location and Event Dataset (ACLED). We choose not to use this data for the following reasons. First, the data starts in 1997 and therefore would truncate our sample size significantly. Second, our dataset which is based on UCDP GED is widely used and therefore facilitates comparability. In contrast ACLED is not very widely used. Third, some studies doubt the quality of ACLED data and suspect that it can bias results (Eck, 2012).

Our main independent variable of interest is the resource discovery variable. Resource discovery is a binary variable taking the value 1 for oil or mineral discovery in a particular grid-year and 0 otherwise. As it may be apparent from the definition above, the variable comprises of two components. First, it identifies grid-years with the discovery of a giant oilfield. As we have mentioned earlier, a giant oil or/and gas (including condensate) field typically contains at least a total of 500 million barrels of ultimate recoverable oil or gas equivalent. Second, it identifies grid-years with the discovery of a giant or major mine. A giant mineral deposit has the capacity to generate at least USD 0.5 billion of annual revenue for 20 years or more after accounting for fluctuations in commodity price. Whereas a major mineral deposit could generate annual revenue stream of at least USD 50 million but not as long life as a giant reserve. As we have discussed earlier, it is not possible to accurately predict the timing of a giant or major discovery. Political manipulation of the announcement of discovery dates is also unlikely in our dataset as the discovery dates are independently verified and documented using multiple sources.

The giant oilfield discovery dates are sourced from Horn (2004) who also reports the geographic coordinates of these discoveries. Many recent notable studies of resource curse use this data source (Cotet and Tsui, 2013; Lei and Michaels, 2014; Arezki et al., 2015). Note that giant onshore oilfield discoveries are extremely rare as our dataset reports only 59 giant onshore oilfield discoveries between 1955 and 2010 in Africa. The discovery dates of giant and major mineral deposits are sourced from MinEx Consulting which reports the geographic coordinates of 258 such events over the period 1950 to 2010. Note that we also present estimates of oil and mineral discoveries separately in section 3.

What is the mechanism through which resource discovery affects conflict? The literature offers several explanations some of which we review in section 1. Our data allows us to test the income effect thesis which postulates that resource discovery and extraction increases income and therefore increases the opportunity cost of fighting. Higher income also improves state capacity to suppress insurgency and rebellion which reduces the likelihood of conflict. We test this by estimating the following models:

$$L_{git+j} = \alpha_g + \beta_t + \theta_1 RD_{git} + \theta_2 YD10_{git} + \eta_{git} \tag{2}$$

$$Y_{git+j} = \alpha_g + \beta_t + \lambda_1 RD_{git} + \lambda_1 L_{git} + \lambda_2 YD10_{git} + \xi_{git} \tag{3}$$

First, we estimate equation 2 to test the link between resource discovery and local income measured by nightlights . If resource discovery improves local income then we would expect the coefficient to be positive and significant. Second, in equation 3 we test the link between this improved income and our outcome variables (conflict onset, conflict incidence). If resource discovery affects conflict exclusively via the discovery induced improved income channel then we would expect to be significant and to be insignificant.

Note that we do not have measures of income for Africa at the grid level. We use satellite data on nightlights density or luminosity density observed over the period 1992 to 2012 as our proxy for income. We calculate luminosity density by dividing the sum of all nightlights pixel values within a grid by the grid area. We source the nightlights data from the Defense Meteorological Satellite Program's Operational Linescan System (DMSP-OLS). The satellite images of the earth are captured between 20:30 to 22:00 local time, and the satellites circle the earth 14 times per day. The data we use here is the cleaned luminosity after filtering for cloud coverage, other ephemeral lights, and background noise. The measure comes on a scale from 0 to 63 (digital number) calculated for every 30-second area (equivalent to 1 square kilometer), where a higher value imply greater nightlights intensity.

The distribution of nightlights across grids is not normal. We have a significant volume of observations that take on the value zero. To account for this, we follow Michalopoulos and Papaioannou (2013) and Hodler and Raschky (2014) and define the dependent variable as the natural log of nightlights density plus 0.01. It is widely acknowledged that such transformation ensures that all available observations are used and the problem of outliers minimized.

The other challenge with nightlights data is measurement error. In particular, issues relating to the difference between true lights emanating into space and what is recorded by a satellite (Henderson et al., 2012). There is also variation in recorded lights data across satellites. Measurement error of this nature is unlikely to be a concern here as it is orthogonal to our models in equations (2) and (3). Furthermore, any cross-satellite variation in nightlights is already accounted for by the year dummy variable capturing time varying common shocks.[10]

Other variables used in the study are: polity 2, distance to the border, distance to national capital, travel time to the nearest urban center, mountainous terrain, forest cover, average precipitation, mean temperature, and ethnic level characteristics. Table 1 reports summary statistics on all variables used and Appendix A2 presents detailed definition of variables.[11] Figures 2 present the grid level boundary map of Africa.

# 3 Evidence

## 3.1 Past and Future Discoveries of Natural Resources

Natural resource discoveries in the recent past in a particular grid could raise the likelihood of additional discoveries in the immediate future. However, table 2 reports evidence to the contrary. Even though there is positive correlation between past and future discoveries in pooled OLS models (see columns 1, 3, and 5), the correlation reverses within a grid after controlling for grid and year specific unobservable (see columns 2, 4, and 6). A discovery in a grid in the recent past in fact reduces the likelihood of another discovery within that grid. This is not surprising given that a grid is a much smaller area relative to a region or country. Indeed, at the region and country levels we observe a positive correlation between past and future discoveries.[12] The country level result is consistent with Lei and Michaels (2014).

## 3.2 Resource Discovery and Conflict: Onset, Incidence and Intensity

Natural resource discovery could increase the likelihood of the start of a conflict. Table 3 tests how resource discovery affects conflict onset. Contrary to expectation, resource discovery appears to reduce the probability of conflict onset by 0.01 percent when we estimate the model using pooled OLS. The negative effect appears to be stable across resource type (see panels B and C) and statistically significant. It is also persistent over time as it survives 10 years post discovery. We find no evidence of resource discovery triggering conflict within a grid. The effect remains negative but weakly significant after

[10]Note that there is time series variation in satellite data here as different satellites cover different years but there is no cross-section variation as all grids in our sample at a particular point in time are covered by the same satellite.

[11]We also check for stationarity of the variables used in the model using Levin-Lin-Chu and Harris-Tzavalis variety of unit root tests. Both tests account for bias emanating from cross-sectional association. We find all variables to be stationary.

[12]The region and country level results are not reported here but are available upon request.

controlling for grid and year fixed effects reported in the last five columns of the table. The individual effects of oil discovery and mineral discovery within a grid remain negative but statistically insignificant. Note that, figures 3 and 4 present non-parametric and parametric estimated plots of the effect of resource discovery on conflict onset. Even though not always statistically significant, both figures demonstrate a decline in the likelihood of conflict onset post discovery.

Factors triggering a conflict could be widely different from factors motivating continuation of a conflict. Therefore, it is important to distinguish between conflict onset, conflict incidence, and conflict intensity. Onset flags the start of a conflict whereas incidence and intensity are aggregate measures of both start and persistence. In tables 4 and 5 we focus on the effect of discovery on incidence[13] and intensity respectively. The last five columns in both tables exploit within grid variation using fixed effects estimation. In table 4, we find a decline in conflict incidence up to 4 years post discovery and the same increases 6 years post discovery. This could be driven by not new conflicts but prolongation of existing conflicts which converges with the start of production in many of the newly discovered deposits. Note that it takes approximately 5 or 6 years post discovery for production to start in these sites. Not surprisingly, similar patterns are observed in the last five columns of table 5 as conflict intensity like conflict incidence is an aggregate measure of conflict onset and persistence. However, the post $t$ - 6 positive coefficient estimates here remain either insignificant or weakly significant.

### 3.3 Resource Discovery, Nightlights and Conflict: Testing the Income Effect Mechanism

Theory predicts that natural resources could affect conflict through multiple channels. It is however difficult to establish these causal channels empirically (Ross, 2004). It is even more difficult for Africa due to lack of data. Using our novel dataset, we are at least able to test the income effect mechanism. Resource discovery could impact on the local living standards and influence the opportunity cost of conflict.

