Economic Shocks and Battle Deaths in Civil Wars

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Abstract

This paper estimates the effects of exogenous income (commodity terms of trade (CTOT)) shocks on battle deaths in civil wars. We show that CTOT growth generally decreases conflict. However, in fuel exporting economies with intermediate ethnic fractionalization, dominant, and/or polarized ethnic groups, both negative and positive CTOT shocks increase conflict. The positive effects come from fossil fuel windfalls in fuel exporters.

JEL Classification: D74, O11, O17

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I. Introduction

The death toll in civil wars can vary significantly.[1] In this paper, we use commodity of trade (CTOT) data to estimate the effects of exogenous macroeconomic income shocks on the intensity of civil wars as indicated by the annual death tolls. The change in the CTOT is the change in commodity export earnings relative to import expenditures holding the trade quantities constant (Krugman et al. 2014, Feenstra 2015). Provided commodity prices are determined in global markets, they generate exogenous income variation. We show that declines in commodity earnings increase the death toll. Additionally, in countries with ethnic compositions that have been linked to conflict in previous research and which, additionally, produce and export fossil fuels, fossil-fuel-generated income growth increases conflict. A possible interpretation is that income growth generally decreases conflict by creating economic opportunities. However, in countries that experience a "perfect storm" consisting of fossil-fuel-dependence, rising export prices for fossil fuels, and ethnic compositions that encourage distributional conflict, the rent-seeking effect can dominate the conflict-decreasing effect (Dube and Vargas 2013). Quantitatively, we estimate that a standard deviation increase in the CTOT shock decreases the death toll per ongoing-conflict year by 34-41%. In fuel exporters with adverse ethnic compositions, however, a standard deviation increase in the fossil-fuel component of the CTOT increases the death toll about 32%.

The paper contributes to the empirical conflict literature (Blattman and Miguel 2010). In contrast to studies that relate commodity export prices to conflict (Brückner and Ciccone 2010, Dube and Vargas 2013, Bazzi and Blattman 2014, Maystadt et al. 2014, Bellemare 2015, Sanchez de la Sierra 2015, Aguirre 2016, Andersen et al. 2017, Berman et al. 2017), we study the effects

[1] For example, Online Appendix A depicts the death tolls we observe in Bosnia and Herzegovina, El Salvador, Guatemala, and Nicaragua.

of terms of trade shocks. Janus and Riera-Crichton (2015) find that terms of trade declines predict the onset of civil wars in countries with dominant and polarized ethnic groups. Janus and Riera-Crichton (2018) show that regressing civil war onsets on export and import price changes produces similar coefficient estimates, suggesting that higher import prices as well as declining export prices increase the onset risk. Additionally, since their price measures for imported and exported commodities are positively correlated (Erten and Ocampo 2013) omitting the import-price control biases the export-price estimate upward toward zero. Macroeconomic and international trade theory relate economic decisions to relative prices (Obstfeld and Rogoff 1996, Feenstra 2015).

In the most related paper, Janus and Riera-Crichton (2015) estimate the effects of CTOT growth on the onset risk for civil wars. In the present paper, instead, we estimate the effects of CTOT growth on the battle-related death tolls during the conflict years using a dataset without peace years. The fact that conflict exposure can change economies significantly makes it unclear that the determinants of the onset and "intensity" of conflicts should coincide. For example, the economies of Colombia, Iraq, Somalia, and Syria, where rebel and militia forces control large territories, human and physical capital has been destroyed, and many citizens have been exposed to violence and/or fled (Berman et al. 2011, Valentino et al. 2004) are likely to function differently than without conflict. The decline of governance and the rule of law during conflicts might discourage contract, transport, energy, and capital-intensive activities, such as formal manufacturing, and encourage more informal and labor-intensive activities. Warlords, criminals, as well as official and rebel elements might rely on extortion, looting, smuggling, drug production, and illegal natural resource extraction in order to profit from and finance the conflict (Keen 2000, Rubin 2000, Le Billon 2001, Bannon and Collier 2003, Dube and Vargas 2013, Nunn and Qian 2014). Due to these reasons, wartime economies might function and respond differently than

peacetime economies to economic shocks. In Online Appendix B, we formally test and demonstrate that the conflict-intensity determinants we identify below do not similarly explain the onset of conflict. Particularly, we find no evidence that higher fossil fuel prices can explain the onset of civil wars.

Finally, we contribute by hypothesizing, testing, and presenting evidence for heterogeneous effects of income shocks. We show that, in fossil fuel exporters with ethnic compositions that have previously been associated with conflict, increases in the fossil fuel terms of trade increase violence. Elsewhere, terms of trade growth decreases conflict. These findings appear consistent with Dube and Vargas (2013) who find that oil and mineral prices are positively related to conflict in Colombia, while the prices received in labor-intensive commodity sectors, such as coffee prices, are negatively related to conflict. Aguirre (2016) finds that counter-cyclical fiscal policy helps to prevent conflict after commodity-price shocks in Africa. Counter-cyclicality is most effective after positive mineral-price and negative agricultural price shocks. Maystadt et al. (2014) and Berman et al. (2017) also relate mineral wealth to conflict.

In the remainder of the paper, Section 2 develops the theoretical background. Section 3 presents our data and econometric model. Section 4 presents the baseline results. Section 5 distinguishes the effects of positive and negative shocks and the effects of fossil fuel and other terms of trade shocks in and outside of fuel exporting economies. Section 6 concludes the paper.

II. Theoretical background

(1) The effects of CTOT shocks

Above, we noted that economies should mainly respond to relative price shocks. In order to see this, consider an economy with a representative export good and a representative import good but,

for simplicity, without a non-tradable good. GDP is $Y = C + I + G + NX$ and $NX = \left(p_x X - p_m M \right)$ in the standard notation. If initially $p_x X = p_m M = 10$, a 10% decrease in export prices and a 10% increase in import prices both decrease the trade balance and GDP by $1 on impact. A 10% drop in both export and import prices has no GDP effect. If import prices fall more than export prices, GDP increases despite the fall in export prices. Lederman and Porto (2016) discuss the impact of commodity prices on household welfare based on survey data from Africa and Latin America as well as a review of the literature. They conclude that households spend large budget fractions on commodities, they often depend on commodities to earn income, and international price changes pass through to households. Thus, households appear exposed to CTOT shocks. Online Appendix C explains the effects of terms of trade declines in a standard two-sector neoclassical trade model.

(2) The effects of ethnic dominance and polarization

Ethnically fractionalized countries may lack a social consensus and choose worse economic policies (Easterly and Levine 1997, Rodrik 1999). Although it is unclear that fractionalization *monotonically* increases the conflict risk (Fearon and Laitin 2003, Blattman and Miguel 2010), there is more evidence that countries with a single or multiple large groups are conflict-prone. In the first case, which Collier and Hoeffler (2004) call "ethnic dominance," the large group threatens to expropriate the minorities. The minorities can respond with coups, secession, and rebellion (Horowitz 1985, Posen 1993, Gurr and Harff 1994, Ross 2005, Østby 2008, Fearon and Laitin 2011, McGarry and O'Leary 2013, Weiner 2015).[2]

[2] In Chad and Sudan, for example, the Arab population has historically dominated the smaller groups. The central government's neglect of the peripheries has encouraged conflict. In Indonesia and Russia, the traditional dominance

If, instead, there are multiple large groups, they might invest a lot of effort into conflict (Esteban and Ray 1994, 1999). Esteban and Ray's (1994) social *polarization* index measures polarity in the size distribution and social distances between groups in society. Ethnic polarization and competition between large ethnic groups might explain the conflict histories of Afghanistan, Angola, Bosnia, Croatia, Guatemala, Iraq, Israel, Lebanon, and Sri Lanka. Most empirical studies using the index assume that the inter-personal distance is unity between members of different groups and zero within the groups (Montalvo and Reynal-Querol 2005, Esteban et al. 2012). In that case, the polarization index is maximized when there are two equally large groups.

