

## The effect of crude oil price changes on civil conflict intensity in rentier states

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### Abstract

While existing literature has considered the relationship between oil and conflict, most of the studies have failed to consider mechanisms that might mediate the effect of the fluctuating market price of oil on conflict. We theorize that the military capacity of the state is a key mediating mechanism for understanding the relationship between shifting oil market prices and conflict intensity. We argue that states which rely upon oil sales to fund a large portion of government spending will have a more difficult time maintaining conflict-reducing state capacity during times in which oil prices are below previously prevailing averages for extended lengths of time. Using country-year data in 67 conflict states from 1989–2019, we find that low average oil prices are associated with lower military spending which in turn is associated with higher rates of battle fatalities in existing civil conflicts.

The relationship between oil and conflict is one which has given rise to broad scholarly interest. One identified component of this relationship is an increased risk of intrastate conflict in oil rich nations, a “curse” which can lead to instability in regions important to the global energy market.<sup>1</sup> Research on the impact of oil on intrastate conflict however tends to treat oil as a constant, contrasting with a reality in which oil prices are continuously in flux. Indeed, there has been significant variation in crude oil prices since 1980, with prices often settling at multi-year averages that are significantly higher or lower than previously. This leads to a lingering question in the literature, what impact does variation in the price of oil have on intrastate conflicts?

This paper addresses this gap in the literature, theorizing that fluctuating oil prices affect the intensity of civil conflict through an intervening variable, military expenditures. While we theorize that the impact of higher oil prices is higher military expenditures and lower combat fatalities, we also recognize that the link between higher military expenditures and civil conflict intensity may be non-linear.

Drawing on crude oil prices, military expenditures, and conflict severity data we examine 67 conflict states from the period of 1989–2019, demonstrating that low average oil prices are correlated with higher battle fatalities in existing civil conflicts. We also demonstrate the role of our proposed causal mechanism, showing that low average oil prices are associated with lower military expenditures, which are in turn associated with higher battle fatalities in low-intensity conflict states.

The remainder of this article starts with a review of relevant literature on oil prices, conflict, and state capacity—to provide context for our analyses. This is followed by defining the theoretical approach and establishing the primary hypotheses. Next is a description of the data used to test the hypotheses and, subsequently, the results of the empirical evaluation are given. The article then closes with some conclusions.

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<sup>1</sup> Ross (2012).

### Literature on oil prices and civil conflict

Many examinations of oil and civil conflict focus on rebel incentives. The notion that natural resources would provide a valuable “prize”<sup>2</sup> or an opportunity to make conflict more viable by offsetting the costs of rebellion<sup>3</sup> is well founded in the literature. Scholars have likewise examined the potential linkage between other lootable natural resources and conflict onset, with mixed results.<sup>4</sup> For instance, work has found that loss of income (in this case from labor-intensive agriculture) can serve as a catalyst for conflict when it impacts a politically marginalized ethnic group.<sup>5</sup> There has been a specific interest on the role that oil plays in conflict. The “oil curse” is a theory that has received considerable attention in the literature, focusing primarily on intrastate conflict onset.<sup>6</sup> Some leading scholars such as Ross argue that the presence of onshore oil production provides a financial incentive for would-be rebels and opposition forces to resort to armed conflict.<sup>7</sup>

We hypothesize that the price of oil does not meaningfully affect the incentive of potential separatist rebels. Those with very poor economic opportunities (i.e., a lack of alternatives) will be similarly enticed by potential spoils from oil revenue regardless of prices.<sup>8</sup> Rebels would still get a larger share of the revenue if they alone controlled the oil reserves instead of the existing central government. This mechanism occurs regardless of prices.<sup>9</sup> Thus we consider rebels to be insensitive to oil price shocks.

In contrast to the incentive approach described above, some find that oil revenue can increase a state’s ability to “pay off” opposition and thus lower the probability of civil conflict.<sup>10</sup> This suggests there are multiple potential mechanisms to understand oil’s effect on conflict, particularly relating to the resources at the disposal of the state and how that impacts on whether it can stave off rebellions.

Oil, like other commodities, varies in pricing, which begs the question as to whether its value to rebels and states also varies. While other researchers have examined the linkages between oil prices and conflict, they have often exclusively focused on interstate conflicts.<sup>11</sup> Increases in the price of oil can in fact lead to an increase in state capacity, in the form of military capacity used in interstate conflict.<sup>12</sup> Positive resource shocks, however, could also allow the state to strengthen its security measures and control and suppress or buy off internal rebellion.<sup>13</sup>

There are indeed some studies that have examined commodity prices and civil conflict. Several analysts have focused on agricultural commodity prices and their relationship with conflict, with important trends emerging. However, these studies tend to focus on either the opportunity cost of insurrection or the state prize model.<sup>14</sup> Under the opportunity cost model, falling agricultural yields make rebellion more appealing as an alternative to agricultural

**For states which rely upon oil sales to fund a large portion of government spending, low average oil prices are associated with lower military spending which in turn is associated with higher rates of battle fatalities in existing civil conflicts.**

**Further to this, the changing energy economy towards less oil-reliance will hold serious consequences for states that derive significant government revenue from the sale of oil. One of these effects is likely to be the reduced capacity for oil reliant states to prosecute ongoing civil conflicts.**

2 Fearon (2005).

3 Collier and Hoeffler (2004).

4 Collier and Hoeffler (2004); Ross (2008); Ali and Abdellatif (2015); Le Billon (2012).

5 Buhaug *et al.* (2021).

6 Collier and Hoeffler (2004); Ross (2008); Watts (2007); Fjelde (2009); Gunter (2015).

7 Ross (2012).

8 Demuynck and Schollaert (2008).

9 Ross (2012).

10 Fjelde (2009).

11 Duffield and Klare (2005); Hendrix (2017).

12 Hendrix (2017).

13 Snyder (2006); Ross (2012); Bazzi and Blattman (2014).

14 Ray and Esteban (2017).

production.<sup>15</sup> The state prize model assumes that rising prices increase rebel incentives to capture lootable resources. Others argue that sub-Saharan African states, which rely on tropical agricultural commodities and mineral wealth, are less likely to see conflict when high agricultural prices provide laborers an alternative to mining and competition over its spoils.<sup>16</sup> Low agricultural prices, however, increase the attractiveness of the mineral sector and thereby fuel conflict onset. A meta-analysis mirrors this line of reasoning, showing that rises in agricultural prices decreases conflict likelihood, while rises in oil prices increases it.<sup>17</sup>

However, other recent work has suggested that lootable, capital-intensive resources like oil are less likely to affect rebel conflict incentives than labor-intensive resources.<sup>18</sup> Price shocks to labor-intensive resources are more likely to provoke conflict given the greater returns and employment opportunities, rather than capital intensive resources like oil and gas. Despite this, commodity price shocks (including oil price shocks) have been shown to effect conflict intensity—measured in battle deaths, conflict onset and duration, and coups. Notably, rising oil and mineral prices have been associated with shorter, less intense conflicts in recent studies, including in a key 2014 study by Bazzi & Blattman.<sup>19</sup> While this study focused primarily on agricultural price shocks, and bundled oil and gas price shocks with mineral price shocks, it provides an important addition to the literature and some basis for our approach. Notably, this study did not provide an empirical treatment of the mechanism, which was loosely explained as military spending and state capacity. However, the authors argue that “the evidence tips...toward a ‘state capacity’ effect”. Other approaches have reached competing conclusions such as income shocks, due to rising oil prices in the 1990s, increasing violence in Colombia during a notoriously long-lasting civil conflict in that state.<sup>20</sup>

In sum, oil price fluctuations ought to have important implications for civil conflict. However, the literature does not clearly link oil price fluctuations with civil conflict in the way described in this article, which is through the transmission mechanism of state military capacity (although some studies suggest this). When oil prices are high and the state can both produce and generate revenues from oil, then conflicts will subside as the state is better able to fund counter-insurgency measures against rebels. The next two subsections briefly discuss the literature around both sides of this mechanism to provide a basis for our theoretical approach.

