Oil Price Shocks and Conflict Escalation: Onshore vs. Offshore

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We reconsider the relationship between oil and conflict, focusing on the location of oil resources. In a panel of 132 countries over the period 1962-2009, we show that oil windfalls escalate conflict in onshore-rich countries, while they de-escalate conflict in offshore-rich countries. We use a model to illustrate how these opposite effects can be explained by a fighting capacity mechanism, whereby the government can use offshore oil income to increase its fighting capacity, while onshore oil may be looted by oppositional groups to finance a rebellion. We provide empirical evidence supporting this interpretation: we find that oil price windfalls increase both the number and strength of active rebel groups in onshore-rich countries, while they strengthen the government in offshore-rich ones.

Keywords: Natural Resources, Conflict

JEL codes: O13, D74, Q34, Q35

1 Introduction

Oil is often considered responsible for fuelling civil conflicts - both as a source of funding for the contenders and as a prize for the fighting. Anecdotal evidence consistent with this argument abounds: examples of recent oil-related episodes of conflict include ISIL's strategic control of resources in Syria and Iraq, oil theft by MEND rebels in Nigeria, and attacks to extraction facilities by Darfur insurgents in South Sudan.[1]

Despite the popularity of the argument, establishing a systematic nexus between oil wealth and conflict has proved complex, since oil-rich countries display large variations in measures of internal stability. While countries like Iraq and Nigeria are often cited as examples of the nefarious consequences of oil abundance on conflict, other countries, as diverse as Qatar, Norway and Gabon, have never experienced a civil conflict over the past 40 years in spite of their vast oil wealth. Yet other countries, like Angola and Azerbaijan, have even put an end to their conflicts in correspondence to large increases in oil wealth. Indeed, while early cross-sectional studies generally found a positive association between oil wealth and the onset and duration of conflict (Collier and Hoeffler, 2004; Fearon and Laitin, 2003; Le Billon, 2003), more recent studies focusing on within-country variation find mixed evidence on the relationship (Bazzi and Blattman, 2014; Cotet and Tsui, 2013; Lei and Michaels, 2014).

In this paper, we take a fresh look at the oil-conflict nexus by focusing on the location of oil, using new industry-licensed data that allow us to distinguish between *onshore* and *offshore* production. We use a large panel of countries and within-country variation to document that onshore and offshore oil have *opposite* effects on the probability of conflict. While greater onshore oil wealth makes conflict escalations more likely, greater offshore oil wealth tends to de-escalate conflicts.

To reach these conclusions we use exogenous fluctuations in international oil prices, weighted by each country's average shares of onshore and offshore production in GDP. The effects we document are both statistically and economically significant. For a large onshore producer like Iraq, our estimates suggest that a one standard deviation increase in the price of oil raises the probability of conflict escalation by 3 percentage points, or 28% compared to its average probability. For a large offshore producer like Azerbaijan, instead, a similar oil price windfall

[1] The auto-proclaimed Islamic State of Iraq and Levant (ISIL) has repeatedly made the headlines and its financing through oil has been extensively analyzed by the media, see, e.g.: "Inside Isis Inc: The journey of a barrel of oil" (Financial Times, 2015). Other examples of journalistic accounts of sabotage, oil-theft and looting of onshore oil fields in different countries include, but are not limited to, Libya ("Libya Declares Force Majeur Over Oil Fields in Central Region", The Wall Street Journal, 2015), Nigeria ("Renewed Delta violence reignites fears for Nigeria oil production", Financial Times, 2016) and South Sudan ("South Sudan's rebels prepare to attack Paloch oilfields", SSNA, 2015).

reduces the probability of conflict escalation by 1.6 percentage points, or 39% of its mean. In general, we show that the overall impact of oil price windfalls shifts from reducing to increasing the probability of conflict escalation when the share of onshore oil exceeds about 38% of total production.

We attribute the opposite effect of oil price windfalls in onshore- and offshore-rich countries to their differential impact on the fighting capacities of the contenders. We argue that a crucial difference between offshore and onshore facilities is that the latter can more easily be attacked, looted, and even seized by rebel groups, which in turn can use the proceeds from the looting to maintain and equip their troops. Thus, oil price windfalls increase relatively more the fighting capacity of rebels compared to the government, the larger is the share of onshore oil production for any given share of offshore (or total) oil production in GDP. Conversely, oil price windfalls tilt the balance of power in favour of the government more, the larger is the share of production obtained from offshore facilities, which are easier to defend and whose proceeds almost exclusively accrue to the central government.