We do not have grid level income data for Africa. Therefore, we use natural logarithm of nightlights density (i.e. dividing the sum of all nightlights pixel values by the grid area) as a proxy measure of local living standards. This however restricts our sample to 1992 to 2012. In table 6, we find that resource discovery improves nightlights density

[13] The conflict incidence measure in table 4 is based on intrastate conflict. Note that some intrastate conflicts end up being internationalised over time. Therefore there is a case for taking that into account in the definition of the conflict incidence variable. We do that by defining conflict incidence for internal and internationalised conflicts and our results are robust to this alternative way of defining incidence.

in a grid by 0.7 percent after controlling for past discoveries, grid fixed effects, and temporal common shocks. This result is consistent with the findings of (Mamo et al., 2015). The effect is marginally bigger for oil discovery than minerals.

In table 7 we explore whether the resource discovery driven improved living standards have any impact on conflict onset and conflict incidence. In columns 5 and 7 we find that indeed higher local living standards measured by nightlights reduce conflict incidence and onset after controlling for grid and year fixed effects. In columns 6 and 8 we test whether the effect of resource discovery works exclusively through improvements in local living standards. The coefficient on resource discovery is negative and significant which suggests that there is a direct effect of discovery on conflict over and above the indirect effect via the income channel. The direct effect could be reflective of the changes in expectations. The local population could expect higher future income after a discovery and this could reduce conflict. Our evidence is qualitatively consistent with Bazzi and Blattman (2014) who find support for the income effect using cross-country data.

## 3.4 Size of Natural Resource Discovery and Conflict

Our dataset allows us to distinguish between giant and major discovery. The giant discoveries are obviously far more superior to the major discoveries. All the onshore oil discoveries in our dataset are giant whereas the mineral discoveries could be classified into giant and major. The negative effect of a discovery on onset remains unchanged in table 8 irrespective of the size of discovery. Panel A reports the effect of a giant discovery on onset. We find no evidence of a giant discovery triggering conflict after controlling for past discoveries and year and grid fixed effects. This result remains qualitatively unchanged when we distinguish between giant and major mineral discovery in panels B and C.

In table 9, we test whether the size of discovery affects the trajectory of a conflict by focusing on conflict incidence. The pattern is similar to what we observed in table 4. The sign of the estimated coefficients stay negative for at least 4 to 6 years post resource discovery. Beyond that point it turns positive. The negative coefficient for the first 4 to 6 years is perhaps reflective of the decline in conflict onset (or new conflict) post discovery. Typically 4 to 6 years post discovery, production starts. A rise in resource production often brings about an increase in the intensity of fighting around existing conflicts which perhaps explains the positive coefficients post $t$ - 6.

### 3.5 Resource Discovery and Conflict: The Effect of the Cold War and Institutions

The Cold War had a significant impact on the African political landscape. The Angolan civil war starting in 1975 had major outside involvement in the form of the Soviet Union and Cuba backing the People's Movement for the Liberation of Angola (MPLA) while the United States and the CIA backing the National Union for the Total Independence of Angola (UNITA). The deposition and subsequent execution of Congolese independence leader and elected Prime Minister Patrice Lumumba in 1961 also shares a similar Cold War history which led to conflict. One could argue that the nature of the relationship between resource discovery and conflict before and after the end of the cold war in 1989 with the fall of the Berlin Wall could be different. In table 10 we test whether this is indeed the case by dividing the sample between pre- and post- Cold War. The coefficient estimates remain negative and insignificant for the pre 1989 sample. For the post 1989 sample the coefficient estimates turn positive but they still remain insignificant. Therefore, we do not find any evidence of resource discovery triggering conflict both before and after the end of the Cold War.

Others have argued that institutional quality and especially the quality of political institutions influence the relationship between natural resources and conflict (Arezki and Gylfason, 2013). Democratic and inclusive political institutions could increase legitimacy of the incumbent government and diffuse tension. Therefore, one would expect democratic institutions to reduce any potential negative consequences of natural resources on conflict. We test this hypothesis using grid level data in table 11. We measure democracy by the widely used Polity 2 score and we do not find any effect of institutions influencing the relationship between resource discovery and conflict onset.

### 3.6 Resource Discovery and Conflict: Region and Country Level Effects

Resource discovery in one grid could trigger conflict elsewhere in the region or country. As a result the negative sign of the coefficient estimates within a grid may not be surprising as resource discovery only fuels conflict elsewhere. To test whether this is indeed the case, in table 12 we estimate the model using region-year and country-year as units of analysis. We aggregate all the variables at the region and country levels. Panel A reports the region level results which comprises of 430 regions. At the region level we find resource discovery significantly reduce the likelihood of conflict onset by 0.3-0.4 percent after controlling for region and year fixed effects. The effect on conflict incidence however is not significant for the first 6 years post discovery but turns positive and significant at . This confirms the effect of production on existing conflicts rather than new conflicts as noted in section 3.2 and 3.4.

Panel B estimates the relationship at the country level with 47 countries and 846 observations in the sample. This result is comparable to recent cross-country studies on this issue by Cotet and Tsui (2013) and Lei and Michaels (2014). Unlike these studies which solely focus on the effect of oil discovery, our dataset permits us to consider not only oil but also mineral discovery. We find that oil and mineral discovery has no discernable effect on conflict onset and incidence at the national level after controlling for country and year fixed effects. Estimating the models separately for oil and mineral discoveries do not change our results. The country level results confirm the findings of (Cotet and Tsui, 2013).

# 4 Robustness

The empirical relationship between resource discovery and conflict could be driven by omitted country specific time varying factors which may not be readily observable. Different countries may have different trajectory in terms of political and economic development which could have differential impact on conflict. To account for such factors in panel A of table 13 we include country specific trend as an additional control variable. The negative effect of resource discovery on conflict onset survives and in fact becomes significant. We perform similar tests using conflict incidence and conflict intensity as dependent variables and we observe no qualitative change in the empirical relationship. This confirms that the empirical relationship is not driven by country specific time varying unobservables.

In panel B we control for additional grid level characteristics and ethnic level characteristics which could be driving the empirical relationship. The grid level characteristics are: distance to the border in km, distance to national capital in km, travel time to nearest urban center in minutes, mountainous terrain as share of grid area, forested terrain as share of grid area, average precipitation in grid-year in mm, and mean temperature in grid-year in mm. The ethnic level characteristics are: ethnic size as a proportion of total population, ethnic total population, and ethnic level GDP per capita. Again we find no evidence of natural resources triggering conflict in Africa. Note that precipitation and temperature accounts for the role of climate in triggering conflict as emphasized by some recent studies (Miguel et al., 2004; Hsiang and Miguel, 2013).

Our onset and incidence variables are constructed using 25 annual fatalities as the threshold. Even though this is widely used, some argue in favor of using a lower threshold of 1 annual fatality. We test the robustness of our results using alternative measures of onset and incidence using the threshold of 1 annual fatality. Our results are qualitatively unchanged. Since both our key dependent and independent variables are binary in nature the relationship between them could be nonlinear. To address such possibility we also estimate a logistic model. The assumption here is that a logistic model would be a better fit than a linear model in the presence of binary dependent and independent variables. However, a linear model is much easier to interpret than a nonlinear model. Our results remain qualitatively unchanged if we estimate a logistic model. For the sake of brevity, these results are not reported here but are available upon request.

# 5 Conclusions

Africa is often viewed as the prime location for natural resource driven conflict. The volume of research on this topic is sizeable. Yet establishing causality has always remained a challenge. In this paper we are able to set up a natural experiment to study the effect of natural resources on conflict at the grid level covering the period 1986 to 2008. Note that grids here correspond to a spatial resolution of 0.5 x 0.5 degrees (approximately 55 x 55 kilometers at the equator). Using giant and major resource (oil and minerals) discovery dates as an exogenous news shock we find no evidence that natural resources trigger conflict in Africa. In particular, resource discovery significantly reduce the likelihood of conflict onset up to ten years post resource discovery in a pooled cross-section model. The effect becomes insignificant once we control for grid and year fixed effects. This broad pattern in the data is apparent with both conflict incidence and conflict intensity as dependent variables. However, on average a surge in the incidence and intensity of ongoing conflict is observed 6 to 8 years post resource discovery. We also explore the mechanism through which discovery could affect conflict. Resource discovery appears to influence conflict indirectly via improved local living standards and directly via improved expectations of high future income. There is little or no heterogeneity in the relationship between resource discovery and conflict across resource type, size of discovery, pre and post conclusion of cold war, and institutional quality.