(3) The heterogeneous effects of income shocks

The evidence suggests that both negative (Miguel et al. 2004, Miguel 2005, Brückner and Ciccone 2010, Blattman and Miguel 2010) and positive income shocks can increase conflict. The problem with positive shocks may be rent-seeking incentives. In the 1990s, Somali warlord fought to control US food aid (Dowden 2009, Albright 2013, Nunn and Qian 2014). Angrist and Kugler (2008) link coca production to violence in Colombia. During Sri Lanka's civil war, the Tamil Tigers used remittances to pay for military equipment; Angola's UNITA rebels and Sierra's Leone's Revolutionary United Front may have relied on diamonds (Bannon and Collier 2003). Dube and Vargas (2013) link price gains for capital-intensive commodity sectors to conflict.[3]

Apart from non-monotonic effects, positive and negative income shocks may have asymmetric effects. For example, after negative shocks, the desire to avoid starvation and

of the Javanese and Russians have encouraged ethnic minorities in Aceh, East Timor, West Papua, and Chechnya to secede. Sri Lanka's Tamil Tigers fought to secede from the Sinhala-dominated central government.

[3]See Le Billon (2001) Ross (2003), Bahney et al. (2010) and Global Witness 2015) for other examples.

bankruptcy thresholds can encourage risk-taking to escape from the threshold. In a behavioral model, loss-aversion can encourage risk-taking after negative shocks (Thaler and Johnson 1990, Jervis 1992, Thaler et al. 1997). Negative shocks might increase create psychological distress and encourage individuals to look for "scapegoats" (Miguel 2005, Cramer 201, Zivin et al. 2011). In turn, the subjective return to violence might increase even if the monetary return decreases due to a fall in the contestable rent. Conversely, income booms due to positive price shocks resemble lottery earnings. As such, they might encourage exuberant or other irrational behaviors (Ross 1999, Shiller 2000, Akerlof and Shiller 2010), including rent-seeking. Alternatively, political elites might appropriate the income gains after positive shocks, but after negative shocks they can only decrease appropriation to zero. After a point, then, the citizens bear the entire loss.

III. Data and Estimation

In the following, we explain the data sources, variable definitions, and estimation procedure. Tables 1 and 2 display the summary statistics for the data.

[Table 1 Goes Here]

[Table 2 Goes Here]

Armed Conflict: We use the conflict data for internal and internationalized internal armed conflicts for the 1946-2008 period provided by the Uppsala Conflict Data Program and the Peace Research Institute of Oslo (UCDP/PRIO). Focusing on internal wars allows us to exclude interstate conflicts and extra-systemic conflicts, which involve a state fighting a non-state group abroad.

Since, in these cases, one of the conflict actors is based abroad (and it may be a foreign government), commodity price shocks may have different effects than in internal conflicts. The definitions of armed conflict and internal armed conflict are as follows (Gleditsch et al. (2002) and Themnér & Wallensteen (2011), Codebook for the UCDP/PRIO Armed Conflict Dataset, Version 4, 1, 9; Lacina and Gleditsch (2005), Battle Deaths Dataset, Codebook for Version 3, 2009, 2)

> '[An armed conflict is] a contested incompatibility that concerns government or territory or both where the use of armed force between two parties results in at least 25 battle-related deaths. Of these two parties, at least one is the government of a state."
>
> "Internal armed conflict occurs between the government of a state and one or more internal opposition group(s) without intervention from other states…Internationalized internal armed conflict occurs between the government of a state and one or more internal opposition group(s) with intervention from other states (secondary parties) on one or both sides.'

Battle-related Fatalities: The battle-related fatalities data comes from Lacina and Gleditsch (2005) and includes 1957 observations of battle-related fatalities from 1946-2008. We use the version of the dataset that is compatible with the conflict dataset we described above. 1717 of the battle death observations in this dataset are linked to internal or internationalized internal armed conflicts rather than interstate and extra-systemic conflict. The definition of battle-related fatalities is (Lacina and Gleditsch (2005), Battle Deaths Dataset, Codebook for Version 3, 2009, 2)

> '…those deaths caused by the warring parties that can be directly related to combat over the contested incompatibility. This includes traditional battlefield fighting, guerrilla activities (e.g. hit-and-run attacks/ambushes) and all kinds of bombardments of military bases, cities and villages etc. Urban warfare

(bombs, explosions, and assassinations) does not resemble what happens on a battlefield, but such deaths are considered to be battle-related. The target for the attacks is either the military forces or representatives for the parties, though there is often substantial collateral damage in the form of civilians being killed in the crossfire, indiscriminate bombings, etc. All fatalities – military as well as civilian – incurred in such situations are counted as battle-related deaths.'

Due to the difficulty of establishing the exact number of battle-related fatalities per year, Lacina and Gleditsch (2005) provide a "low" and a "high" estimates for all observations and, for about 70% of the observations, they further provide a "best" estimate. Since they provide the data at a country-year-conflict level, we add the low, high and best estimates within country-years to get a country-year panel of low, high, and best estimates. Table 1 shows that the low estimates range from 10 to 50,000 with a mean of 1,478. The high estimates range from 25 to 250,000 with a mean of 7,319. The best estimates average 4,061 with a standard deviation of 9,132.

Our main empirical measure is the best country-year estimate, unless it does not exist. If it does not exist, we construct an "imputed" best estimate. The imputed best estimate is the sum across ongoing conflicts within a country-year of the best conflict-specific estimate or, if it does not exist for that conflict, the average of the low and high estimates for the conflict. This methodology follows Bazzi and Blattman (2014). If we alternatively dropped the country-years with missing best estimates, we could be dropping a selected sample and get selection bias. For example, countries that have multiple ongoing conflicts – making missing data more likely *ceteris paribus* - may have many ethnic groups and poor data collection. In any case (see below) our qualitative results are robust to using the low and high instead of the "best" and "imputed best" estimates. They are also robust to using only battle-deaths estimates derived from year-specific sources in Lacina and Gleditsch (2005), which excludes most of the imputed observations.

Ethnicity: In order to study the effects of ethnic dominance and polarization, we first observe that they are conceptually distinct. The ethnic dominance concept identifies countries where a single large group lives together with smaller group(s) that it can potentially dominate. In polarized countries, there are several large groups. Unfortunately, Janus and Riera-Crichton (2015) show that it is difficult to distinguish countries with dominant ethnic groups (defined as when the largest groups represents about 50-85% of the population), countries with a high Esteban and Ray (1994) polarization index, and countries with an intermediate (25^{th}-75^{th} percentile) Herfindahl-Hirschman ethnic fractionalization index.. Figure 1 copies Janus and Riera-Crichton (2015) Figure 1. The figure suggests that it is difficult to disentangle intermediately fractionalized countries from countries with dominant groups and polarized countries. In the following, we start with using an intermediate-fractionalization (IF) indicator and then we show that using an ethnic-dominance or high-polarization indicator produces similar estimates. All three indicators come from Janus and Riera-Crichton (2015). The IF indicator equals one when countries fall in the 25^{th}-75^{th} percentile of the Herfindahl-Hirschman ethnic-fractionalization index given by $ef = 1 - \sum_{i=1}^{n} s_i^2$,where s_i is the population share of group i. The ethnic-dominance indicator equals one when the largest ethnic group represents 50-85% of the population. The high-polarization indicator equals one when the Esteban and Ray (1994) polarization index under the assumptions in Montalvo and Raynal-Querol (2005), $pol = 4\sum_{i=1}^{n} s_i^2(1 - s_i)$, exceeds the median. The ethnicity data comes from Fearon (2003).