### *State capacity, military expenditures, and conflict*

The ability for the state to project power and engage with belligerents is a long-standing explanatory factor for conflict. States must be able to reach and control far and difficult to reach corners of its territory.<sup>21</sup> Large militaries can help with favorable outcomes for the government (assuming that they can win quickly) and have been linked to primary commodity exports.<sup>22</sup> Recent work has also linked military capacity to the prevention of civil conflict onset.<sup>23</sup> Others have reached similar findings about the effect of military capacity on conflict duration and intensity by examining *military expenditures* specifically as a measure of military capacity.<sup>24</sup>

The literature’s debate on state capacity measures and its relationship to conflict onset is long-standing. Relative to conflict onset, there is a smaller literature on how military state capacity affects conflict *severity*.<sup>25</sup> Most literature

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15 Collier and Hoeffler (1998); Miguel, Satyanath, and Sergenti (2004); Dal Bó and Dal Bó (2011).

16 Demuyne and Schollaert (2008).

17 Blair, Christensen, and Rudkin’s (2021).

18 Blair *et al.* (2021).

19 Bazzi and Blattman (2014).

20 Dube and Vargas (2013).

21 Tilly (2017); Herbst (2000); Buhaug *et al.* (2009); Roessler (2016).

22 DeRouen and Sobek (2004).

23 Müller-Crepon *et al.* (2021).

24 Hendrix (2010).

25 In general, the literature focuses on the determinants of conflict onset compared to how wars are fought. See Lu and Thies (2011); Balcells and Kalyvas (2014).

focuses on the relationship between state capacity and conflict onset using static measures such as the size of the army or gross domestic product. These studies do not provide much information about how state capacity affects ongoing conflict. Moreover, the determinants of conflict onset differ from severity.<sup>26</sup> Recent work has shown how various state level factors can explain conflict intensity and duration such as state economic conditions<sup>27</sup> and regime and cultural characteristics.<sup>28</sup> Military capacity is likely to affect the severity of conflict as the government works to defeat insurgents. National militaries with combined arms capabilities, or mechanized infantry, armor, and air units working in tandem, are correlated with shorter civil conflict duration.<sup>29</sup> Such capabilities, not only in the form of equipment, but in the necessary training in tandem, require significant investments. Building on existing work, we focus here on military state capacity and factors related to conflict intensity, conceptualized as conflict-related battle deaths.<sup>30</sup> We depart from this work by arguing that impacts on state capacity overwhelm impacts on rebel capabilities or incentives, as oil rents enable more military spending and leave governments better equipped to fight rebels.

In sum, there is reason to suspect that military capacity is an important variable in determining the intensity of ongoing civil conflict, and that military expenditure is a reasonable means by which to estimate this capacity.

### *Oil and military expenditures*

As discussed, military strength and the state's capacity for coercion is an important variable for examining conflict intensity. However, how fluctuating oil prices impact oil-dependent states' coercive capacity is still an open question. Revenue reflects the ability of the state to fund operations, namely conflict relevant operations, that are important to the course of conflict. Scholarship on the link between decreasing oil prices and shrinking military expenditures has been mixed, but generally favors a positive correlation. Military expenditures were found to be inelastic relative to variations in oil revenues in one study of five major oil producing states between 1997–2007.<sup>31</sup> Likewise, a similar analysis of Gulf Cooperation Council (GCC) states found limited correlation between oil price volatility and increases in military expenditures.<sup>32</sup> However, a positive effect was found in non-GCC Middle East and North African (MENA) states in a similar study.<sup>33</sup> The study argued that corruption plays a mediating role between oil rents and military spending, with oil having a larger, more positive impact on military spending in polities which are more corrupt. This finding is also reinforced by work linking higher oil rents with greater military expenditures in MENA states.<sup>34</sup> Other studies posit a positive relationship between oil rents and military spending in GCC states as well.<sup>35</sup>

These findings of a positive relationship have been substantiated by several case studies including Chad<sup>36</sup>, Algeria<sup>37</sup>, and Iran.<sup>38</sup> Scholars have generally supported a positive correlation between oil wealth and military spending in non-democratic countries.<sup>39</sup> Various causal mechanisms linking oil revenue to military spending have been proposed in prior literature such as corruption<sup>40</sup>, buying the loyalty of the military<sup>41</sup>, or a combination of these

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26 Lacina (2006).

27 Lu and Thies (2011); Chaudoin *et al.* (2017).

28 Lacina (2006).

29 Caverley and Sechser (2017).

30 Lacina (2006); Hendrix (2010); Balcells and Kalyvas (2014).

31 Chun (2010).

32 Erdoğan, Çevik, Gedikli (2020).

33 Farzanagen (2018).

34 Ali and Abdellatif (2015); Dizaji (2019); Dizaji (2022).

35 Al-Mawali (2015).

36 Frank and Guesnet (2009).

37 Perlo-Freeman and Brauner (2012).

38 Farzanegan (2011).

39 Cotet and Tsui (2013).

40 Farzanagen (2018).

41 Bellin (2004).

variables.<sup>42</sup>

In sum, it seems clear that positive resource shocks, such as those created in oil-reliant states by a significant and lasting increase in the price of oil, ought to often result in greater military expenditures. However, the literature contains gaps in our understanding of oil resources and conflict intensity, as well as unclear mechanisms surrounding how price fluctuations may impact this relationship. With this article, we seek to clarify one mechanism by which this relationship is governed. Specifically, we suspect that oil revenues support military spending, and that greater military spending increases state capacity to suppress rebellion. Next, we present a theory, focused on state military capacity, that seeks to address these concepts directly.

### A theory of oil price shocks and conflict in rentier states

In conflict states in which the central government budget is heavily reliant on oil revenues, we predict that significant negative changes in price will impact on the ability of the government to finance security measures in areas vulnerable to rebellion. States are best suited to prevail in intrastate, and particularly counter-insurgency, conflicts when their forces are well equipped and properly trained, both of which are resource-intensive endeavors. Positive resource shocks allow the state to strengthen its security measures and control and suppress or buy off rebellion.<sup>43</sup> Rising oil and mineral prices are therefore associated with shorter, less intense conflicts.<sup>44</sup> Below, we introduce three hypotheses to support this position.

If our core hypothesis proves correct, then we will have shown that an increase in oil prices leads to more effective security and less battlefield fatalities. We would then expect that greater oil prices correlate to lower battlefield fatalities in oil reliant states:

*Hypothesis 1 (H1): An increase in oil prices will be correlated with a decrease in combat fatalities, i.e., “battle deaths,” in conflict states reliant on oil, relative to those not reliant on oil, all else being equal.*

In states dependent on the sale of oil, higher prices lead to more revenue. These higher revenues lead to more military and security spending, allowing states to fund additional soldiers, police, and other security personnel. This increase in security capacity leads to a reduction in rebels’ ability to operate, and so ought to reduce the number of battle deaths—as in the medium term rebels scale back operations or lay down their arms.