A common argument is that the relationship between natural resources and conflict is national rather than local. Hence using aggregation we also test the relationship at the regional and national levels. Our main result that natural resources do not seem to affect conflict in Africa remains unaffected when we estimate the model at the regional and national levels.

In spite of her colonial and post-colonial history as a supplier of raw materials, a vast majority of African natural wealth remains untapped (Collier, 2010). These resources are expected to be exploited over the coming two to three decades amid increasing global demand for raw materials. The expected steady depletion of natural resources and the favorable global commodity prices presents Africa with an opportunity to harness this wealth for improving state capacity and living standards. Our research suggests that both of these factors could significantly contribute towards eradication of civil conflict from the African continent.

**Appendices**

**A1. List of Countries in the Sample:**

Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Democratic Republic of Congo, Cote d'Ivoire, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Morocco, Mozambique, Namibia, Niger, Nigeria, Republic of Congo, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe.

**A2. Data Appendix:**

**Civil armed conflict onset**: A dummy variable identifying the grid-cell hosting the first recorded battle location for each intrastate armed conflict with > 25 battle deaths. Source: Sundberg and Melander (2013) and Tollefsen and Buhaug (2012).
**Civil armed conflict incidence**: A dummy variable equals one if at least one intrastate armed conflict with > 25 battle deaths happened in the grid-year. Source: Sundberg and Melander (2013) and Tollefsen and Buhaug (2012).
**Civil armed conflict intensity**: The number of intrastate armed conflict events with > 1 battle deaths observed in the grid-year. Source: Sundberg and Melander (2013) and Tollefsen and Buhaug (2012).
**Natural resource discovery**: Dummy variable taking the value one for at least one discovery of natural resources (giant or major oil/ mineral reserves) in a grid-year. Source: Horn (2004) and MinEx Consulting.
**Oilfield discovery**: Dummy variable taking the value one for at least one discovery of a giant oil reserve in a grid-year. See section 2 for the definition of giant oil reserve. Source: Horn (2004).
**Mineral resource discovery**: Dummy variable taking the value one for at least one discovery of a giant or major mineral reserve in a grid-year. See section 2 for the definition of giant and major mineral reserve and footnote 4 for a list of minerals included in the dataset. Source: MinEx Consulting.
**Democracy**: Democracy score measured by Polity2. Source: Polity IV dataset (Marshall et al., 2014).
**Distance to the border**: Distance (in kilometers) from the grid cell centroid to the border of the nearest neighboring country, regardless of whether the nearest country is located across international waters. Source: Tollefsen and Buhaug (2012).

**Distance to the national capital**: Distance (in kilometers) from the grid cell centroid to the national capital city in the corresponding country. Source: Tollefsen and Buhaug (2012).
**Travel time to the nearest urban center**: Estimated cell-average travel time (in minutes) by land transportation from the cell to the nearest major city with more than 50,000 inhabitants. Travel time is time invariant. Source: Tollefsen and Buhaug (2012).
**Mountainous terrain**: Mountainous terrain as a share of total grid area. Mountainous terrain is time invariant. Source: Tollefsen and Buhaug (2012).
**Forrest cover**: Forest cover as a share of total grid area. Source: Tollefsen and Buhaug (2012).
**Average precipitation**: Average annual precipitation (in millimeters) in the grid cell. Yearly observations covering the period 1946 - 2008. Source: Tollefsen and Buhaug (2012).
**Mean temperature**: Average annual temperature (in degrees Celsius) in the grid cell. Yearly observations covering the period 1946 - 2008. Source: Tollefsen and Buhaug (2012).
**Ethnic level characteristics**: Contains information of the identity of spatially defined, politically relevant ethnic groups settled in the grid cell. The covariates include the ethnic size as a proportion to total population, ethnic total population and their exclusion from executive state power. Source: PRIO-GRID GeoEPR attribute table (Tollefsen and Buhaug, 2012).

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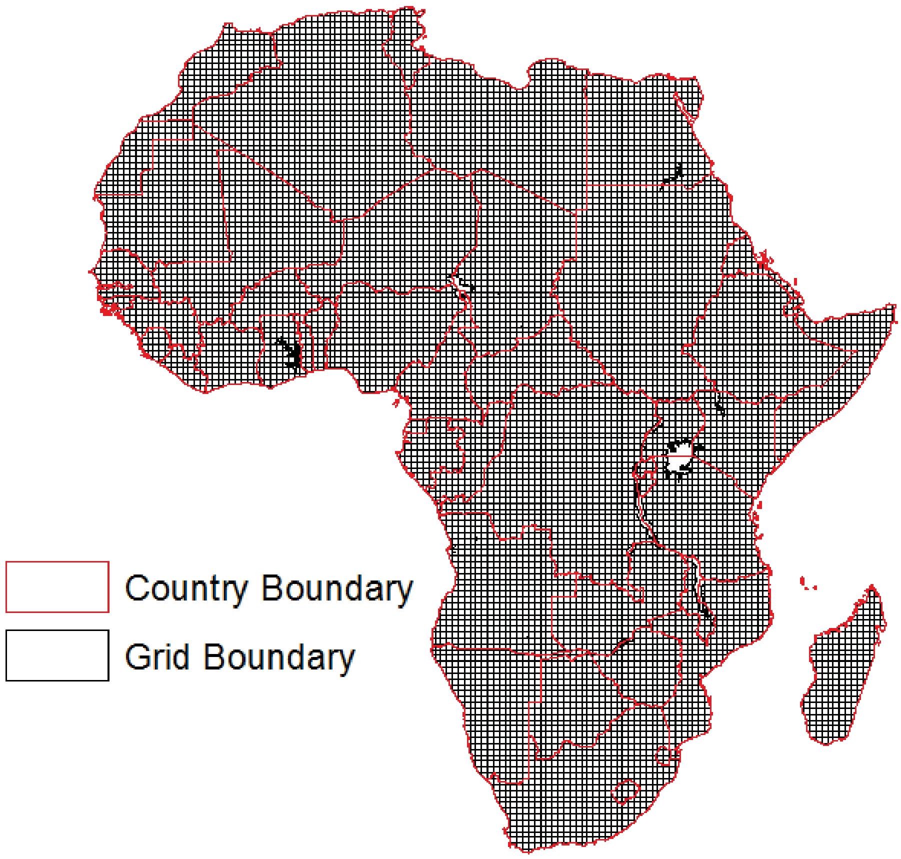
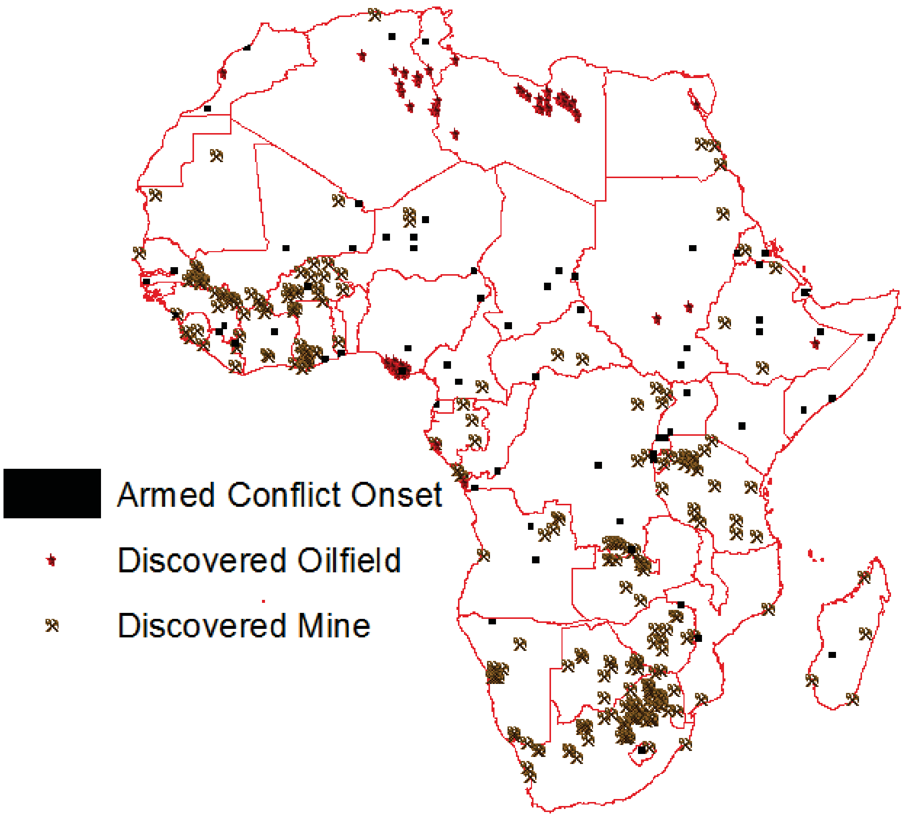
Figure 1: Grid Level Boundary Map of Africa