Commodity Terms of Trade: The dataset for commodity terms of trade (CTOT) covers the period from 1970-2008. The CTOT index was originally developed by Ricci et al. (2008) and Spatafora and Tytell (2009) and is defined as

$$CTOT_{jt} = \prod_i (P_{it} / MUV_t)^{X_j^i} / \prod_i (P_{it} / MUV_t)^{M_j^i} \quad (1)$$

where $CTOT_{jt}$ is the CTOT index for country j in year t; P_{jt} is a common price index for each of six commodity categories (food, fuels, agricultural raw materials, metals, gold, and beverages); X_j^i is the average share of exports of commodity i in GDP from 1970 to 2006; M_j^i is the corresponding average share of imports; and the commodity prices are deflated by a manufacturing unit value index (MUV). The fact that X_j^i and M_j^i are averaged over the sample year ensures that the CTOT index is invariant to changes in export and import volumes in response to conflict outcomes, thus isolating the effect of commodity price fluctuations. If we compute the change in the log CTOT we can get the approximate CTOT growth rate per year

$$\ln CTOT_{jt} - \ln CTOT_{j(t-1)} = \ln\left(\frac{\prod_i (P_{it} / MUV_t)^{X_j^i}}{\prod_i (P_{i(t-1)} / MUV_{t-1})^{X_j^i}} \right) - \ln\left(\frac{\prod_i (P_{it} / MUV_t)^{M_j^i}}{\prod_i (P_{it(-1)} / MUV_{t-1})^{M_j^i}} \right) \quad (2)$$

Following Brückner and Ciccone (2010), Bazzi and Blattman (2014), and Janus and Riera-Crichton (2015), we note that the annual commodity price shocks may be serially correlated and have lagged conflict effects. In order to address this concern, we focus on the growth rate of the three-year moving average of the terms of trade index,

$$\Delta CTOT_{jt} = \ln \sum_{s=t-2}^{t} CTOT_{js} / 3 - \ln \sum_{s=t-3}^{t-1} CTOT_{js} / 3 \quad (3)$$

Since the growth rate of the three-year moving average index approximately equals the average annual growth rate over the three-year period (see the appendix to Janus and Riera-Crichton 2015), we can interpret every % (0.01) increase in the index as a mean increase of 1% per year over three years. In order to test whether it is appropriate to include the change in the moving average CTOT index in the regressions instead of including the three component *annual* CTOT shocks, we first included the annual shocks and tested whether the coefficients differed. However, we find no consistent evidence that this is the case. Nor is there a pattern suggesting that one of the lagged terms is a better battle-deaths predictor than the other terms.

Estimation: The estimation regresses the logarithm of the number of battle-related fatalities on the 3-year-moving-average CTOT growth rate in equation (3) in a linear specification with country and year fixed effects, country-specific time trends, and robust standard errors that we cluster at the country level to control for serial correlation. Following Bazzi and Blattman (2014), we also include a control for the duration of the conflict and a dummy for the first conflict-year. The regressions take the form

$$b_{jt} = \alpha + \beta \Delta CTOT_{jt} + \gamma \Delta CTOT_{jt} \times ID_j + d_{jt} + f_{jt} + \mu_j + z_t + \rho_j t + \varepsilon_{jt}, \quad (4)$$

where b_{jt} is the natural logarithm of the number of battle-related fatalities in country j in year t, $\Delta CTOT_{jt}$ is the growth rate of the three-year moving-average CTOT index, ID_j is the time-invariant dummy for the IF countries, and d_{jt} and f_{jt} represent the duration of the conflict since the onset year and a dummy for the first conflict year. Finally, μ_j and z_t are country and year fixed effects, $\rho_j t$ is the country-specific time-trend, and ε_{jt} is the error term.[4]

IV. Results

Table 3, Column (1) presents the results of regressing the natural logarithm of the annual battle-related death toll on the *annual* CTOT shocks for periods t, t-1, and t-2 as well as their interactions with the IF indicator. The sum of the non-interacted CTOT coefficients s significant and negative. Thus, terms of trade growth is associated with a declining death toll outside of the IF economies. Since the sum of the direct and interaction terms is insignificant, however, there does not appear to exist a linear relationship for IF countries as a whole.

In column (2), we use the growth rate of the three-year moving average CTOT, $\Delta CTOT$, instead of the annual growth rates. Column (3) replaces the IF indicator based on Fearon's (2003) ethnicity data an indicator based on the Alesina et al. (2003) data. Column (4) controls for the lagged dependent variable to control for persistence in battle deaths (Bazzi and Blattman 2014); in order to correct the dynamic panel bias, we use the random-effects procedure in Hausman and

[4] Bazzi and Blattman (2014) estimate battle deaths with a interval regressions. Online Appendix D explains why we use a linear fixed-effects probability model. Mainly, the interval estimator makes it difficult to include country fixed effects and non-normally-distributed errors can bias the estimates. Online Appendix D also explains why we believe that the country-level may be a suitable unit of analysis despite growing availability of subnational data.

Taylor (1981) and Amemiya and MaCurdy (1986).[5] Column (5) restrict the sample to observations at least three years into the conflict since $\Delta CTOT$ is a a 3-year moving average shock. Following Bazzi and Blattman (2014), Column (6) focuses on observations where Lacina and Gleditsch (2005) observe year-specific deaths rather than rely on interpolated or noisy estimates (Lacina 2009, 5). Column (7) imposes the sample restrictions from Columns (5)-(6) simultaneously. Column (8) replaces the country fixed effects and country-specific time trends with conflict-episode-fixed effects and a quadratic conflict-episode-specific time trend in case death tolls are systematically smaller at the beginning and ending of conflict episodes. In all cases, the results remain similar. Tables A2-A3 in Online Appendix E show that the results remain similar if we replace the intermediate-diversity dummy with eight alternative indicators for intermediate ethnic diversity, ethnic polarization, and ethnic dominance (Table A1) and control for interactions between the CTOT shock and geographic, historical, and non-ethnic diversity (Table A2).

[Table 3 Goes Here]

In Table 4, we test whether positive and negative CTOT shocks, $\Delta CTOT_{jt}^{+} \equiv Max\{\Delta CTOT_{jt}, 0\}$ and , have different effects. Note that the effect of a CTOT decline is *minus* the coefficient on $\Delta CTOT_{jt}^{-}$ .The estimates in Column (1) suggest that the effects are highly asymmetric in the sense that both positive and negative shocks increase the death toll.

[5] The Hausman-Taylor estimation declares the dynamic regressor endogenous. It is infeasible to use the alternative General Methods of Moments (GMM) Arellano and Bond (1991, 1998) estimator because the number of time periods in our panel does not exceed the number of panel units.

In Columns (2)-(3), we divide the sample into IF and other countries. The estimates suggest that positive and negative shocks only have asymmetric effects in IF countries. Column (4) reports the estimate for the remaining sample without the positive-negative decomposition. Inspecting the partial residual plots and the estimates resulting from dropping one country at a time, however, suggest that the Column (4) estimate is sensitive to including or dropping Indonesia from the sample: dropping any of the 38 sample countries other than Indonesia keeps the $\Delta TOT(t)$ estimate in the range [-18.6, -12.2], close to the original -15.6 estimate. However, dropping Indonesia increases the estimate to -28.6 (Column (5)). When we examined the case-study evidence for Indonesia (see Online Appendix F), we found that it is a, potentially, a borderline case: whether it meets our criteria for being intermediately fractionalized and having ethnic dominance depends on whether one treats the largest two ethnic groups, the Javanese and the Sundanese, which both live on Java, as a single group. Ross (2005) notes that several observers do so. Given that outlier effect an borderline nature of Indonesia, Column (5) reports the estimates without Indonesia as well. With Indonesia in the sample, the Column (4) estimate is insignificant ($p=0.16$). Without Indonesia, the Column (5) estimate implies that a standard deviation increase in CTOT growth decreases the annual death toll by 34%.