To test the mediating variable in this hypothesis, we also examine whether oil prices impact oil-dependent states’ military expenditures. In line with the conclusions of previous scholars who demonstrated a correlation between oil rents/revenue and military spending<sup>45</sup>, we theorize a correlation exists between oil prices and military expenditures among states more reliant on oil rents. As the price of oil rises, rentier states highly dependent on oil will see a growth in revenue. As their revenue increases, these states will be inclined to dedicate more resources to the military. In contrast, when oil prices drop along with rents, states will respond with cuts to military spending:

*Hypothesis 2 (H2): When oil prices are at high average levels, oil dependent conflict states will have higher levels of military expenditures relative to periods of low oil prices, all else being equal.*

States can derive oil rents from a variety of sources, such as through taxation or the capture of profits through state-owned enterprises. Depending on the time of year and how the state budgeting process works, the impacts from a

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<sup>42</sup> Fjelde (2009).

<sup>43</sup> Snyder (2006); Ross (2012); Bazzi and Blattman (2014).

<sup>44</sup> Bazzi and Blattman (2014).

<sup>45</sup> Frank and Guesnet (2009); Perlo-Freeman and Brauner (2012); Al-Mawali (2015); Dizaji (2019).

positive or negative shock to revenue could happen in the same or following year. We examine both scenarios by testing lag variables for both H1 and H2.

Lastly, we propose to link this measure of state capacity; military expenditures, with the primary dependent variable from H1, i.e., “battle deaths”. When state military expenditures are higher, this ought to reduce the number of battle deaths from civil conflict as the security environment improves. However, the relationship between these variables is complex and may be nonlinear. For example, increases in military capacity may lead to “crackdowns” that temporarily lead to *higher* battle deaths. However, for most states in civil conflict, we predict that this relationship will be negative:

*Hypothesis 3 (H3): When oil dependent conflict states have higher military expenditures, this will be correlated with a decrease in combat fatalities, i.e., “battle deaths”, relative to when military expenditures are lower, all else being equal.*

One way we choose to examine this possibility of a nonlinear effect is by splitting the sample along the lines of conflict intensity.

## Data

67 conflict states with varying degrees of oil dependence from 1989–2019 were considered. Since government budgets do not fluctuate daily like oil prices, an average over a longer term is the most appropriate measure, thus our unit of analysis is measured at the country-year. We employ several methods to estimate the effect of the primary independent variable, *oil prices*. Government spending decisions are typically made in advance, so a lagged measure which captures the dynamic shifts in oil prices from year to year is prudent. We tested a one-year average of crude oil prices for our primary measures. This data was obtained from the Federal Reserve Bank of St. Louis FRED dataset, a widely accepted benchmark for crude oil prices.<sup>46</sup> We opted to use the West Texas Intermediary (WTI) price of oil instead of Brent. These two measures are highly correlated, and the results using Brent were substantively indistinguishable from using WTI.

Second, we expect the effect of oil prices to appear primarily in states that are heavily dependent on oil for government revenue. Therefore, we employ a measurement of relative oil rents. Oil rents are a continuous variable which indicates the percentage of total GDP which was derived from the sale of oil each year. This data can be obtained from the World Bank Open Data online database.<sup>47</sup> Ross (2012) uses oil income per capita as his primary measure of a petro-state. However, there are some concerns about this measure. The measure does not estimate the relative importance of oil to the overall economy, the degree to which the government derives state revenue from it, or independent effects from changes to GDP—leading researchers to consider other measures in more recent work.<sup>48</sup> For this reason, we opt to use oil rents as a percentage of GDP, which provides a better estimate of how important oil is to the overall economy.

Oil reliant states ought to have greater capacity to deal with rebels when oil prices are high. To test this hypothesis, we examine the impact of oil prices on military expenditures, and the impact of military expenditures on conflict intensity. When military spending is high, governments ought to have additional military resources to devote to suppressing armed rebellions and providing security. When these resources are scarcer, governments may need to scale back military and security operations, potentially allowing groups more opportunity to sustain and intensify an armed

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<sup>46</sup> U.S. Energy Information Administration (2020).

<sup>47</sup> The World Bank (2020).

<sup>48</sup> Wright *et al.* (2015).

rebellion. For example, Nigerian military spending was at an all-time high in 2011, which coincided with a peak in the two-year average price of oil during the same year. Oil prices hit a two-year low in 2014, and Nigerian military expenditure that year was less than half the value than in 2011.<sup>49</sup> Our data on military expenditures was obtained from a dataset on military expenditures developed by the Stockholm International Peace Research Institute, which is integrated into the World Bank Open Data online database. We use military expenditure in constant U.S. dollars (USD) as our primary measure.

Rebel-incentive based theories are limited to describing the behavior of rebels located in regions with onshore oil reserves and little economic opportunity cost for rebellion.<sup>50</sup> However, our theoretical mechanism ought to work in any conflict-prone oil state, regardless of the type of rebel (secessionist or non-secessionist) or location of reserves. However, key conflict-related independent variables identified in prior studies, such as overall GDP, still need to be included.

We expect that states with higher military expenditures will have less intense civil conflicts. There are multiple series that allow for the creation of a variable measuring conflict intensity—this article uses battle-related deaths. Another possible measure is found by aggregating battle-related deaths and deaths from one-sided violence (i.e., civilian deaths), but we view these measures of violence and conflict intensity as separate, with the latter not capturing conflict between government forces and rebels, but rather crimes against civilians, which is a theoretically distinct phenomenon. Therefore battle-related deaths are used here as the measure of conflict intensity—obtained from the UCDP Battle-Related Deaths Dataset.<sup>51</sup>

The Uppsala Conflict Data Program (UCDP) defines an armed conflict as a contested incompatibility that concerns government and/or territory over which the use of armed force between two parties, of which at least one is the government of a state, has resulted in at least 25 battle-related deaths in one calendar year. Battle-related deaths refer to those deaths caused by the warring parties that can be directly related to combat.

Our dataset includes approximately 1,200 country-year cases of states in which civil conflict was occurring and for which we have both a measurement of battle related deaths and a measurement of the share of oil sales in the state's GDP. Among the universe of civil conflict states in the dataset, that average level of military spending was USD 7.1bn. The average level of oil rents as a share of GDP was 4.75%. The mean level of yearly battle deaths was 703, ranging from 25 to 30,000—however, most civil conflict state cases saw fewer than 500 fatalities per year. The mean level of military expenditure as a percentage of GDP and as a percentage of total government spending was 3.2% and 11.9%, respectively.

The conflict models used here incorporate several controls for confounding variables. The first of these is population size—a larger population size ought to be predictive of a higher number of battle deaths in a civil conflict.<sup>52</sup> Among other control measures used were a security effectiveness score taken from the Center for Systemic Peace (which also produces the well-known Polity series).<sup>53</sup> A higher score on this index indicates a less secure state, making it a good indicator of state capacity. Lastly, GDP was also introduced as a control variable, another measure of relative state capacity and size.<sup>54</sup> The models also include fixed effects which are described in detail in the results section.

The model examining military expenditures and conflict carries some concern about endogenous variables. States in more severe conflicts will tend to spend more on the military. The presence of this effect serves to work against

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49 Stockholm International Peace Research Institute Data (2018).