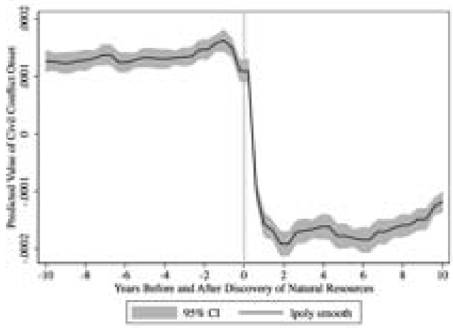

**Notes**: This boundary map is the grid level subnational division of Africa. The grid has a spatial resolution of 0.5 x 0.5 degrees latitude and longitude (i.e. around 55 x 55 kilometers at the equator), dividing the whole continent into equally sized cells. We exclude small island countries (Saint Helena, Seychelles, Sao Tome and Principe, Reunion, Mayotte, Mauritius, Cape Verde and Comoros) and Djibouti. Our sample consists of 10257 grids from 47 African countries.

Figure 2: Oilfield and Mineral Discovery Locations and Armed Conflict Onset

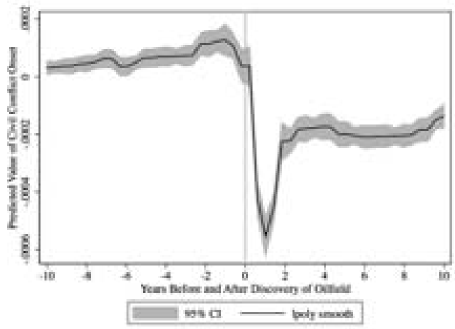



**Notes**: The map shows grids with armed conflict onset over the period 1946 to 2010. The grid-cell hosts the first recorded battle location for each intrastate armed conflict (with > 25 battle-related fatalities). The map also shows the location of mineral deposit and oilfield discoveries in Africa over the period 1946-2010.

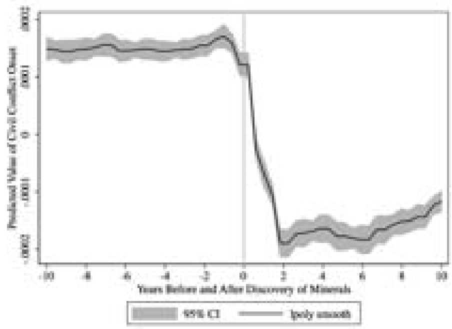
Figure 3: Resource Discovery and Civil Conflict Onset: Predicted Value of Conflict Onset




A: Both Oilfield and Minerals



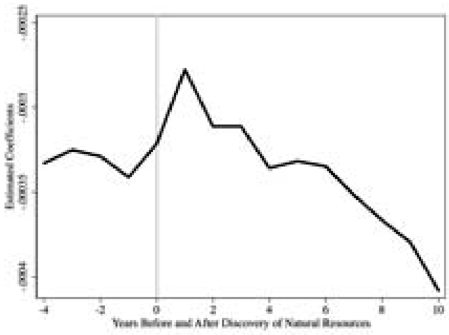

B: Oilfield



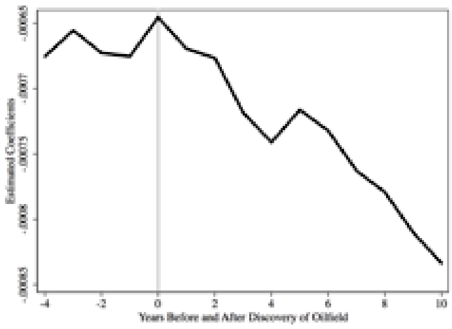

C: Minerals

**Notes**: The figure is plotted using a nonparametric local polynomial regression method with an Epanechnikov kernel, and the bar displays a graph of the smoothed values with 95% confidence intervals. The nonparametric regression is conditional on year and grid fixed effects. We predict the value of civil conflict onset for a given discovery of natural resource in a panel of grid?year observations. The sample period is 1946 - 2008 covering 10257 grids from 47 African countries.

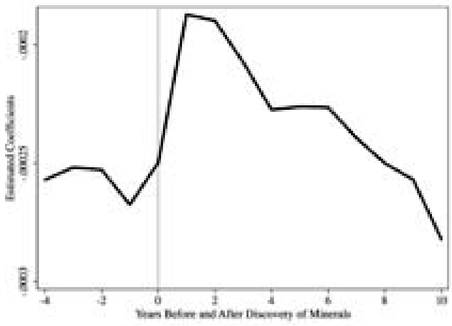
Figure 4: Resource Discovery and Civil Conflict Onset: The Estimated Coefficients




A: Both Oilfield and Minerals




B: Oilfield




C: Minerals

**Notes**: The figure shows the estimated coefficients from the regression of natural resource discovery on civil conflict onset. On the horizontal axis we have the number of years before or after the discovery, ranging from t-4 to t+10. The black lines show the estimated coefficients. All regressions include year and grid fixed effects. The sample period is 1946 - 2008 covering 10257 grids from 47 African countries.

Table 1: Summary Statistics

| Variable | Obs | Mean | Std. Dev. | First Year | Last Year |
|---|---|---|---|---|---|
| **Discovery of Oilfield and Mineral Resources** | | | | | |
| Resource discovery indicator | 646191 | 0.0004 | 0.021 | 1946 | 2010 |
| Years with res. disc. (t-10 to t-1) | 646191 | 0.004 | 0.067 | 1946 | 2010 |
| Oilfield discovery indicator | 646191 | 0.0001 | 0.009 | 1946 | 2010 |
| Years with oil disc. (t-10 to t-1) | 646191 | 0.001 | 0.031 | 1946 | 2010 |
| Mineral discovery indicator | 646191 | 0.0003 | 0.019 | 1946 | 2010 |
| Years with min. disc. (t-10 to t-1) | 646191 | 0.003 | 0.060 | 1946 | 2010 |
| **Civil Armed Conflict** > 25 **annual battle-related fatalities)** | | | | | |
| Conflict onset indicator | 646191 | 0.0001 | 0.011 | 1946 | 2008 |
| Internal conflict incidence | 205140 | 0.161 | 0.368 | 1989 | 2008 |
| **Civil Armed Conflict** (> 1 **annual battle-related fatalities)** | | | | | |
| Conflict onset indicator | 225698 | 0.01 | 0.1 | 1989 | 2010 |
| Conflict incidence indicator | 225698 | 0.02 | 0.15 | 1989 | 2010 |
| Conflict intensity | 225698 | 0.03 | 0.209 | 1989 | 2010 |
| **Democracy Variables** | | | | | |
| Polity2 | 640395 | -3.336 | 3.476 | 1946 | 2008 |
| Resource discovery * Polity2 | 640395 | -0.0005 | 0.105 | 1946 | 2008 |
| Oilfield discovery * Polity2 | 640395 | -0.0004 | 0.053 | 1946 | 2008 |
| Mineral discovery * Polity2 | 640395 | -0.0001 | 0.091 | 1946 | 2008 |
| **Additional Covariates: Grid Level Characteristics** | | | | | |
| Area of the grid cell (sq. km) | 646191 | 7.921 | 0.436 | 1946 | 2008 |
| Distance to the border (km) | 632646 | 4.679 | 1.137 | 1946 | 2008 |
| Distance to national capital (km) | 646191 | 6.242 | 0.773 | 1946 | 2008 |
| Travel time to urban centre (km) | 646191 | 6.210 | 0.837 | 1946 | 2008 |
| Mountainous terrain (% cover) | 624771 | 0.111 | 0.194 | 1946 | 2008 |
| Forest areas (% cover) | 433377 | 2.881 | 1.478 | 1946 | 2008 |
| Average precipitation (mm) | 615814 | 5.976 | 1.050 | 1946 | 2008 |
| Mean temperature (°C) | 615814 | 3.197 | 0.167 | 1946 | 2008 |
| **Additional Covariates: Ethnic Level Characteristics** | | | | | |
| Ethnic size (share in total pop) | 287550 | 2.908 | 0.971 | 1946 | 2008 |
| Ethnic total population | 282165 | 9.392 | 1.080 | 1946 | 2008 |
| Exclusion from state power | 284494 | 0.477 | 0.499 | 1946 | 2008 |

**Notes**: This table reports summary statistics for a panel of 10257 grids from 47 African countries. See data appendix for variable descriptions and data sources.