[Table 4 Goes Here]

Table 5 shows that the results for IF countries – the fact that their death tools respond to both positive and negative CTOT shocks – remain similar when we divide the sample according to (i) low and high ethnic polarization and (ii) the presence and absence of a dominant ethnic group. In Table 6, we test the robustness of the results to using alternative dependent variables. (i) the lowest

estimate for the annual death toll implied by Lacina and Gleditsch (2005); (ii) the highest implied estimate; and (iii) an ordinal measure that equals one when the best or imputed best estimate is at most 1000 and two when the best or imputed best estimate exceeds 1000.

In Table 7, similarly, we replicate the Table 4, Columns (4)-(5) regressions for the NIF countries with and without the inclusion of Indonesia. The results again remain similar.

[Table 5 Goes Here]

[Table 6 Goes Here]

[Table 7 Goes Here]

V. The effects of fossil fuel dependence and fossil fuel terms of trade shocks

In this section, we try to explain why positive CTOT shocks increase conflict in IF countries. First, we note that several studies have found that price increases for capital-intensive natural resource sectors, such as the oil sector, increase conflict (Dube and Vargas 2013; Aguirre 2016). Increases in relative prices of capital-intensive goods might increase the return to rent seeking (Dal Bó and Dal Bó 2011). Additionally, fossil fuel resources are often geographically concentrated, so ethnic groups that live in resource-rich areas might fight to increase their autonomy and revenue shares (Le Billon 2001; Ross 2004). Alternatively, the central government can invade the regions (Ross 2005). The conflicts between the Iraqi government and the Iraqi Kurds, Sudan's Second Civil War, and Indonesia's secessionist conflicts, for instance, pitted ethnic groups associated with central

governments against peripheral groups with access to oil and natural gas. Both the capital-intensity and the geographic-concentration hypotheses link price increases for fossil fuels to conflict.

Our second idea comes from the resource-curse literature. Oil dependence might encourage the growth of undemocratic, corrupt, and repressive "rentier states," where the political elite uses resource income, such as royalties, to finance high living standards. Further, since the state is relatively independent on tax collections, it may have little incentive to invest in economic development and state capacity through improving the legal system, the quality of the bureaucracy, the ability to collect income taxes, and so forth. (Smith 2004; Fearon 2005; Basedau and Lay 2009, Ross 2012). The most extreme example may be Equatorial Guinea, whose 2015 PPP-based GDP per capita of $30,000 was about the same as Portugal's, but whose Human Development Index – a broader development measure that is tracked by the United Nations Development Program and responds to health and education as well as income – looks like Zambia's.

On the basis of these ideas, we ask whether fossil-fuel-generated terms of trade shocks have different effects than non-fuel terms of trade shocks and whether fuel and non-fuel shocks have different effects in fuel-dependent compared to other economies. In order to do so, we decompose the change in the (log) three-year-moving average terms of trade index into the change in the fossil fuel component – the fossil fuel category includes coke, coal, and briquettes; petroleum and petroleum products; and gas (natural and manufactured) – and the change in the remaining commodities component. Second, we define fuel-dependent economies as countries whose average export share of fossils fuels in GDP from 1970-2006 (the year range we use to construct the CTOT-index) exceeded its import share and 2% of GDP.

In Table 8, Column (1) presents the estimates for positive and negative CTOT shocks (not yet disaggregated by commodity category) in IF fuel exporters, NIF fuel exporters, IF non-fuel

exporters, and NIF non-fuel exporters. The estimates imply that positive CTOT shocks increase conflict intensity in fuel exporters, including the NIF fuel exporters. However, 91% (89/98) of the observations for NIF fuel-exporters come from just four countries – Angola, Azerbaijan, Indonesia, and Sudan - that have a history of ethnic conflict involving large or dominant ethnic groups. Moreover, although their ethnic fractionalization levels are outside the 25^{th}-75^{th} percentiles we use to define the IF economies, they are in the 15^{th}-85^{th} percentiles. In Online Appendix G, we study the individual conflicts that generated these 89 observations and conclude that they were ethnic conflicts that were, at least in part, either motivated or financed by natural resources. On this basis we believe the best interpretation of the data may be that it is the interaction between fuel-dependence and ethnic tensions that encourages conflict after positive income shocks. In order to support this idea, Column (2) shows that, if we widen the IF definition from countries in the 25^{th}-75^{th} ethnic fractionalization percentile to countries in the 15^{th}-85^{th} percentile, the coefficient on the positive CTOT shocks in NIF fuel exporters turns negative. Nonetheless, in order to firmly rule out that terms of trade growth in fuel exporters increases conflict *regardless of ethnic composition*, we would need e more observations for fuel exporters with alternative ethnic compositions.[6]

[Table 8 Goes Here]

[6] Unfortunately, we only have 9 observations for NIF fuel exporters, that is, countries with very high or low ethnic fractionalization. The very fact that we have so few observations for these countries, however, suggests that they may be unlikely to experience civil war in the first place (Fearon and Laitin 2003; Collier and Hoeffler 2004).

In Table 9 we focus on NIF fuel exporters but decompose the CTOT shocks sand ask whether positive fossil fuel CTOT shocks as opposed to other positive CTOT shocks cause conflict. Column (1) suggest that this is the case. A standard deviation (0.011) increase in the fossil fuel CTOT shock increases the annual death toll in IF fuel exporters by about 32%. Columns (2)-(3) show that the results for ethnic dominance and ethnically polarized countries are similar.

Finally, the positive relationship between fossil fuel CTOT growth and conflict raises the concern that conflict upticks in fuel exporters increase global fuel prices, creating reverse causality. Note, however, that the reverse-causality hypothesis would only be able to explain the positive sign on the positive CTOT shocks in Table 9. It cannot explain the negative sign on the negative shocks. In other words, if increases and decreases in conflict caused, respectively, positive and negative changes in global fuel prices, the coefficients on both negative and positive shocks should be positive, which is not what we observe.

In order to, nonetheless, address the issue, we inspected the sample countries and removed the ones that could plausibly affect global oil prices. Reviewing the Table 9, Column (1) sample immediately suggests that we should omit Saudi Arabia. Dropping the single Saudi Arabia observation, however, gives virtually identical results. Additionally, Iran, Iraq, Mexico Oman, Russia, Saudi Arabia, and Venezuela could be important for global fuel prices (Kilian 2014). Given that dropping these countries only leaves us with 3 of the original 10 IF fuel exporters and just 40 observations, we expand the IF definition to countries in the 15^{th}-85^{th} rather than 25^{th}-75^{th} ethnic-fractionalization percentile. Thus, we add Angola, Azerbaijan, Indonesia, and Sudan to the fuel exporter sample. Column (4) reports the estimates for all fuel exporters in 15^{th}-85^{th} ethnic fractionalization percentile. Column (5) shows that dropping Iran, Iraq, Mexico Oman, Russia, Saudi Arabia, and Venezuela only increases the positive-shock (as well as the negative-shock)

estimates. These results suggest that reverse causality is unlikely to explain the paper's findings. Dube and Vargas (2013), similarly, conclude that higher oil prices increase in Colombia, which supplies less 1% of the world's oil (Dube and Vargas 2013).[7]

[Table 9 Goes Here]

VI. Conclusion

This paper estimated the effects of commodity terms of trade (CTOT) shocks on battle deaths in civil wars. We found that CTOT growth generally decreases conflict. However, in fuel exporting economies with intermediate ethnic fractionalization, dominant, and/or polarized ethnic groups, both negative and positive CTOT shocks increase conflict. The positive effects come from fossil fuel windfall in fuel-exporters. A possible interpretation is that income growth usually diminishes conflict by creating more economic opportunities and increasing the opportunity cost of fighting, but in countries that experience a "perfect storm" composed of fuel-dependence, booming fuel prices, and adverse ethnic compositions, the rent-seeking incentive can increase enough to increase conflict despite the rising opportunity cost of fighting. Quantitatively, we estimate that a standard deviation increase in the CTOT shock decreases the death toll per ongoing-conflict year by 34-41%. In fuel exporters with adverse ethnic compositions, however, a standard deviation increase in the fossil-fuel component of the CTOT increases the death toll about 32%. Finally, the study suggests that economic stabilization policies might diminish the death toll in civil wars.