50 Ross (2012).

51 Davies *et al.* (2023); UCDP(2023)

52 Bruckner (2010).

53 Center for Systemic Peace (2022)

54 d'Agostino *et al.* (2011).

our hypothesis, and we control for it by incorporating previous period conflict intensity as a control, as well as fixed effects.<sup>55</sup>

The spending models include controls for GDP, total currency reserves (excluding gold), and government debt—all taken from the World Bank data. Each of these measures ought to be expected to be positively related to military spending, as they are measures of government resources and state capacity.<sup>56</sup> The spending models also include controls for fixed effects.

An initial examination of this aggregated data indicates support for H1. A full move across the range of observed price values for WTI Crude Oil in the dataset (from the lowest observed price to the highest) is predictive of over 50 fewer monthly deaths in ongoing civil conflicts on average among the most oil-reliant conflict states observed (where oil rents were greater than 20 percent of GDP). A figure illustrating this association can be found in the appendix. In the next section we rigorously examine the data to determine the strength and characteristics of this relationship.

## Results

To examine our hypotheses using this data, we first subdivided the full set of conflict states into a smaller subset of “oil states”. States that saw the sale of oil comprise a mean value of 10% or more of GDP over the observation period were designated as “oil states”. These oil states ought to be most sensitive to the impact of oil price fluctuations on state capacity. We also designated a smaller subset of “extreme oil states”—states in which the sale of oil was over 20% of GDP. Among the sample, there were 8 “oil states” and 5 “extreme oil states”, comprising about 197 and 104 total cases respectively.

The first set of models were designed to test the impact of oil price changes on battle deaths in these oil reliant states. We employed four measures for oil prices. First, a simple measure of the mean price for WTI in the current year. Second, a measure of the prior year’s mean price. The reason for testing a lagged variable here was because increases or decreases in the price of oil may not impact state revenues until a later period in states where budgets are set the year prior. The next two measures evaluate the change in WTI prices in percentage terms from the prior year’s mean. We include a measure of the change relative to the prior period mean (i.e., the change for the current year), and a measure of the change between the prior period and the period preceding that (i.e., the change for the prior year). These measures provide a variety of ways to evaluate the degree to which oil prices changes may impact conflict-reducing state capacity.

Our standard specification approach for the first set of models was to use ordinary-least-squares (OLS) regression models with fixed effects for state errors. State fixed effects are particularly important as states have wide endogenous variation in the number of battle deaths.<sup>57</sup> In this first test of Hypothesis 1, we specify the following four basic models of yearly conflict battle deaths:

$$\text{Battle Deaths}_{it} = B_0 + B_1 \text{WTI Price}_{it} + B_2 \log(\text{population})_{it} + B_3 \text{SecScore}_{it} + B_4 \log(\text{GDP})_{it} + C_i + e$$

$$\text{Battle Death}_{sit} = B_0 + B_1 \text{WTI Price}_{i(t-1)} + B_2 \log(\text{population})_{it} + B_3 \text{SecScore}_{it} + B_4 \log(\text{GDP})_{it} + C_i + e$$

$$\text{Battle Deaths}_{it} = B_0 + B_1 \text{WTI PriceChange}_{it} + B_2 \log(\text{population})_{it} + B_3 \text{SecScore}_{it} + B_4 \log(\text{GDP})_{it} + C_i + e$$

$$\text{Battle Deaths}_{it} = B_0 + B_1 \text{WTI PriceChange}_{i(t-1)} + B_2 \log(\text{population})_{it} + B_3 \text{SecScore}_{it} + B_4 \log(\text{GDP})_{it} + C_i + e$$

<sup>55</sup> d’Agostino *et al.* (2011).

<sup>56</sup> Ali and Bhuiyan (2022).

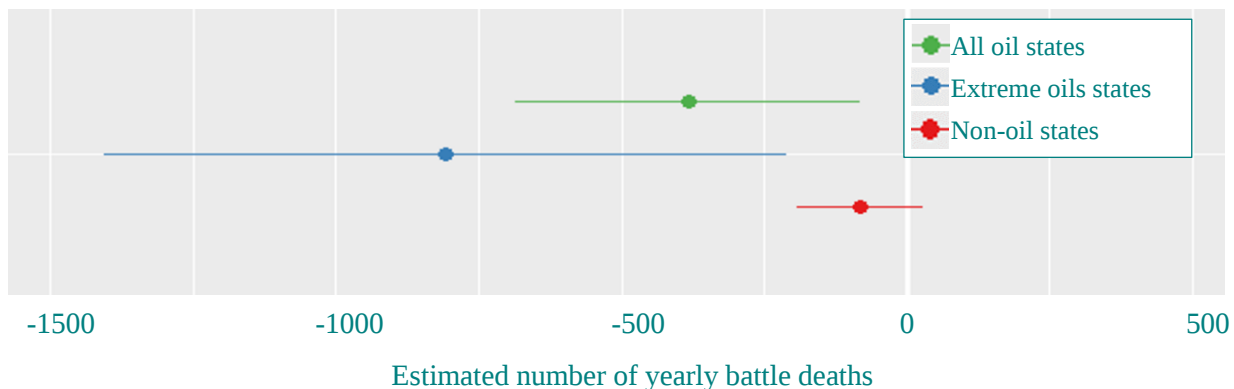
<sup>57</sup> Fixed effects for time were not included in this model due to poor model fit. Fixed effects for time are used in the interactive effects regressions presented later in this section and tested for all subsequent regressions.

As Table 1 illustrates, we find that three out of four measures of oil price levels were significantly and negatively associated with the number of battle deaths in the state. An increase in the price of oil by USD 50 was associated with roughly 15 fewer battle deaths per year. While this figure appears rather small at first, it is more significant when we consider that roughly half of the conflicts in the dataset saw 100 or fewer battle deaths per year. We also tested measures of the percentage change in oil prices. Positive changes in both the current and prior period were associated with fewer battle deaths. A 10% increase in price in the current or prior period was associated with a decrease in yearly battle deaths of over 100.

**Table 1: Oil prices and conflict intensity in oil reliant conflict states**

|                           | Dependent variable: Battle deaths (yearly) |                            |                            |                           |
|---------------------------|--------------------------------------------|----------------------------|----------------------------|---------------------------|
|                           | Model                                      |                            |                            |                           |
|                           | 1                                          | 2                          | 3                          | 4                         |
| WTI P(t)                  | −28.875***<br>(10.693)                     |                            |                            |                           |
| WTI P(t-1)                |                                            | −2.888<br>(9.602)          |                            |                           |
| WTI % chng(t)             |                                            |                            | −1,190.311**<br>(600.541)  |                           |
| WTI % chng(t-1)           |                                            |                            |                            | −1,617.526**<br>(673.981) |
| log(Population)           | 2,244.934<br>(2,038.138)                   | 4,279.730**<br>(1,977.919) | 4,161.462**<br>(1,901.066) | 3,452.998*<br>(1,925.875) |
| Sec score                 | 1,152.992**<br>(510.982)                   | 875.673*<br>(526.654)      | 773.926<br>(504.849)       | 976.206*<br>(503.646)     |
| log(GDP)                  | 841.387<br>(626.393)                       | −281.843<br>(580.287)      | −403.644<br>(432.539)      | −212.523<br>(436.278)     |
| Observations              | 139                                        | 139                        | 139                        | 139                       |
| R <sup>2</sup>            | 0.113                                      | 0.062                      | 0.090                      | 0.103                     |
| Adjusted R <sup>2</sup>   | 0.036                                      | −0.019                     | 0.011                      | 0.025                     |
| F Statistic (df = 4; 127) | 4.034***                                   | 2.116*                     | 3.138**                    | 3.626***                  |

*Notes:* Models are panel linear regressions with country fixed effects. Price coefficients show the result of a 100 dollar increase in oil prices. Robust standard errors in parentheses. \*p<0.1; \*\*p<0.05; \*\*\*p<0.01



**Figure 1: Marginal effect of oil price moves on battle deaths.**

*Notes:* The figures represent the marginal effect of 1 standard deviation increase in the West Texas Intermediary (WTI) price of oil (from the prior year in percentage terms).