Table 2: Past Discoveries and Near Future Discoveries

| Dependent Variables | Natural Resource Discovery | | Oilfield Discovery | | Mineral Discovery | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Pooled OLS | FE | Pooled OLS | FE | Pooled OLS | FE |
| Years with discoveries from t-10 to t-1 | 0.014*** | -0.007** | 0.011*** | -0.007 | 0.05*** | -0.007* |
| | (0.003) | (0.003) | (0.005) | (0.006) | (0.003) | (0.004) |
| Year Fixed Effects | No | Yes | No | Yes | No | Yes |
| Grid Fixed Effects | No | Yes | No | Yes | No | Yes |
| Observations | 646191 | 646191 | 646191 | 646191 | 646191 | 646191 |
| Years | 1946-2008 | 1946-2008 | 1946-2008 | 1946-2008 | 1946-2008 | 1946-2008 |
| Number of Grids | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 |
| Number of Countries | 47 | 47 | 47 | 47 | 47 | 47 |

**Notes**: This table reports whether discoveries in a grid's recent past raise the odds of additional discoveries in its near future. Numbers in parentheses are Driscoll-Kraay standard errors. Driscoll-Kraay standard errors are well calibrated when very general forms of cross-sectional and temporal dependence are present. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 3: Natural Resource Discoveries and Civil Conflict Onset

| | Dependent Variable: Intrastate Civil Conflict Onset (> 25 Annual Fatalities) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Pooled OLS | | | | | Fixed Effects | | | | |
| | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) |
| Outcome: | t + 2 | t + 4 | t + 6 | t + 8 | t + 10 | t + 2 | t + 4 | t + 6 | t + 8 | t + 10 |
| **Panel A: Effect of Discovering Natural Resource (Oilfield + Minerals)** | | | | | | | | | | |
| Discovery | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0003 | -0.0003* | -0.0003* | -0.0004* | -0.0004* |
| | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.0002) | (0.0002) | (0.0002) | (0.0002) |
| Past Disc. | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0003** | -0.0003* | -0.0003* | -0.0003* | -0.0004* |
| | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.0002) | (0.0002) | (0.0002) | (0.0002) |
| **Panel B: Effect of Discovering Oilfield** | | | | | | | | | | |
| Discovery | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 |
| | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Past Disc. | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 |
| | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| **Panel C: Effect of Discovering Mineral Resources** | | | | | | | | | | |
| Discovery | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0002 | -0.0002 | -0.0002 | -0.0002 | -0.0003 |
| | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.0002) | (0.0002) | (0.0002) | (0.0002) | (0.0002) |
| Past Disc. | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0002* | -0.0002* | -0.0003* | -0.0003* | -0.0003 |
| | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.0001) | (0.0001) | (0.0001) | (0.0002) | (0.0002) |
| Year FE | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Grid FE | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Obs | 625677 | 605163 | 584649 | 564135 | 543621 | 625677 | 605163 | 584649 | 564135 | 543621 |
| Grids | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 |
| Countries | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 |

**Notes**: This table reports the effect of discovering at least one natural resource in a panel of grid-year observations. The panel uses data from 1946 to 2008. The dependent variable is civil conflict onset. Numbers in parentheses are Driscoll-Kraay standard errors. Driscoll-Kraay standard errors are well calibrated when very general forms of cross-sectional and temporal dependence are present. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. Past Disc. is years with discoveries from t-10 to t-1.

Table 4: Natural Resource Discoveries and Civil Conflict Incidence

| | Dependent Variable: Intrastate Civil Conflict Incidence (> 25 Annual Fatalities) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Pooled OLS | | | | | Fixed Effects | | | | |
| | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) |
| Outcome: | t + 2 | t + 4 | t + 6 | t + 8 | t + 10 | t + 2 | t + 4 | t + 6 | t + 8 | t + 10 |
| **Panel A: Effect of Discovering Natural Resource (Oilfield + Minerals)** | | | | | | | | | | |
| Discovery | -0.103*** | -0.093*** | -0.099*** | -0.067*** | -0.058 | -0.050 | -0.022 | 0.011 | 0.056*** | 0.038 |
| | (0.018) | (0.022) | (0.011) | (0.021) | (0.041) | (0.023) | (0.021) | (0.014) | (0.016) | (0.023) |
| Past Disc. | -0.089*** | -0.081*** | -0.070*** | -0.074*** | -0.084*** | -0.011 | 0.011 | 0.040** | 0.048*** | 0.013 |
| | (0.014) | (0.011) | (0.010) | (0.011) | (0.012) | (0.017) | (0.010) | (0.017) | (0.012) | (0.023) |
| **Panel B: Effect of Discovering Oilfield** | | | | | | | | | | |
| Discovery | -0.158*** | -0.0164*** | -0.170*** | -0.019 | -0.242 | -0.196* | -0.198** | -0.077 | 0.190** | 0.292* |
| | (0.014) | (0.018) | (0.022) | (0.113) | (0.259) | (0.094) | (0.080) | (0.049) | (0.072) | (0.159) |
| Past Disc. | -0.23 | 0.028 | 0.062 | 0.078 | 0.022 | -0.029 | 0.089 | 0.188*** | 0.245*** | 0.095 |
| | (0.070) | (0.070) | (0.073) | (0.074) | (0.061) | (0.090) | (0.055) | (0.054) | (0.076) | (0.125) |
| **Panel C: Effect of Discovering Mineral Resources** | | | | | | | | | | |
| Discovery | -0.099*** | -0.087*** | -0.094*** | -0.075*** | -0.087*** | -0.040 | -0.007 | 0.018 | 0.043*** | 0.012 |
| | (0.019) | (0.023) | (0.011) | (0.016) | (0.024) | (0.023) | (0.018) | (0.017) | (0.013) | (0.021) |
| Past Disc. | -0.096*** | -0.091*** | -0.083*** | -0.088*** | -0.093*** | -0.10 | 0.003 | 0.025 | 0.026*** | 0.002 |
| | (0.010) | (0.009) | (0.007) | (0.009) | (0.014) | (0.012) | (0.010) | (0.017) | (0.010) | (0.013) |
| Year FE | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Grid FE | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Obs | 625677 | 605163 | 584649 | 564135 | 543621 | 625677 | 605163 | 584649 | 564135 | 543621 |
| Grids | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 |
| Countries | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 |