[7] In order to ensure that outlier effects do not explain the results, Online Appendix H depicts the partial residuals for the positive and negative fossil fuel terms of trade shocks in the Table 9, Column (1) and (5) specifications.

References

Aguirre, Alvaro. (2016). 'Fiscal Policy and Civil Conflict in Africa' *Journal of African Economies* 25 (4): 614-36.

Akerlof, George A., and Robert J. Shiller. *Animal spirits: How human psychology drives the economy, and why it matters for global capitalism*. Princeton University Press, 2010.

Alesina, A., Devleeschauwer, A., Easterly, W., Kurlat, S. and Wacziarg, A. (2003). 'Fractionalization.' *Journal of Economic Growth* 8 (2): 155-94

Amemiya, T. and MaCurdy, T. E. (1986). 'Instrumental-Variable Estimation of An Error-Components model.' *Econometrica* 54 (4): 869-80.

Andersen, J., Frode, J., Nordvik, M., and Tesei, A. (2017). 'Oil and Civil Conflict: On and Off (Shore).' *Centre for Applied Macro- and Petroleum Economics (CAMP) Working Paper Series* No. 1/2017

Angrist, Joshua D., and Kugler, Adriana D. (2008). 'Rural windfall or a new resource curse? Coca, income, and civil conflict in Colombia.' *Review of Economics and Statistics* 90 (2): 191-215.

Arellano, M., and Bond, S. R. (1991). 'Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations.' *Review of Economic Studies*, 58(2): 277–97.

Arellano, M., and Bond, S. R. (1998). 'Initial Conditions and Moment Restrictions in Dynamic Panel Data Models.' *Journal of Econometrics* 87(1): 115-43.

Bahney, Benjamin Howard J. Shatz, Carroll Ganier, Renny McPherson and Barbara Sude with Sara Beth Elson, Ghassan Schbley. 2010. *An Economic Analysis of the Financial Records of al-Qa'ida in Iraq*. Rand Corporation.

Bannon, I., and Collier P. (eds.). (2003). *Natural resources and violent conflict: options and actions*. Washington, DC: World Bank Publications.

Basedau, M., and Lay, J. (2009). 'Resource curse or rentier peace? The ambiguous effects of oil wealth and oil dependence on violent conflict.' *Journal of Peace Research* 46 (6): 757-76.

Bazzi, S., and Blattman, C. (2014). 'Economic Shocks and Conflict: Evidence from Commodity Prices.' *American Economic Journal: Macroeconomics* 6 (4): 1-38.

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

Berman, Nicolas, Mathieu Couttenier, Dominic Rohner, and Mathias Thoenig (2017). This Mine is Mine! How Minerals Fuel Conflicts in Africa. *American Economic Review* 107(6), 1564-1610.

Blattman, C., and Miguel E. (2010). 'Civil War.' *Journal of Economic Literature* 48 (1): 3–57.

Collier, P. and Hoeffler, A. (2004). 'Greed and grievance in civil war.' *Oxford economic papers* 56 (4): 563-595.

Dowden, R. (2009). *Africa: Altered States, Ordinary Miracles*. New York: Public Affairs

Dube, O. and Vargas, Juan F. (2013). 'Commodity Price Shocks and Civil Conflict: Evidence from Colombia.' *Review of Economic Studies* 80 (4): 1384-1421.

Easterly, William, and Ross Levine (1997). Africa's growth tragedy: policies and ethnic divisions." *The quarterly journal of economics* 112(4): 1203-1250.

Esteban, J. and Ray, D. (1994). 'On the Measurement of Polarization.' *Econometrica 62* (4): 819–51.

Esteban, J. and Ray, D. (1999). 'Conflict and distribution.' *Journal of Economic Theory* 87 (2): 379-415.

Esteban, J., Mayoral, L. and Ray, D. (2012). 'Ethnicity and Conflict: An Empirical Study.' *American Economic Review* 102 (4): 1310-42.

Fearon, James D. (2003). 'Ethnic and Cultural Diversity by Country.' *Journal of Economic Growth* 8: 195-22.

Fearon, James D. (2005). 'Primary commodity exports and civil war.' *Journal of conflict Resolution* 49 (4): 483-507.

Fearon, James D. and Laitin, D. (2003). 'Ethnicity, Insurgency, and Civil War.' *American Political Science Review* 97 (1): 75-90.

Fearon, James D. and Laitin, D. (2011). 'Sons of the Soil, Migrants, and Civil War.' *World Development* 39 (2): 199-211.

Feenstra, Robert C. (2015). *Advanced international trade: theory and evidence*. 3rd ed. New Jersey: Princeton University Press.

Hausman, J. and Taylor, W. (1981). 'Panel data and unobservable individual effects.' *Econometrica* 49 (6): 1377– 1398.

Havard Strand. (2002). 'Armed Conflict 1946-2001: A New Dataset.' *Journal of Peace Research* 39 (5): 615-37. Codebook for Version 4-2009 available at https://www.prio.org/Data/Armed-Conflict/UCDP-PRIO/Armed-Conflicts-Version-X-2009/

Hirshleifer, Jack. (1991). 'The paradox of power.' *Economics and Politics,* 3 (3): 177-200.

Horowitz, D. (1985). *Ethnic Groups in Conflict*. Berkeley: University of California Press.

Janus, T. and Riera-Crichton, D. (2015). 'Economic Shocks, Civil War and Ethnicity.' *Journal of Development Economics* 115: 32-44.

Janus, T. and Riera-Crichton, D. (2018), forthcoming 'Controlling for Import Price Effects in Civil War Regressions.' *Peace Economics, Peace Science and Public Policy*

Jervis, Robert. (1992). 'Political implications of loss aversion.' *Political Psychology* 13 (2): 187-204.

Keen, David. (2000). *Incentives and disincentives for violence*. Lynne Rienner Publishers; International Development Research Centre.

Kilian, Lutz. (2014). 'Oil price shocks: causes and consequences.' *Annual Review of Resource Economics* 6 (1): 133-154.

Krugman, Paul R, Obstfeld, M. and Melitz, M. (2014). *International Economics: Theory and Policy* (10th ed.) Pearson, New York City, New York.

Lacina, B. (2006). 'Explaining the severity of civil wars.' *Journal of Conflict Resolution* 50 (2): 276-289.

Lacina, B. (2009). Battle Deaths Dataset 1946–2008. Codebook for Version 3.0. Centre for the Study of Civil War (CSCW). International Peace Research Institute, Oslo (PRIO). See https://www.prio.org/Data/Armed-Conflict/Battle-Deaths/The-Battle-Deaths-Dataset-version-30/

Lacina, B and Gleditsch, Nils P. (2005). 'Monitoring Trends in Global Combat: A New Dataset of Battle Deaths.' *European Journal of Population* 21 (2–3): 145–166. http://www.prio.no/CSCW/Datasets/Armed-Conflict/Battle-Deaths/

Le Billon, P. (2001). 'The Political Ecology of War: Natural Resources and Armed Conflicts.' *Political Geography* 20 (5): 561-584.

Lederman, D. and Porto, G. (2016). 'The price is not always right: on the impacts of commodity prices on households (and countries).' *World Bank Research Observer* 31(1): 168-197.

Maystadt, Jean-François, Giacomo De Luca, Petros G. Sekeris, and John Ulimwengu (2014). Mineral Resources and Conflicts in DRC: A Case of Ecological Fallacy? *Oxford Economic Papers* 66(3), 721–49.