Among the control variables, performance was largely in line with expectations based on similar models. Overall model fit was within an acceptable range. However, the number of observations was limited to fewer than 200, as most states in the dataset were not “oil states”. In response to this, to examine the robustness of these findings, and to determine the effect that oil dependency has on the size of the marginal effect, we tested two additional subsets of Model 4 in Table 1. The first additional subset was tested using only extreme oil states and the second was tested using all states in the set.

As Figure 1 illustrates, the effect of oil prices increases was most pronounced for the most oil-reliant states. By contrast, among non-oil states, there was no statistically significant effect. This all indicates that oil price increases have conflict-reducing impacts to state capacity in these oil-reliant states. To provide an additional examination of the robustness of this observation, we also examined the entire set of cases using an interactive term between oil price and the level of oil rents.

To undertake a test using all the data, we employed the variable measuring oil rents as a percentage of GDP directly into the model. The term was multiplied with the variable measuring the price of oil to form an interactive term. As before, our standard specification approach for all models was to use ordinary-least-squares (OLS) regression models with two-way fixed effects for time (by year) and state errors. The formal specifications for these models can be found in the appendix.

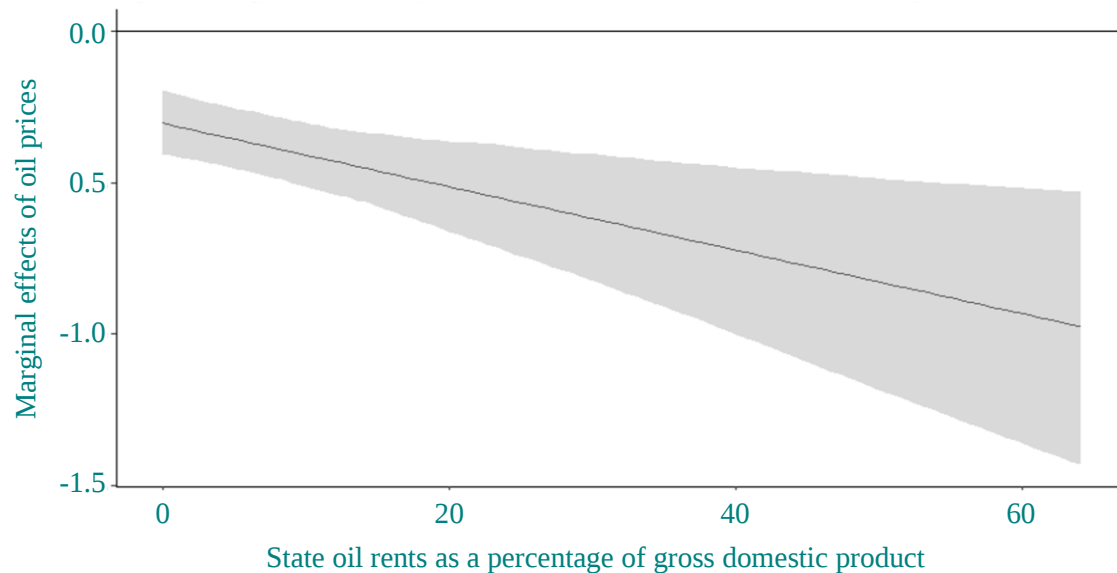
Observing the results of these four interactive models in Table 2, we see that both the current and prior year percentage change in oil price is negatively associated with the number of battle deaths in ongoing conflicts. In both cases, a 100% increase in the price of oil during the current or prior year is associated with roughly 60 fewer fatalities per year. Substantively speaking, the effect from oil shocks is modest. However, it represents the average across the entire dataset. The marginal effect increases significantly as the level of oil dependence increases (discussed below).

Among the control variables, the prior year battle deaths variable was most statistically significant, as might be expected. The independent effect of oil prices was dropped in these models due to the inclusion of time fixed effects, meaning that price was invariant within states in many cases. This is also the reason that time fixed effects were not included in Table 1. When time fixed effects were dropped for these regressions, the independent effect of oil price was not statistically significant. This is expected, as we ought to expect a significant effect from oil prices only when oil rents as a percentage of GDP are also high.

**Table 2: Oil prices and conflict intensity in all conflict states**

|                          | <i>Dependent variable: Battle deaths (yearly)</i> |                        |                        |                        |
|--------------------------|---------------------------------------------------|------------------------|------------------------|------------------------|
|                          | <i>Model</i>                                      |                        |                        |                        |
|                          | 1                                                 | 2                      | 3                      | 4                      |
| WTI P(t)                 | −0.148<br>(0.231)                                 |                        |                        |                        |
| WTI P(t-1)               |                                                   | 0.229<br>(0.201)       |                        |                        |
| WTI % chng(t)            |                                                   |                        | −60.175**<br>(25.878)  |                        |
| WTI % chng(t-1)          |                                                   |                        |                        | −62.031***<br>(25.889) |
| OilRents                 | 7.823<br>(20.850)                                 | −26.362<br>(18.116)    | 17.942<br>(15.166)     | 10.998<br>(15.655)     |
| Battle deaths(t-1)       | 0.347***<br>(0.029)                               | 0.348***<br>(0.029)    | 0.342***<br>(0.029)    | 0.340***<br>(0.029)    |
| log(Population)          | 558.401<br>(1,061.429)                            | 545.259<br>(1,062.073) | 405.422<br>(1,060.751) | 446.246<br>(1,058.723) |
| log(GDP)                 | 213.170<br>(242.903)                              | 144.129<br>(240.011)   | 183.295<br>(232.703)   | 197.094<br>(232.683)   |
| Observations             | 1,040                                             | 1,020                  | 1,040                  | 1,020                  |
| R <sup>2</sup>           | 0.132                                             | 0.131                  | 0.136                  | 0.137                  |
| Adjusted R <sup>2</sup>  | 0.053                                             | 0.053                  | 0.058                  | 0.060                  |
| F Statistic (df =5; 953) | 28.881***                                         | 28.833***              | 30.031***              | 30.375***              |

*Notes:* Models are panel linear regressions with country fixed effects. Price coefficients show the result of a 100 dollar increase in oil prices. The OilRents variable in models 2 and 4 is lagged. Robust standard errors in parentheses. \*p<0.1; \*\*p<0.05; \*\*\*p<0.01



**Figure 2: Marginal effect of oil prices on conflict deaths at various levels of oil dependence**

*Notes:* The effect illustrated here is modeled in Model 1 of Table 2 (using monthly data in place of yearly).

Figure 2 provides an illustration of the effect modeled in Model 1 of Table 2 (using monthly data in place of yearly).<sup>58</sup> As shown in Figure 2, the marginal effect of the oil price coefficient increases as the level of rentierism increases. Across the range of the sample, the marginal effect increases by nearly 3 times. This indicates that, on average, states without dependence on oil revenue experience a substantively insignificant effect on the level of conflict intensity even during large shocks. However, for states in which oil represents over 20 percent of gross domestic product, the negative marginal effect of price increases on conflict intensity are more significant. Around the median point, where oil rents represent approximately 30 percent of GDP, a one dollar increase in oil prices is expected to result in approximately 0.6 fewer monthly battle deaths. This is equivalent to roughly 72 fewer battle deaths on average in a year where prices increased by USD 10. This illustration mirrors the results from the three non-interactive models illustrated in Figure 1, where the effect was observed most strongly for the most oil reliant states.