**Notes**: This table reports the effect of discovering at least one natural resource in a panel of grid-year observations. The dataset contains time-varying values for the period 1989 to 2008. The dependent variable is intrastate civil conflict incidence. Numbers in parentheses are Driscoll-Kraay standard errors. Driscoll-Kraay standard errors are well calibrated when very general forms of cross-sectional and temporal dependence are present. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 5: Natural Resource Discoveries and Civil Conflict Intensity

| | Dependent Variable: Intrastate Civil Conflict Intensity (> 1 Annual Fatalities) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Pooled OLS | | | | | Fixed Effects | | | | |
| | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) |
| Outcome: | t + 2 | t + 4 | t + 6 | t + 8 | t + 10 | t + 2 | t + 4 | t + 6 | t + 8 | t + 10 |
| **Panel A: Effect of Discovering Natural Resource (Oilfield + Minerals)** | | | | | | | | | | |
| Discovery | -0.005 | 0.01 | 0.003 | 0.014 | -0.003 | -0.026 | -0.018 | -0.008 | 0.004 | -0.022 |
| | (0.012) | (0.02) | (0.02) | (0.02) | (0.02) | (0.019) | (0.021) | (0.023) | (0.017) | (0.015) |
| Past Disc. | 0.01 | -0.003 | 0.001 | -0.003 | -0.004 | -0.014 | -0.021** | -0.005 | -0.010 | -0.017** |
| | (0.01) | (0.01) | (0.003) | (0.005) | (0.01) | (0.009) | (0.009) | (0.010) | (0.008) | (0.007) |
| **Panel B: Effect of Discovering Oilfield** | | | | | | | | | | |
| Discovery | -0.027*** | -0.027*** | -0.028*** | -0.030 | -0.030 | -0.014 | -0.020** | -0.013 | 0.008 | 0.051* |
| | (0.003) | (0.002) | (0.002) | (0.005) | (0.01) | (0.011) | (0.01) | (0.01) | (0.013) | (0.020) |
| Past Disc. | -0.024*** | -0.024*** | -0.014 | -0.002 | 0.034 | -0.021 | -0.024 | -0.01 | 0.016 | 0.092* |
| | (0.001) | (0.002) | (0.01) | (0.02) | (0.055) | (0.013) | (0.016) | (0.016) | (0.023) | (0.044) |
| **Panel C: Effect of Discovering Mineral Resources** | | | | | | | | | | |
| Discovery | -0.004 | -0.01 | 0.01 | 0.018 | -0.0003 | -0.026 | -0.020** | -0.013 | 0.008 | 0.051* |
| | (0.003) | (0.002) | (0.002) | (0.005) | (0.01) | (0.011) | (0.01) | (0.01) | (0.013) | (0.020) |
| Past Disc. | -0.024*** | -0.024*** | -0.014 | -0.002 | 0.034 | -0.021 | -0.024 | -0.01 | 0.016 | 0.092* |
| | (0.001) | (0.002) | (0.01) | (0.02) | (0.01) | (0.011) | (0.010) | (0.012) | (0.008) | (0.008) |
| Year FE | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Grid FE | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Obs | 625677 | 605163 | 584649 | 564135 | 543621 | 625677 | 605163 | 584649 | 564135 | 543621 |
| Grids | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 |
| Countries | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 |

**Notes**: This table reports the effect of discovering at least one natural resource in a panel of grid-year observations. The panel uses data from 1989 to 2010. The dependent variable is civil conflict intensity. Numbers in parentheses are Driscoll-Kraay standard errors. Driscoll-Kraay standard errors are well calibrated when very general forms of cross-sectional and temporal dependence are present. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 6: Natural Resource Discoveries and Nightlights as a measure of Local Economic Development

| Dependent Variable: Natural Logarithm of Local Economic Development | | | | | | |
|---|---|---|---|---|---|---|
| | Pooled OLS | | | Fixed Effects | | |
| | (1) | (2) | (3) | (1) | (2) | (3) |
| Indicatory of Nat. Resource Discovery | 1.897*** | | | 0.735*** | | |
| | (0.263) | | | (0.192) | | |
| Years with discoveries from t-10 to t-1 | 0.127 | | | -0.323*** | | |
| | (0.347) | | | (0.110) | | |
| Indicatory of Oilfield Discovery | | 3.033*** | | | 1.396*** | |
| | | (0.579) | | | (0.310) | |
| Years with discoveries from t-10 to t-1 | | 0.873 | | | 0.080 | |
| | | (0.655) | | | (0.228) | |
| Indicatory of Min. Resource Discovery | | | 1.819*** | | | 0.703*** |
| | | | (0.246) | | | (0.200) |
| Years with discoveries from t-10 to t-1 | | | 0.065 | | | -0.358*** |
| | | | (0.319) | | | (0.118) |
| Year Fixed Effects | No | No | No | Yes | Yes | Yes |
| Grid Fixed Effects | No | No | No | Yes | Yes | Yes |
| Observations | 215376 | 215376 | 215376 | 215376 | 215376 | 215376 |
| Years | 1992 - 2012 | 1992 - 2012 | 1992 - 2012 | 1992 - 2012 | 1992 - 2012 | 1992 - 2012 |
| Number of Grids | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 |
| Number of Countries | 47 | 47 | 47 | 47 | 47 | 47 |

**Notes**: This table reports the effect of discovering at least one natural resource on local economic development in a panel of grid-year observations. The dependent variable is the natural logarithm of luminosity density adjusted for population size. Numbers in parentheses are Driscoll-Kraay standard errors. Driscoll-Kraay standard errors are well calibrated when very general forms of cross-sectional and temporal dependence are present. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 7: Natural Resource Discoveries, Local Economic Development and Conflict: Testing the Income Effect

| Dependent Variable: Indicator for Intrastate Civil Conflict (> 25 Annual Fatalities) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Pooled OLS | | | | Fixed Effects | | | |
| | Incidence | | Onset | | Incidence | | Onset | |
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| Ln(Econ Development) | -0.002*** | -0.002*** | -0.001*** | -0.001 | -0.004*** | -0.004*** | -0.003*** | -0.003*** |
| | (0.0004) | (0.0004) | (0.0003) | (0.0002) | (0.001) | (0.001) | (0.0001) | (0.0005) |
| Resource Discovery | | -0.008*** | | -0.006*** | | -0.018*** | | -0.011** |
| | | (0.001) | | (0.001) | | (0.006) | | (0.004) |
| Past Discovery | | 0.004 | | 0.003* | | -0.004 | | -0.0003 |
| | | (0.002) | | (0.002) | | (0.003) | | (0.002) |
| Year Fixed Effects | No | No | No | No | Yes | Yes | Yes | Yes |
| Grid Fixed Effects | No | No | No | No | Yes | Yes | Yes | Yes |
| Observations | 215376 | 215376 | 215376 | 215376 | 215376 | 215376 | 215376 | 215376 |
| Years | 1992-2012 | 1992-2012 | 1992-2012 | 1992-2012 | 1992-2012 | 1992-2012 | 1992-2012 | 1992-2012 |
| Number of Grids | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 |
| Number of Countries | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 |

**Notes**: This table reports the effect of discovering at least one natural resource and local economic development on civil conflict in a panel of grid-year observations. The local economic development is natural logarithm of luminosity adjusted for population size. The dependent variable is the onset or incidence of civil conflict. Numbers in parentheses are Driscoll-Kraay standard errors. Driscoll-Kraay standard errors are well calibrated when very general forms of cross-sectional and temporal dependence are present. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 8: Size of Discovery and Civil Conflict Onset

| | Dependent Variable: Intrastate Civil Conflict Onset (> 25 Annual Fatalities) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Pooled OLS | | | | | Fixed Effects | | | | |
| | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) |
| Outcome: | t + 2 | t + 4 | t + 6 | t + 8 | t + 10 | t + 2 | t + 4 | t + 6 | t + 8 | t + 10 |
| **Panel A: Effect of Giant Discovery of Natural Resource (Oilfield + Minerals)** | | | | | | | | | | |
| Discovery | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0003 | -0.0003 | -0.0003 | -0.0004 | -0.0004 |
| | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.0003) | (0.0003) | (0.0004) | (0.0004) | (0.0004) |
| Past Disc. | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0003 | -0.0003 | -0.0003 | -0.0004 | -0.0004 |
| | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.0003) | (0.0003) | (0.0003) | (0.0003) | (0.0004) |
| **Panel B: Effect of Giant Discovery of Mineral Resources** | | | | | | | | | | |
| Discovery | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | 0.00001 | -0.00002 | -0.00003* | -0.00001 | -0.00004 |
| | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.00001) | (0.00002) | (0.00002) | (0.00002) | (0.00002) |
| Past Disc. | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.00003* | -0.00032* | -0.00002 | -0.00002 | -0.00001 |
| | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.00001) | (0.00001) | (0.00001) | (0.00001) | (0.00001) |
| **Panel C: Effect of Major Mineral Discovery** | | | | | | | | | | |
| Discovery | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0003 | -0.0004 | -0.0004 | -0.0004 | -0.0005 |
| | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.0003) | (0.0003) | (0.0003) | (0.0003) | (0.0003) |
| Past Disc. | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0001*** | -0.0004 | -0.0004 | -0.0004* | -0.0005 | -0.0005 |
| | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.0002) | (0.0002) | (0.0003) | (0.0003) | (0.0003) |
| Year FE | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Grid FE | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Obs | 625677 | 605163 | 584649 | 564135 | 543621 | 625677 | 605163 | 584649 | 564135 | 543621 |
| Grids | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 |
| Countries | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 |