Mendoza, E. (1995). 'The Terms of Trade, The Real Exchange Rate, and Economic Fluctuations.' *International Economic Review* 36 (1): 101-37

Miguel, E, Satyanath, S. and Sergenti, E. (2004). 'Economic Shocks and Civil Conflict: An Instrumental Variables Approach.' *Journal of Political Economy* 112 (4): 725-53.

Miguel, Edward (2005). 'Poverty and witch killing.' *Review of Economic Studies* 72, 1153-1172.

Montalvo, José G. and Reynal-Querol, M. (2005). 'Ethnic Polarization, Potential Conflict and Civil Wars.' *American Economic Review* 95 (3): 796–816.

Obstfeld, Maurice, Kenneth S. Rogoff 1996. *Foundations of international macroeconomics*. Cambridge, MA: MIT press.

Østby, G. (2008). 'Polarization, horizontal inequalities and violent civil conflict.' *Journal of Peace Research* 45 (2): 143-62.

Posen, Barry R. (1993). The Security Dilemma and Ethnic Conflict. *Survival* 35 (1): 27-47.

Ricci, Luca A., Milesi-Ferretti, Gian M. and Lee, Jaewoo. (2008). 'Real Exchange Rates and Fundamentals: A Cross-Country Perspective.' IMF Working Paper 08/13.

Ross, Michael L. (1999). 'The political economy of the resource curse.' *World politics* 51, 2, 297-322.

Ross, Michael L. (2003). 'Oil, drugs, and diamonds: How do natural resources vary in their impact on civil war?' In *The political economy of armed conflict: Beyond greed and grievance*, eds. Karen Ballentine and Jake Sherman. Boulder: Lynne Rienner, 47-67.

Ross, Michael L. (2004). 'What do we know about natural resources and civil war?' *Journal of Peace Research* 41 (3): 337-56.

Ross, Michael L. (2005). 'Resources and Rebellion in Aceh, Indonesia.' In Paul Collier and Nicholas Sambanis (eds.) *Understanding Civil War: Evidence and Analysis* Vol. 2: Europe, Central Asia, and Other Regions. Washington, DC: The World Bank.

Ross, Michael L. (2012). *The oil curse: how petroleum wealth shapes the development of nations*. New Jersey: Princeton University Press.

Rubin, Barnett R. (2000). 'The political economy of war and peace in Afghanistan.' *World Development* 28 (10): 1789-1803.

Sanchez de la Sierra, Raul. (2015). On the Origin of States: Stationary Bandits and Taxation in Eastern Congo. https://raulsanchezdelasierra.com/papers.

Shiller, Robert C. (2000). 'Irrational exuberance.' *Philosophy & Public Policy Quarterly* 20, 1 18-23.

Smith, B. (2004). 'Oil wealth and regime survival in the developing world, 1960–1999.' *American Journal of Political Science* 48 (2): 232-246.

Spatafora, N. and Tytell, I. (2009). ‘Commodity Terms of Trade: The History of Booms and Busts.’ IMF Working Papers No. 09-205.

Thaler, Richard H., and Eric J. Johnson. (1990). ‘Gambling with the house money and trying to break even: The effects of prior outcomes on risky choice.’ *Management Science* 36 (6):643-660.

Thaler, Richard H., et al. (1997). ‘The effect of myopia and loss aversion on risk taking: An experimental test.’ *Quarterly Journal of Economics* 112 (2): 647-661.

Valentino, B., Huth, P. and Balch-Lindsay, D. (2004). ''Draining the sea': mass killing and guerrilla warfare.’ *International Organization* 58 (2): 375-407.

Tables and Figures

TABLE 1

Summary Statistics

Variable	*Obs*	*Mean*	*SD*	*Min*	*Max*
Total Battle Deaths Low Estimate	906	1,196	2,899	14	37,000
Total Battle Deaths High Estimate	906	5,820	12,437	26	200,000
Total Battle Deaths Best Estimate	655	3,603	8,320	25	80,000
Commodity Terms of Trade Shock	906	0.001	0.016	-0.099	0.132
3 Year Moving Ave. CTOT Shock	906	0.001	0.012	-0.071	0.111
3 Year Mov. Ave. Fuel CTOT Shock	906	0.001	0.011	-0.076	0.097
Conflict Duration Up to Present Year	906	10.62	11.03	1	60
First Year of Conflict Dummy	906	0.16	0.37	0	1
Intermediate Ethnic Diversity Dummy	900	0.45	0.50	0	1
Ethnic Dominance Dummy	900	0.45	0.50	0	1
High Ethnic Polarization Dummy	900	0.45	0.50	0	1

TABLE 2

Sample Countries

Afghanistan	Cuba	Haiti	Mauretania*	Philippines	Trin &Tob*
Angola	DR Congo	India	Mexico*	Rep of Congo	Tunisia
Argentina	Djibouti*	Indonesia	Morocco*	Rwanda	Turkey*
Azerbaijan	Dom Rep*	Iran*	Mozambique	Saudi Arabia*	Uganda
Bangladesh	Egypt	Iraq*	Nepal*	Senegal	Uruguay
Bolivia	El Salvador	Ivory Coast	Nicaragua*	Sierra Leone	Venezuela*
Burkina Faso	Eritrea*	Kenya	Niger*	Somalia	Vietnam
Burundi*	Ethiopia	Laos*	Nigeria	South Africa	Zimbabwe*
Cambodia	Gabon	Lebanon	Oman*	Sri Lanka*	
Cameroon	Gambia	Lesotho*	Pakistan*	Sudan	
Central	Ghana	Liberia	Panama*	Syria*	
Chad	Guatemala*	Madagascar	Papua New G	Tajikistan*	
Chile*	Guinea*	Malaysia*	Paraguay	Thailand*	
Colombia*	Guin.-Bissau	Mali	Peru*	Togo	

Note: * indicates intermediately ethnically fractionalized countries

TABLE 3

The effects of commodity terms of trade shocks on battle-related deaths in civil wars

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Estimation Method	*LSDV*	*LSDV*	*LSDV*	*HTaylor*	*LSDV*	*LSDV*	*LSDV*	*LSDV*
Dep. Variable:				*Ln (battle deaths)*				
dCTOT(t)	-7.295							
	[5.910]							
dCTOT(t-1)	0.283							
	[5.319]							
dCTOT(t-2)	-11.708**							
	[5.616]							
dCTOT*IF(t)	11.349*							
	[6.603]							
dCTOT*IF(t-1)	2.102							
	[6.127]							
dCTOT*IF(t-2)	7.335							
	[6.046]							
ΔTOT(t)		-17.107*	-16.737*	-26.620***	-16.534	-14.701	-32.917**	-42.044***
		[9.583]	[9.687]	[9.748]	[12.422]	[10.084]	[16.089]	[12.924]
ΔTOT*IF(t)		20.116*	20.690*	23.843**	17.554	18.639	35.267**	38.146***
		[10.995]	[10.731]	[10.490]	[13.111]	[11.871]	[15.862]	[13.236]
Duration	-0.014	-0.013	-0.007	-0.027**	-0.019	-0.028	-0.055*	6.991***
	[0.023]	[0.022]	[0.021]	[0.011]	[0.032]	[0.025]	[0.031]	[1.921]
First Year Dummy	-0.950***	-0.927***	-0.893***			-0.937***		-0.155
	[0.166]	[0.165]	[0.168]			[0.193]		[0.202]
AR(1) term				0.463***				
				[0.034]				
Observations	900	900	885	756	664	742	536	900
R-squared	0.523	0.519	0.537		0.587	0.514	0.615	0.677
# countries/conflicts	79	79	78	59	50	76	45	154
p-val sum of shocks	0.06	0.08	0.09	0.01	0.19	0.15	0.05	0.00
p-val sum of interac.	0.08	0.07	0.06	0.02	0.19	0.12	0.03	0.00
p-val shocks+interac.	0.67	0.43	0.23	0.42	0.74	0.47	0.46	0.03
p-val shocks equal	0.35							
p-val interac equal	0.6							
Year dummies	Y	Y	Y	Y	Y	Y	Y	Y
Cntry/conf time trnds	Y	Y	Y	Y	Y	Y	Y	Y