It is possible that the effects shown in Tables 1 and 2 are weakened in part because the effect of military spending on battle deaths may in some cases work in the opposite direction that we hypothesize. For example, if increased military spending/greater military capacity leads to military “crackdowns” on rebels, we may expect a short-term uptick in battle deaths because of increased military activity. This is examined in greater detail below.

For all the models using an interactive term between oil rents and oil price, it is also important to note a feature of the interactive model which likely causes an underestimation of the true effect. As oil prices decline, the proportion of a state’s GDP that is normally generated by the sale of oil declines, causing the state to appear as less of an “oil state”. However, it is in precisely these states that we are trying to observe an effect. This causes an underestimation of the effect—which makes the results more conservative.

As previously theorized, the reason for these observed effects is the impact that declines in oil prices have on

<sup>58</sup> This is done for illustrative purposes to provide more observations. We chose models using yearly oil price data in the tables because our conflict and spending data is yearly. The model using monthly data used for this illustration can be found in the appendix.

government revenue in rentier states. When oil dependent states face large declines in oil prices, they have a few limited options to make up the shortfall. Borrowing on capital markets is an option, but for most of these states, creditworthiness is inherently tied to the value of oil exports, so this option also becomes constrained. Some states have “rainy day funds” in the form of sovereign wealth funds, and others may receive foreign military aid. However, these alternatives are present for only a select number of states. For most states, significant declines in real government revenue means significant declines in actual government spending, which includes the military.

We specify four models to test Hypothesis 2. The first two models estimate the effect of the measures of oil price in the current and prior period on military expenditures in oil reliant states only (using the same set of cases used for the models in Table 1). The second two models use all states and employ the interactive effect between oil rents and oil prices (similar to the method used for the models in Table 2). Once again, the models are OLS linear regressions with fixed effects included. The formal model specifications can be viewed in the appendix.

Table 3 demonstrates the effect of oil price shocks on gross military expenditures in constant 2017 USD. For the linear models using oil reliant states only (the first two models), a USD 100 increase in the price of oil in the prior period was associated with an increase in military expenditures of USD 36mn.

In the first interactive model (the third model), the marginal effect of an increase in the price of oil during the current year, when multiplied by an increase in oil rents, is associated with a more positive marginal effect on military expenditures by the magnitude of roughly USD 14mn. For the price of oil during the prior year, this figure was a USD 5mn increase in the marginal effect on military expenditures. For context, the standard deviation for military expenditure in the data was roughly USD 12bn. Using the figure in model 3, an increase in oil rents by five percent is associated with an increase in the positive marginal effect of oil prices by USD 700mn dollars, and a USD 10 increase in the price of oil at this level would entail a USD 7bn dollar increase in spending.

States that use the revenue from oil sales to fund government expenditures often have alternative sources of funding such as sovereign wealth funds or access to international credit markets. Thus, control variables for these features were added to the models here and in the appendix. The appendix models also provide alternative specifications, taking the log of the dependent variable and additional fixed effects. The results of these models were similar to those shown here. While the second two models in the table used the full dataset of 1200 cases, the number of observations was more severely limited by the inclusion of the control variables for which there were fewer observations. Models without control variables saw similar performance of the primary independent variables of oil price and oil rents, but these models without controls had a much weaker fit.

Based on these results, it seems plausible to suspect that significant price shocks can be expected to have an impact on both the intensity of civil conflict (H1), as well as the level of military spending, which mediates this outcome (H2).

**Table 3: Oil prices and military spending in conflict states**

| <i>Dependent variable: Oil prices and military spending in conflict states</i> |                                       |                                       |                               |                               |
|--------------------------------------------------------------------------------|---------------------------------------|---------------------------------------|-------------------------------|-------------------------------|
|                                                                                | <i>Models</i>                         |                                       |                               |                               |
|                                                                                | <i>1</i><br><i>Oil Reliant States</i> | <i>2</i><br><i>Oil Reliant States</i> | <i>3</i><br><i>All States</i> | <i>4</i><br><i>All States</i> |
| WTI P(t)*OilRents                                                              |                                       |                                       | 14,087,750***<br>(3,689,224)  |                               |
| WTI P(t-1)*OilRents(t-1)                                                       |                                       |                                       |                               | 3,216,664***<br>(1,905,151)   |
| WTI P(t)                                                                       | 5,314,081<br>(9,607,049)              |                                       | -28,047,722**<br>(13,037,850) |                               |
| WTI P(t-1)                                                                     |                                       | 36,188,156***<br>(8,552,945)          |                               | -18,518,084<br>(12,181,288)   |
| OilRents                                                                       |                                       |                                       | -264,725,160<br>(261,892,763) | 28,324,14<br>(228,550,421)    |
| log(GDP)                                                                       | 966,952,011***<br>(322,459,424)       | 287,898,859<br>(308,713,578)          | -159,851,212<br>(624,665,693) | -45,925,586<br>(617,583,728)  |
| Total reserves                                                                 | 369,389,520***<br>(130,978,480)       | 283,032,140**<br>(122,189,741)        | 11,039,391***<br>(364,678)    | 11,038,959***<br>(368,679)    |
| Central government debt                                                        |                                       |                                       | -3,802,557<br>(10,384,174)    | 2,979,000<br>(10,232,084)     |
| Observations                                                                   | 154                                   | 154                                   | 384                           | 373                           |
| R <sup>2</sup>                                                                 | 0.431                                 | 0.494                                 | 0.863                         | 0.860                         |
| Adjusted R <sup>2</sup>                                                        | 0.392                                 | 0.458                                 | 0.852                         | 0.849                         |
| F Statistic (df =5; 953)                                                       | 36.171***<br>(df = 3; 143)            | 46.465***<br>(df = 3; 143)            | 371.400***<br>(df = 6; 354)   | 363.277***<br>(df = 6; 354)   |

*Notes:* Models are panel linear regressions with country fixed effects. Total reserves are logged for models using only oil reliant states. Oil rents variable is lagged for Model 4. Robust standard errors in parentheses. \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

The final hypothesis (H3) examines the relationship between military spending and the number of battle deaths in oil reliant conflict states. Analysis here is made more challenging by the fact that, without control variables, military spending can be expected to have a strong positive association with conflict intensity—since states experiencing more conflict will tend to spend more on the military. The inclusion of a measure for the number of battle deaths in the previous period helps to mitigate this effect and improve model fit, as do fixed effects.