**Notes**: The table reports the effect of giant and major discoveries in a panel of grid-year observations. Note that all oil discoveries in the dataset are giant whereas mineral discoveries are giant and major. The panel uses data from 1946 to 2008. The dependent variable is civil conflict onset. Numbers in parentheses are Driscoll-Kraay standard errors. Driscoll-Kraay standard errors are well calibrated when very general forms of cross-sectional and temporal dependence are present. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 9: Size of Discovery and Civil Conflict Incidence

| | Dependent Variable: Intrastate Civil Conflict Incidence (> 25 Annual Fatalities) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Pooled OLS | | | | | Fixed Effects | | | | |
| | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) |
| Outcome: | t + 2 | t + 4 | t + 6 | t + 8 | t + 10 | t + 2 | t + 4 | t + 6 | t + 8 | t + 10 |
| **Panel A: Effect of Giant Discovery of Natural Resource (Oilfield + Minerals)** | | | | | | | | | | |
| Discovery | -0.081*** | -0.072*** | -0.127*** | -0.053*** | -0.021*** | -0.033 | -0.010 | -0.007 | 0.082*** | 0.042 |
| | (0.027) | (0.021) | (0.020) | (0.046) | (0.073) | (0.031) | (0.034) | (0.024) | (0.023) | (0.037) |
| Past Disc. | -0.084*** | -0.082*** | -0.072*** | -0.073*** | -0.093*** | -0.003 | 0.011 | 0.037** | 0.062* | -0.017 |
| | (0.017) | (0.020) | (0.024) | (0.025) | (0.017) | (0.023) | (0.013) | (0.017) | (0.032) | (0.037) |
| **Panel B: Effect of Giant Discovery of Mineral Resources** | | | | | | | | | | |
| Discovery | -0.065* | -0.053* | -0.121*** | -0.074* | -0.095* | -0.0001 | 0.034* | 0.004 | 0.050* | -0.031 |
| | (0.035) | (0.029) | (0.024) | (0.037) | (0.032) | (0.026) | (0.019) | (0.033) | (0.023) | (0.024) |
| Past Disc. | -0.101*** | -0.114*** | -0.0110*** | -0.115*** | -0.125*** | 0.003 | -0.012 | -0.007 | -0.003 | -0.064*** |
| | (0.010) | (0.011) | (0.013) | (0.014) | (0.022) | (0.013) | (0.015) | (0.016) | (0.022) | (0.008) |
| **Panel C: Effect of Major Mineral Discovery** | | | | | | | | | | |
| Discovery | -0.127*** | -0.117*** | -0.087*** | -0.085*** | -0.090*** | -0.064** | -0.031 | 0.026 | 0.038 | 0.034 |
| | (0.025) | (0.037) | (0.025) | (0.026) | (0.034) | (0.027) | (0.019) | (0.025) | (0.023) | (0.024) |
| Past Disc. | -0.103*** | -0.088*** | -0.077*** | -0.082*** | -0.085*** | -0.018 | 0.012 | 0.043* | 0.040** | 0.033* |
| | (0.015) | (0.012) | (0.007) | (0.007) | (0.013) | (0.018) | (0.015) | (0.020) | (0.014) | (0.017) |
| Year FE | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Grid FE | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Obs | 625677 | 605163 | 584649 | 564135 | 543621 | 625677 | 605163 | 584649 | 564135 | 543621 |
| Grids | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 |
| Countries | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 |

**Notes**: The table reports the effect of giant and major discoveries in a panel of grid-year observations. Note that all oil discoveries in the dataset are giant whereas mineral discoveries are giant and major. The panel contains time-varying values for the period 1989 to 2008. The dependent variable is intrastate civil conflict incidence. Numbers in parentheses are Driscoll-Kraay standard errors. Driscoll-Kraay standard errors are well calibrated when very general forms of cross-sectional and temporal dependence are present. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 10: Natural Resource Discoveries and Conflict before and after the End of Cold War

| | Dependent Variable: Intrastate Civil Conflict Incidence (> 25 Annual Fatalities) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Before End of the Cold War (1989) | | | | | After End of the Cold War (1989) | | | | |
| | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) |
| Outcome: | t + 2 | t + 4 | t + 6 | t + 8 | t + 10 | t + 2 | t + 4 | t + 6 | t + 8 | t + 10 |
| **Panel A: Effect of Giant Discovery of Natural Resource (Oilfield + Minerals)** | | | | | | | | | | |
| Discovery | -0.002 | -0.002 | -0.002 | -0.002 | -0.002 | 0.00001 | 0.00002 | 0.00001 | -0.00001 | -0.00001 |
| | (0.0002) | (0.0002) | (0.0002) | (0.0002) | (0.0002) | (0.00001) | (0.00002) | (0.00001) | (0.00001) | (0.00001) |
| Past Disc. | -0.0002 | -0.0002 | -0.0002 | -0.0002 | -0.0002 | 0.00001* | 0.00003*** | 0.00002* | 0.00001 | 0.00001 |
| | (0.0002) | (0.0002) | (0.0002) | (0.0002) | (0.0002) | (0.00001) | (0.00001) | (0.00001) | (0.00001) | (0.00001) |
| **Panel B: Effect of Giant Discovery of Mineral Resources** | | | | | | | | | | |
| Discovery | -0.00001 | -0.00001 | -0.00001 | -0.00001 | -0.00001 | 0.00003 | 0.00002 | -0.00001 | 0.00007** | -0.00001 |
| | (0.00003) | (0.00003) | (0.00003) | (0.00003) | (0.00003) | (0.00004) | (0.00003) | (0.00001) | (0.00002) | (0.00001) |
| Past Disc. | -0.00002 | -0.00001 | -0.00001 | -0.00001 | -0.00001 | 0.00001 | 0.00005*** | 0.00004* | 0.00002 | -0.00001 |
| | (0.00002) | (0.00002) | (0.00002) | (0.00003) | (0.00003) | (0.00001) | (0.00001) | (0.00001) | (0.00001) | (0.00001) |
| **Panel C: Effect of Major Mineral Discovery** | | | | | | | | | | |
| Discovery | -0.0002 | -0.0003 | -0.0002 | -0.0002 | -0.0003 | 0.00001 | 0.00002 | 0.00001 | -0.00001 | -0.00001 |
| | (0.0002) | (0.0002) | (0.0002) | (0.0002) | (0.0002) | (0.00001) | (0.00002) | (0.00001) | (0.00001) | (0.00001) |
| Past Disc. | -0.0003 | -0.0003 | -0.0003 | -0.0003 | -0.0003 | 0.00001* | 0.00003*** | 0.00002* | 0.00001 | 0.00001 |
| (0.0002) | (0.0002) | (0.0002) | (0.0002) | (0.0002) | (0.00001) | (0.00002) | (0.00001) | (0.00001) | (0.00001) | |
| Year FE | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Grid FE | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Obs | 625677 | 605163 | 584649 | 564135 | 543621 | 625677 | 605163 | 584649 | 564135 | 543621 |
| Grids | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 | 10257 |
| Countries | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 |