Note: Robust standard errors clustered at the country-level (except in Column (1)) in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Δ denotes the change in the three-year moving average. IF denotes intermediately fractionalized countries. NIF denotes non-intermediately fractionalized countries. Columns (1)-(2) estimate the effects of the current and two preceding years' commodity terms of trade shocks on battle-related fatalities in countries with and without an intermediate ethnic diversity level. Column (2) estimates the same effects of the growth rate of the three-year moving average terms of trade shock. Column (3) replaces the IF indicator based on the Fearon (2003) ethnicity data with the corresponding indicator based on the Alesina et al. (2003). Column (4) includes a lagged dependent variable and uses Hausman and Taylor (1981) and Amemiya and MaCurdy (1986) to correct the dynamic panel bias. Columns (5)-(6) restrict the sample to, respectively, observations at least three years into the conflict and observations for which Lacina and Gleditsch (2005) report year-specific battle deaths. Column (7) imposes the two restrictions simultaneously. Column (8) estimates the column (2) specification with conflict fixed effects and a quadratic conflict-specific time trends rather than country fixed effects and country-specific time trends.

TABLE 4

The effects of positive and negative commodity terms of trade shocks in intermediately fractionalized (IF) and non-intermediately fractionalized (NIF) countries

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Estimation Method	*LSDV*	*LSDV*	*LSDV*	*LSDV*	*LSDV*
Sample	*Full*	*IF*	*NIF*	*NIF*	*NIF*
PosΔTOT(t)	19.171***	20.118**	-5.723		
	[7.208]	[8.393]	[36.590]		
NegΔTOT(t)	-24.477***	-34.393***	-25.754		
	[5.475]	[7.495]	[24.485]		
ΔTOT(t)				-15.605	-28.630***
				[10.863]	[9.895]
Duration	-0.012	-0.050	0.000	0.000	0.007
	[0.021]	[0.045]	[0.012]	[0.012]	[0.009]
First Year	-0.928***	-1.023***	-0.926***	-0.920***	-0.863***
	[0.159]	[0.242]	[0.219]	[0.216]	[0.216]
Observations	906	409	491	491	464
R-squared	0.524	0.486	0.614	0.614	0.614
p-val (PosΔTOT=-NegΔTOT)	0.00	0.00	0.73		
Number of countries	81	40	39	39	38
Year dummies	Y	Y	Y	Y	Y
Country time trends	Y	Y	Y	Y	Y

Note: Robust standard errors clustered at the country-level (except in Column (1)) in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Δ denotes the change in the three-year moving average. IF denotes intermediately fractionalized countries. NIF denotes non-intermediately fractionalized countries. Column (1) estimates the effects of positive and negative commodity terms of trade shocks in the full sample. Columns (2)-(3) estimate the effects in, respectively, the intermediately and non-ethnically fractionalized countries. Column (4) replaces the positive and negative shocks in the non- intermediately fractionalized countries with the original terms shock measure. Column (5) excludes Indonesia from the non-intermediately fractionalized sample.

TABLE 5

Results with polarization and ethnic dominance-based sample divisions

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Estimation Method	*LSDV*	*LSDV*	*LSDV*	*LSDV*	*LSDV*
Sample	*High Polarization*	*Low Polarization*	*Ethnic Dominance*	*Non-Ethnic Dominance*	*Non-Ethnic Dominance*
ΔTOT(t)		-19.460***		-14.701	-26.134***
		[6.011]		[10.108]	[9.639]
PosΔTOT(t)	23.783***		18.726**		
	[4.716]		[8.558]		
NegΔTOT(t)	-24.703***		-34.278***		
	[5.177]		[8.287]		
Duration	0.016	-0.065**	-0.052	-0.002	0.005
	[0.019]	[0.032]	[0.046]	[0.013]	[0.010]
First Year	-0.711***	-1.235***	-0.976***	-0.989***	-0.923***
	[0.161]	[0.253]	[0.251]	[0.210]	[0.209]
Observations	549	355	383	510	483
R-squared	0.579	0.554	0.468	0.624	0.625
Number of countries	48	32	37	41	40
Year dummies	Y	Y	Y	Y	Y
Country time trends	Y	Y	Y	Y	Y

Note: Robust standard errors clustered at the country-level (except in Column (1)) in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Δ denotes the change in the three-year moving average. IF denotes intermediately fractionalized countries. NIF denotes non-intermediately fractionalized countries. Columns (1)-(2) divide the sample into countries with high and low ethnic polarization, defined as a polarization index below and above the sample median. Columns (3)-(4) divide the sample into countries with and without a dominant ethnic group, defined as a group that represents 50-85% of the population. Column (5) reports the results without Indonesia.

TABLE 6

Robustness to alternative dependent variables (intermediately fractionalized sample)

	(1)	*(2)*	*(3)*
Estimation Method	*LSDV*	*LSDV*	*LSDV*
Dep. Var. Measure of Battle Deaths	*Low*	*High*	*Ordinal*
Sample	*IF*	*IF*	*IF*
PosΔTOT(t)	23.560**	21.119***	3.669
	[9.090]	[7.123]	[2.990]
NegΔTOT	-19.120	-33.631***	-7.725**
	[13.801]	[7.579]	[3.199]
Duration	-0.057	-0.054	-0.018
	[0.042]	[0.043]	[0.012]
First Year	-0.920***	-0.848**	-0.207**
	[0.246]	[0.317]	[0.085]
Observations	409	409	409
R-squared	0.440	0.473	0.389
Number of countries	40	40	40
Year dummies	Y	Y	Y
Country time trends	Y	Y	Y

Note: Robust standard errors clustered at the country-level (except in Column (1)) in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Δ denotes the change in the three-year moving average. IF denotes intermediately fractionalized countries. NIF denotes non-intermediately fractionalized countries. Column (1) report the effects of positive and negative commodity terms of trade shocks on the best and imputed best battle deaths measure. In columns (2)-(4) we estimate the effects on the low and high estimates for the annual battle-related deaths in Lacina and Gleditisch (2005) and the effects on an ordinal measure that equals one when the best or imputed best estimate is at most 1000 and two when the best or imputed best estimate exceeds 1000.

TABLE 7

Robustness to alternative dependent variables (non-intermediately fractionalized sample)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Estimation Method	*LSDV*	*LSDV*	*LSDV*	*LSDV*	*LSDV*	*LSDV*
Dep. Var. Measure of Battle Deaths	*Low*	*High*	*Ordinal*	*Low*	*High*	*Ordinal*
Sample	*NIF*	*NIF*	*NIF*	*NIF*	*NIF*	*NIF*
ΔTOT(t)	-13.940	-12.571	-3.310	-38.462**	-28.558**	-5.787**
	[19.514]	[12.778]	[2.524]	[15.174]	[11.706]	[2.495]
Duration	0.050	0.015	0.002	0.069***	0.025**	0.001
	[0.031]	[0.016]	[0.005]	[0.021]	[0.012]	[0.005]
First Year	-0.785***	-0.767***	-0.157**	-0.664***	-0.671***	-0.158**
	[0.269]	[0.207]	[0.074]	[0.240]	[0.192]	[0.075]
Observations	491	491	491	464	464	464
R-squared	0.515	0.517	0.478	0.541	0.532	0.453
Number of countries	39	39	39	38	38	38
Year dummies	Y	Y	Y	Y	Y	Y
Country time trends	Y	Y	Y	Y	Y	Y

Note: Robust standard errors clustered at the country-level (except in Column (1)) in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Δ denotes the change in the three-year moving average. IF denotes intermediately fractionalized countries. NIF denotes non-intermediately fractionalized countries.. Columns (2)-(4) report the effects of commodity terms of trade shocks using the low and high estimates for the annual battle-related deaths in Lacina and Gleditisch (2005) as well as an ordinal measure which equals one when the best or imputed best estimate is at most 1000 and two when the best or imputed best estimate exceeds 1000. Columns (3)-(6) reports the estimates without Indonesia.