**Table 4: Military spending and conflict intensity in oil reliant conflict states**

| <i>Dependent variable: Battle deaths (yearly)</i> |                           |                               |                                |
|---------------------------------------------------|---------------------------|-------------------------------|--------------------------------|
|                                                   | <i>Models</i>             |                               |                                |
|                                                   | <i>1</i>                  | <i>2</i>                      | <i>3</i>                       |
|                                                   | <i>All Oil States</i>     | <i>Low Intensity Conflict</i> | <i>High Intensity Conflict</i> |
| log(milex)                                        | 552.724<br>(430.128)      | -106.947*<br>(56.211)         | 1,584.703<br>(1,522.129)       |
| Battle deaths(t-1)                                | 0.472***<br>(0.092)       | 0.049<br>(0.030)              | 0.046<br>(0.246)               |
| log(Population)                                   | 6,438.542*<br>(3,508.574) | 91.047<br>(363.617)           | 73,134.420<br>(48,482.200)     |
| Sec score                                         | 144.797<br>(529.507)      | -54.749<br>(62.593)           | -8,809.556**<br>(3,302.620)    |
| log(GDP)                                          | -307.582<br>(743.779)     | -112.682<br>(96.471)          | -8,491.844**<br>(3,180.431)    |
| Observations                                      | 128                       | 83                            | 45                             |
| R <sup>2</sup>                                    | 0.431                     | 0.494                         | 0.863                          |
| Adjusted R <sup>2</sup>                           | 0.146                     | -0.446                        | -0.518                         |
| F Statistic (df =5; 953)                          | 11.348***<br>(df = 5; 92) | 1.938<br>(df = 5; 47)         | 3.597**<br>(df = 5; 11)        |

*Notes:* Models are panel linear regressions with time and country fixed effects. Robust standard errors in parentheses. \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

As previously discussed, we can expect the effect of military spending on the number of battle deaths in a conflict to be nonlinear. States during higher intensity conflicts may see the number of associated battle deaths rise with increased military spending, as additional military spending is used to crack down on rebels. However, in states where ongoing conflict is less intense, we can expect that opportunity-minded or less-numerous rebels may have less appetite for conflict as the security environment improves. For this reason, we ought to primarily observe additional military spending reducing the number of battle deaths in states where conflict is already relatively mild and rebels can more easily disengage.

Based on these intuitions, we split the sample of oil reliant conflict states into high intensity conflict states (those where yearly battle deaths exceeded 500), and low intensity conflict states (where battle deaths were less than 500). The formal specifications for these models can be found in the appendix. Table 4 illustrates the results of these tests. The first model illustrates the effect using all oil reliant states. The second model includes the low intensity conflict states, and the third model uses the high intensity conflict states. As before, we employed OLS panel regressions with

fixed effects for time and country.

As Table 4 shows, the logged value of military expenditures was negatively associated with the number of battle deaths in oil reliant states in which low-level conflict was occurring. A 25 percent increase in military expenditures was associated with roughly 25 fewer yearly battle deaths. This result supports the general hypothesis that military expenditures reduce conflict by increasing state capacity and dissuading rebel attacks. It also helps to explain why higher oil prices are negatively associated with the number of battle deaths in oil reliant states that are in conflict—because it links the results from H2 relating to military expenditures and oil prices with an estimation of how military expenditures in turn impact battle deaths.

## Conclusion

The research described in this article helps define important aspects of the relationship between oil prices and civil conflict in oil-reliant states. When oil prices are high, rentier states can better fund conflict-reducing state capacity, such as expenditures on military force. Rebels seeking to capture oil-rich regions can be expected to contend with the central government seeking to end their rebellion. Additionally, this research helps to expand an already existing literature on the impact of oil prices and conflict, which thus far has mainly focused on rebel incentives, or on the propensity for interstate conflict. By understanding the associations between these variables more closely, both researchers and policy makers will have additional insight into what conditions can be expected to generate conflict in oil dependent states.

The article's study could be improved by developing and testing alternative measures of state capacity and conflict intensity. As seen in the data analysis, high state capacity may not always lead to less battle deaths, and likewise lower military expenditure may not always indicate a weaker security sector. Improved measures of these variables will allow analysts to develop more flexible models than the ones presented here. The newness of many state capacity measures limits their usage in quantitative studies, and addressing this limitation ought to be a priority for peace researchers.

Regardless of the true size of the effects estimated here, it seems clear that the changing energy economy will hold serious consequences for states that derive significant government revenue from the sale of oil. As oil demand continues to decline in the face of economic greening and technological improvement, states oriented around the sale of these commodities will be faced with fewer options. Although some may find alternative sources of revenue, it seems plausible to expect that this shift in the global economy could result in significant political instability in vulnerable states.

As we have attempted to demonstrate in this article, one of these effects is likely to be the reduced capacity for oil reliant states to prosecute ongoing civil conflicts. In most cases, we can expect this to lead to increased conflict intensity. Policy makers and political scientists are well advised to continue to examine these relationships, and, if possible, develop solutions to reduce these unintended consequences of both oil price fluctuations and the ultimate move away from fossil fuels.

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## Appendix

A visual model of our primary hypothesis yields a clear negative relationship between the prevailing market price for oil (measured in monthly mean intervals) and the average monthly battle deaths in ongoing conflicts—provided those conflicts are occurring in states heavily reliant upon the sale of crude oil for government revenue. Shown in Figure A1, a full move across the range of observed price values for WTI Crude Oil in the dataset (from the lowest observed price to the highest) is predictive of over 50 fewer monthly deaths in ongoing civil conflicts on average among the states observed.

To re-test Hypothesis 1 with an interactive term, we specify the following four basic models of yearly conflict battle deaths to include oil rents as a share of the state's total GDP interacted with various measures of oil prices:

$$\text{Battle Deaths}_{it} = B_0 + B_1 \text{WTI Price}_{it} * \text{Oil Rents}_{it} + B_2 \text{WTI Price}_{it} + B_3 \text{Oil Rents}_{it} + B_4 \log(\text{population})_{it} + B_5 \log(\text{GDP})_{it} + B_6 \text{BattleDeaths}_{it-1} + C_i + e$$

$$\text{Battle Deaths}_{it} = B_0 + B_1 \text{WTI Price}_{i(t-1)} * \text{Oil Rents}_{it} + B_2 \text{WTI Price}_{i(t-1)} + B_3 \text{Oil Rents}_{it} + B_4 \log(\text{population})_{it} + B_5 \log(\text{GDP})_{it} + B_6 \text{BattleDeaths}_{it-1} + C_i + e$$

$$\text{Battle Deaths}_{it} = B_0 + B_1 \text{WTI Price Change}_{it} * \text{Oil Rents}_{it} + B_2 \text{WTI Price Change}_{it} + B_3 \text{Oil Rents}_{it} + B_4 \log(\text{population})_{it} + B_5 \log(\text{GDP})_{it} + B_6 \text{BattleDeaths}_{it-1} + C_i + e$$

$$\text{Battle Deaths}_{it} = B_0 + B_1 \text{WTI Price Change}_{i(t-1)} * \text{Oil Rents}_{it} + B_2 \text{WTI Price Change}_{i(t-1)} + B_3 \text{Oil Rents}_{it} + B_4 \log(\text{population})_{it} + B_5 \log(\text{GDP})_{it} + B_6 \text{BattleDeaths}_{it-1} + C_i + e$$