**Notes**: This table reports the effect of discovering at least one natural resource in a panel of grid-year observations. The panel uses data from 1946 to 2008. The dependent variable is civil conflict onset. Numbers in parentheses are Driscoll-Kraay standard errors. Driscoll-Kraay standard errors are well calibrated when very general forms of cross-sectional and temporal dependence are present. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 11: Natural Resource Discovery, Democracy and Conflict

| Dependent Variable: Intrastate Civil Conflict Onset (> 25 Annual Fatalities) | | | | | |
|---|---|---|---|---|---|
| | | | Fixed Effects) | | |
| | (1) | (2) | (3) | (4) | (5) |
| Outcome: | t + 2 | t + 4 | t + 6 | t + 8 | t + 10 |
| **Panel A: Effect of Giant Discovery of Natural Resource (Oilfield + Minerals)** | | | | | |
| Natural Resource Discovery | -0.0003 | -0.0003 | -0.0003 | -0.0003* | -0.0003* |
| | (0.0002) | (0.0002) | (0.0002) | (0.0002) | (0.0002) |
| Discovery interacted with Polity2 | 0.00002 | 0.00002 | 0.00002 | 0.00002 | 0.00002 |
| | (0.00002) | (0.00002) | (0.00002) | (0.00002) | (0.00002) |
| Years with discoveries from t-10 to t-1 | -0.0003** | -0.0003* | -0.0004* | -0.0004* | -0.0004* |
| | (0.0002) | (0.0002) | (0.0002) | (0.0002) | (0.0002) |
| **Panel B: Effect of Giant Discovery of Mineral Resources** | | | | | |
| Oilfield Discovery | -0.004 | -0.004 | -0.004 | -0.004 | -0.004 |
| | (0.004) | (0.005) | (0.005) | (0.005) | (0.005) |
| Discovery interacted with Polity2 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Years with discoveries from t-10 to t-1 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| **Panel C: Effect of Major Mineral Discovery** | | | | | |
| Mineral Resource Discovery | -0.0002 | -0.0002 | -0.0002 | -0.0003 | -0.0003 |
| | (0.0002) | (0.0002) | (0.0002) | (0.0002) | (0.0002) |
| Discovery interacted with Polity2 | 0.00004 | 0.00004 | 0.00004 | 0.00005 | 0.00005 |
| | (0.00004) | (0.00004) | (0.00004) | (0.00004) | (0.00005) |
| Years with discoveries from t-10 to t-1 | -0.0002* | -0.0002* | -0.0003* | -0.0003* | -0.0003 |
| | (0.0001) | (0.0001) | (0.0001) | (0.0001) | (0.0001) |
| Year and Grid FE | Yes | Yes | Yes | Yes | Yes |
| Obs | 620065 | 599735 | 579405 | 559075 | 538745 |
| Grids | 10257 | 10257 | 10257 | 10257 | 10257 |
| Countries | 47 | 47 | 47 | 47 | 47 |

**Notes**: This table reports the effect of discovering at least one natural resource in a panel of grid-year observations. The panel uses data from 1946 to 2008. The dependent variable is civil conflict onset. The Polity2 score ranges from -10 to +10, with higher values indicating stronger country-level democratic institutions. Numbers in parentheses are Driscoll-Kraay standard errors. Driscoll-Kraay standard errors are well calibrated when very general forms of cross-sectional and temporal dependence are present. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 12: Natural Resource Discoveries and Conflict at the Region and Country Levels

| Dependent Variable: Intrastate Civil Conflict Onset and Incidence (> 25 Annual Fatalities) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Intrastate Civil Conflict Onset (> 25 Annual Fatalities) | | | | | Intrastate Civil Conflict Incidence (> 25 Annual Fatalities) | | | | |
| | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) |
| Outcome: | t + 2 | t + 4 | t + 6 | t + 8 | t + 10 | t + 2 | t + 4 | t + 6 | t + 8 | t + 10 |
| **Panel A: Unit of Analysis - Regions** | | | | | | | | | | |
| Discovery | -0.004*** | 0.001 | -0.003*** | 0.002 | -0.004*** | -0.041 | 0.038 | -0.011 | 0.036* | 0.011 |
| | (0.001) | (0.004) | (0.001) | (0.005) | (0.001) | (0.031) | (0.032) | (0.025) | (0.017) | (0.047) |
| Past Disc. | -0.001 | -0.002** | -0.002** | -0.002** | -0.002** | 0.006 | 0.010 | 0.034** | 0.029* | 0.017 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.018) | (0.010) | (0.013) | (0.016) | (0.013) |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Region FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Obs | 26230 | 25370 | 24510 | 23650 | 22790 | 7740 | 6880 | 6020 | 5160 | 4300 |
| Regions | 430 | 430 | 430 | 430 | 430 | 430 | 430 | 430 | 430 | 430 |
| Countries | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 |
| **Panel B: Unit of Analysis - Countries** | | | | | | | | | | |
| Discovery | -0.021 | 0.007 | 0.054 | 0.027 | -0.056 | -0.053 | -0.024 | -0.022 | 0.013 | -0.006 |
| | (0.023) | (0.017) | (0.055) | (0.057) | (0.053) | (0.034) | (0.050) | (0.067) | (0.071) | (0.094) |
| Past Disc. | 0.00004 | 0.030 | 0.043*** | 0.030* | 0.027** | 0.008 | 0.005 | 0.025 | 0.030 | 0.048** |
| | (0.009) | (0.018) | (0.012) | (0.015) | (0.011) | (0.027) | (0.019) | (0.021) | (0.021) | (0.018) |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Obs | 846 | 752 | 658 | 564 | 470 | 846 | 752 | 658 | 564 | 470 |
| Countries | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 |

**Notes**: This table reports the effect of discovering at least one natural resource in a panel of region-year observations. The panel uses data from 1946 to 2008. The dependent variable is civil conflict onset. Numbers in parentheses are Driscoll-Kraay standard errors. Driscoll-Kraay standard errors are well calibrated when very general forms of cross-sectional and temporal dependence are present. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 13: Natural Resource Discoveries and Conflict: Robustness Tests

| Dependent Variable: Intrastate Civil Conflict Onset (> 25 Annual Fatalities) | | | | | |
|---|---|---|---|---|---|
| | Fixed Effects) | | | | |
| | (1) | (2) | (3) | (4) | (5) |
| Outcome: | t + 2 | t + 4 | t + 6 | t + 8 | t + 10 |
| **Panel A: Robustness to Country Specific Trend** | | | | | |
| Natural Resource Discovery | -0.0003* | -0.0003* | -0.0003* | -0.0004* | -0.0004* |
| | (0.0002) | (0.0002) | (0.0002) | (0.0002) | (0.0002) |
| Years with discoveries from t-10 to t-1 | -0.0003* | -0.0003* | -0.0004* | -0.0004* | -0.0004 |
| | (0.0002) | (0.0002) | (0.0002) | (0.0002) | (0.0002) |
| Year and Grid FE | Yes | Yes | Yes | Yes | Yes |
| Country-Specific Trend | Yes | Yes | Yes | Yes | Yes |
| Obs | 625677 | 605163 | 584649 | 564135 | 543621 |
| Grids | 10257 | 10257 | 10257 | 10257 | 10257 |
| Countries | 47 | 47 | 47 | 47 | 47 |
| **Panel B: Robustness to Additional Covariates** | | | | | |
| Natural Resource Discovery | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Years with discoveries from t-10 to t-1 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Year and Grid FE | Yes | Yes | Yes | Yes | Yes |
| Grid Level Characteristics | Yes | Yes | Yes | Yes | Yes |
| Ethnic Level Characteristics | Yes | Yes | Yes | Yes | Yes |
| Obs | 183812 | 176070 | 168326 | 160600 | 152880 |
| Grids | 4227 | 4227 | 4227 | 4227 | 4227 |
| Countries | 39 | 39 | 39 | 39 | 39 |

**Notes**: This table reports the effect of discovering at least one natural resource in a panel of grid-year observations. The panel uses data from 1946 to 2008. The dependent variable is civil conflict onset. Numbers in parentheses are Driscoll-Kraay standard errors. Driscoll-Kraay standard errors are well calibrated when very general forms of cross-sectional and temporal dependence are present. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. The grid level characteristics are: distance to the border in km, distance to national capital in km, travel time to nearest urban center in minutes, mountainous terrain as share of grid area, forested terrain as share of grid area, average precipitation in grid-year in mm, and mean temperature in grid-year in mm. The ethnic level characteristics are: ethnic size as a proportion of total population, ethnic total population, and ethnic level GDP per capita.