TABLE 8

The effects of positive and negative shocks in intermediately and non-intermediately fractionalized net fuel exporters and net fuel importers

Estimation Method	*LSDV*	*LSDV*
Sample	*Full*	*Full*
Intermediate ethnic diversity definition	*Main (25^{th}-75^{th} percentile of ethnic fractionalization index)*	*Extended (15^{th}-85^{th} percentile of ethnic fractionalization index)*
PosΔTOT(t) in IF net fuel exporter	23.070***	24.710***
	[6.183]	[6.041]
PosΔTOT(t) in NIF net fuel exporter	63.238*	-5,440.035***
	[33.034]	[966.792]
PosΔTOT(t) in IF non-fuel exporter	-13.219	-17.001
	[25.606]	[24.494]
PosΔTOT(t) in NIF non-fuel exporter	-41.426	-58.627*
	[29.689]	[34.689]
NegΔTOT(t) in IF net fuel exporter	-17.170**	-20.989***
	[7.732]	[6.678]
NegΔTOT(t) in NIF net fuel exporter	-78.935***	262.301
	[18.691]	[178.779]
NegΔTOT(t) in IF non-fuel exporter	-21.232	-18.187
	[15.118]	[13.170]
NegΔTOT(t) in NIF non-fuel exporter	-12.685	-11.021
	[34.261]	[59.105]
Duration	-0.009	-0.009
	[0.021]	[0.021]
First year	-0.924***	-0.904***
	[0.160]	[0.155]
Observations	900	900
R-squared	0.53	0.53
Number of countries	79	79
Year dummies	Y	Y
Country time trends	Y	Y

Note: Robust standard errors clustered at the country-level (except in Column (1)) in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Δ denotes the change in the three-year moving average. IF denotes intermediately fractionalized countries. NIF denotes non-intermediately fractionalized countries. Column (1) reports the effects of positive and negative commodity terms of trade shocks in intermediately ethnically fractionalized (IF) and non-intermediately ethnically fractionalized (NIF) net fossil fuel exporters and importers. Columns (1) and (2) define the intermediate ethnically fractionalized countries as countries with an ethnic fractionalization index in, respectively, the 25^{th} -75^{th} percentile and the 15^{th}-85^{th} percentile.

TABLE 9

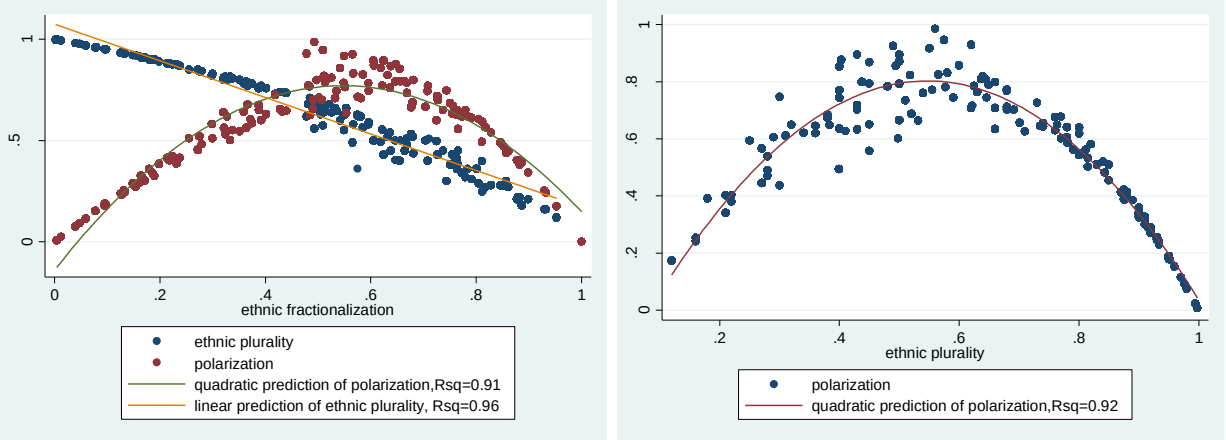
The effects of fuel and non-fuel terms of trade shocks in fuel exporters

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Estimation Method	*LSDV*	*LSDV*	*LSDV*	*LSDV*	*LSDV*
Sample definition	*Fuel exporters in 25th-75th percentile of ethnic fractionalization*	*Ethnic dominance*	*High polarization*	*Fuel exporters in 15th-85th percentile of fractionalization*	*Small fuel exporters in 15-85th percentile of fractionalization*
Sample countries	Colombia Iran Iraq Malaysia Mexico Oman Russia Saudi Arabia Trinidad & Tobago Venezuela	Colombia Iran Iraq Malaysia Mexico Oman Russia Saudi Arabia Venezuela	Angola Colombia Iran Iraq Malaysia Mexico Oman Saudi Arabia Sudan Trinidad & Tob Venezuela	Angola Azerbaijan Colombia Indonesia Iran Iraq Malaysia Mexico Oman Russia Saudi Arabia Sudan Trinidad & Tob Venezuela	Angola Azerbaijan Colombia Indonesia Malaysia Sudan Trinidad & Tob
Pos fuel ΔTOT(t)	28.69*	28.69*	37.34***	32.42***	119.32**
	[13.605]	[13.733]	[6.319]	[7.891]	[37.996]
Pos non-fuel ΔTOT(t)	-24.66	-24.66	-17.06**	-47.60	-173.12
	[35.419]	[35.752]	[7.092]	[28.210]	[119.387]
Neg fuel ΔTOT(t)	-38.47***	-38.47***	-32.27***	-30.97***	-109.38***
	[2.649]	[2.674]	[5.453]	[7.001]	[28.709]
Neg non-fuel TOT(t)	16.80	16.80	-43.19	4.64	-76.12
	[34.334]	[34.657]	[32.347]	[40.085]	[126.880]
Duration	-0.09	-0.09	-0.01	-0.04	-0.02
	[0.074]	[0.075]	[0.037]	[0.036]	[0.038]
First year	-1.16*	-1.16*	-0.73***	-1.03***	-0.70
	[0.547]	[0.552]	[0.185]	[0.218]	[0.518]
Observations	116	115	157	205	129
R-squared	0.723	0.72	0.71	0.644	0.740
No. countries	10	9	11	14	7
Year dumm.	Y	Y	Y	Y	Y
Cntry time tr.	Y	Y	Y	Y	Y

Note: Robust standard errors clustered at the country-level (except in Column (1)) in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Δ denotes the change in the three-year moving average. IF denotes intermediately fractionalized countries. NIF denotes non-intermediately fractionalized countries. Column (1) reports the estimates for positive and negative fuel and non-fuel commodity terms of trade shocks in intermediately ethnically fractionalized net fuel exporters. Columns (2)-(3) repeat the analysis for net fuel exporters with ethnic dominance and high ethnic polarization. The Column (4) regression uses the countries with Herfindahl-Hirschman ethnic fractionalization index in the 15th-85th percentile instead of the 25th-75th percentile in the Column (1) regression. Column (5) omits fuel producers that could potentially influence global fossil fuel prices.

FIGURE 1

The Relationship between Ethnic Fractionalization, Ethnic Polarization, and the Population Share of the Ethnic Plurality



Source: Janus and Riera-Crichton (2015). Using Fearon (2003) data.