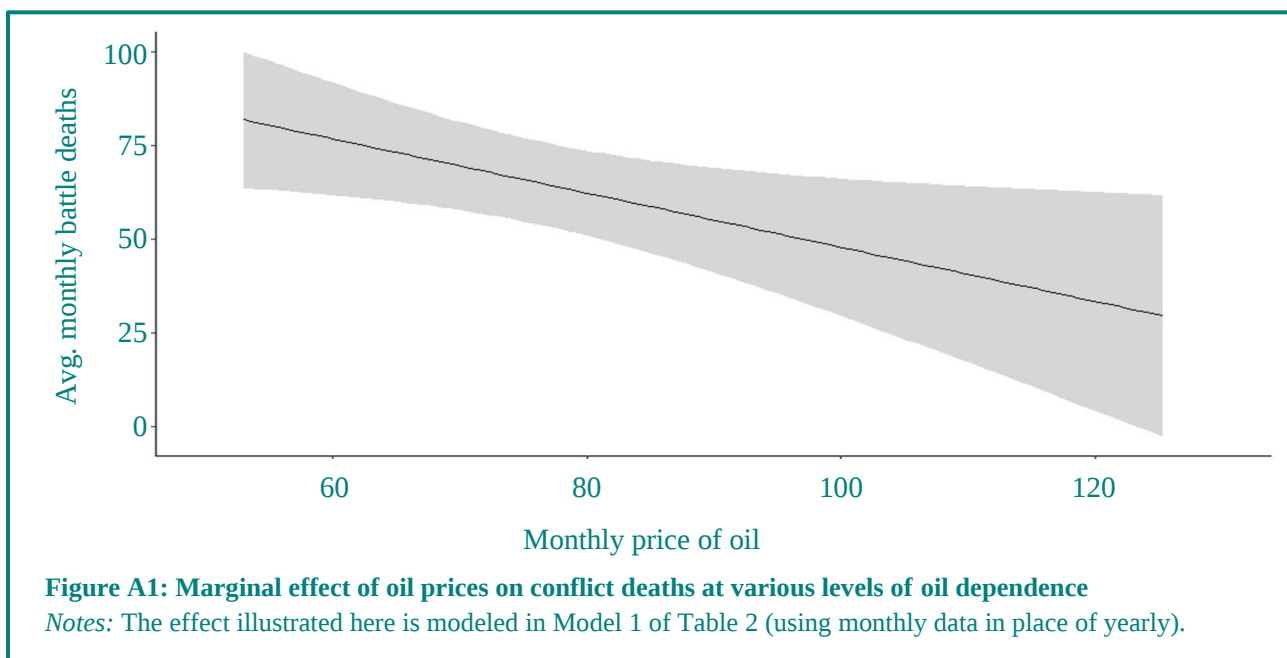


Table A1 presents the results of the formal model used for the illustration in Figure 2, which uses monthly data instead of yearly data.

**Table A1: Oil prices and conflict intensity in all conflict states**

*Dependent variable: Battle deaths (monthly avg.)*

|                            | (1)                   | (2)                   |
|----------------------------|-----------------------|-----------------------|
| WTI P(t)*Oil rents         | -1.1***<br>(0.004)    |                       |
| WTI P(t-1)*Oil rents       |                       | -0.8**<br>(0.004)     |
| WTI P(t)                   | -0.302***<br>(0.055)  |                       |
| WTI P(t-1)                 |                       | -0.295***<br>(0.055)  |
| Oil rents                  | -3.456***<br>(0.378)  | -3.696***<br>(0.377)  |
| log(Population)            | 122.718***<br>(9.557) | 121.018***<br>(9.588) |
| Sec score                  | 7.061*<br>(3.770)     | 7.239*<br>(3.772)     |
| Observations               | 10,224                | 10,224                |
| R <sup>2</sup>             | 0.043                 | 0.042                 |
| Adjusted R <sup>2</sup>    | 0.037                 | 0.036                 |
| F Statistic (df =5; 10161) | 91.804***             | 89.749***             |

*Notes:* Models are panel linear regressions with country fixed effects. Price coefficients show the result of a 100 dollar increase in oil prices. Robust standard errors in parentheses. \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Below are the formal model specifications used for H2. The models using only oil reliant states were not able to employ the debt variable due to the limited number of observations:

$$\begin{aligned} \text{Military Expenditures}_{it} &= B_0 + B_1 \text{WTI Price}_{it} * \text{Oil Rents}_{it} + B_2 \text{WTI Price}_{it} + B_3 \text{Oil Rents}_{it} \\ &\quad + B_4 \log(\text{GDP})_{it} + B_5 \text{FX Reserves}_{it} + B_6 \text{Gov Debt}_{it} + C_i + e \\ \text{Military Expenditures}_{it} &= B_0 + B_1 \text{WTI Price}_{i(t-1)} * \text{Oil Rents}_{it} + B_2 \text{WTI Price}_{i(t-1)} + B_3 \text{Oil Rents}_{it} \\ &\quad + B_4 \log(\text{GDP})_{it} + B_5 \text{FX Reserves}_{it} + B_6 \text{Gov Debt}_{it} + C_i + e \\ \text{Military Expenditures}_{it} &= B_0 + B_1 \text{WTI Price}_{it} + B_2 \log(\text{GDP})_{it} + B_3 \text{FX Reserves}_{it} + C_i + e \\ \text{Military Expenditures}_{it} &= B_0 + B_1 \text{WTI Price}_{i(t-1)} + B_2 \log(\text{GDP})_{it} + B_3 \text{FX Reserves}_{it} + C_i + e \end{aligned}$$

To test the robustness of these models, we employed additional specifications shown in Table A2. The first two models add the use of fixed effects for time. The second two models include this and log the dependent variable. In each specification, the results remained consistent.

**Table A2: Robustness checks for spending models**

|                          | Dependent variable:                 |                                     |                                       |                                       |
|--------------------------|-------------------------------------|-------------------------------------|---------------------------------------|---------------------------------------|
|                          | <i>milex (2017 constant USD)</i>    | <i>milex (2017 constant USD)</i>    | <i>log(milex (2017 constant USD))</i> | <i>log(milex (2017 constant USD))</i> |
|                          | (1)                                 | (2)                                 | (3)                                   | (4)                                   |
| Oilrents                 | -384,447,114<br>(246,662,205)       | -160,865,293<br>(223,333,541)       | -0.026<br>(0.024)                     | -0.021<br>(0.022)                     |
| log(GDP)                 | 3,283,270,833***<br>(1,094,388,524) | 3,666,134,906***<br>(1,088,693,981) | 1.170***<br>(0.107)                   | 1.184***<br>(0.105)                   |
| Total reserves           | 10,815,253***<br>(356,339)          | 10,759,540***<br>(357,815)          | 0.0001***<br>(0.00003)                | 0.0001***<br>(0.00003)                |
| Central government debt  | 11,786,521<br>(10,796,978)          | 19,292,384*<br>(10,398,843)         | 0.004***<br>(0.001)                   | 0.004***<br>(0.001)                   |
| WTIprice(t)*Oilrents     | 11,922,098***<br>(3,576,031)        |                                     | 0.001*<br>(0.0003)                    |                                       |
| WTIprice(t-1)*Oilrents   |                                     | 5,342,796***<br>(2,010,420)         |                                       | 0.0004**<br>(0.0002)                  |
| Observations             | 384                                 | 384                                 | 384                                   | 384                                   |
| R <sup>2</sup>           | 0.783                               | 0.781                               | 0.366                                 | 0.368                                 |
| Adjusted R <sup>2</sup>  | 0.748                               | 0.745                               | 0.261                                 | 0.264                                 |
| F Statistic (df =5; 953) | 237.792***                          | 234.174***                          | 37.911***                             | 38.277***                             |

Notes: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Below is the formal model specification used for H3:

$$\begin{aligned} \text{Battle Deaths}_{it} &= B_0 + B_1 \log(\text{milex})_{it} + B_2 \log(\text{population})_{it} + B_3 \text{SecScore}_{it} + B_4 \log(\text{GDP})_{it} \\ &\quad + B_5 \text{Battledeaths}_{it-1} + C_i + e \end{aligned}$$