We document the empirical relevance of the fighting capacity mechanism using a rebel strength indicator that measures the ability of active rebel groups to maintain and equip troops, relative to the government (Cunningham et al., 2013). Consistent with our interpretation, an increase in the price of oil raises the indicator of rebels' strength in onshore-rich countries, while it decreases it in offshore-rich countries.

To get a better sense of the sort of episodes driving our empirical analysis, consider the case of Indonesia. During the early 1970s, the discovery of vast oil and gas fields in the northern region of Aceh almost doubled the country's oil production, 80% of which proceeded from onshore sources. The spike in production, coupled with the fourfold increase in the price of oil during the 1973 crisis, were instrumental to the consolidation of the Free Aceh Movement (GAM), an insurgency movement that aimed at securing larger shares of the oil rents to the local population (Schulze, 2006). In 1976 the group launched an offensive against the central government.[2] During the following three years, characterized by soaring oil prices, the number of GAM rebels and their strength relative to the government increased, resulting in a large scale civil conflict. Only around 1980, with oil prices starting to decline sharply, did the central government manage to defeat the insurgency, and the group's leader fled the country.

Now consider instead the case of Angola, where, at the end of the 1990s, new deep-water exploration technologies made it possible to double offshore oil production, which came to

[2] The group's leader, Hasan di Tiro, bid for an oil contract in 1974 but lost to a U.S. company, while in the run-up to the 1976 conflict the group was responsible for numerous episodes of extortion against Exxon Mobil to induce the company to pay "protection fees" for its gas plant in Aceh.

represent 80% of the country's GDP. The increased offshore production, together with the sustained increase in oil prices (an average annual growth rate of 60% between 1998 and 2000) enabled the government to mortgage future oil revenues, purchase weapons on the international arms market and, in 1999, launch an offensive against the rebels of the National Union for the Total Independence of Angola (UNITA) (Le Billon, 2007). The offensive led to the destruction of UNITA as a conventional military force, paving the way for the end of a civil war that had been going on since the country's independence in 1975.

To guide our empirical analysis, we open the paper with a model *a la* Tullock (1980) in which the government and a rebel group fight over power and, thereby, the control of oil resources. In the baseline version of the model, the probability of winning the conflict depends on the relative fighting capacity of the contenders (e.g., their relative abilities to maintain and equip troops). Our simple theoretical innovation is to let the fighting capacities be functions of oil and its geographical location. Crucially, we assume that both onshore and offshore oil income contribute to the fighting capacity of the central government, but only onshore oil contributes to the fighting capacity of the rebels. A straightforward implication of this assumption is that an oil windfall raises the fighting capacity of the rebels relative to the government when the share of onshore production is sufficiently large – that is, above what we call the *fighting capacity threshold*.

Incorporating the fighting capacity mechanism into the baseline model also allows us to identify an *equilibrium conflict threshold*. This represents the share of onshore production above which an oil windfall raises the probability of conflict escalation. The equilibrium conflict threshold lies below the fighting capacity threshold, because it also accounts for the value of holding power (a state prize effect). Hence, the two thresholds effectively identify three ranges for the share of onshore oil production. If the share is low (i.e. below the equilibrium conflict threshold), an oil price shock mostly benefits the government, weakening the rebels and increasing the probability of a conflict de-escalation. If, on the contrary, the share of onshore production is high (i.e. above the fighting capacity threshold), the shock benefits mostly the rebels, raising their fighting capacity and increasing the probability of conflict. Finally, if the share of onshore production lies between the two thresholds, an oil price shock increases the probability of conflict escalation in spite of making the government relatively stronger. Intuitively, this is because – at intermediate values of onshore production – the increased value of holding power (the state prize effect) more than compensate the rebels for the reduced probability of winning the conflict (the fighting capacity effect), motivating them to intensify their conflict activities despite having become relatively weaker compared to the government.

Both the fighting capacity and the equilibrium conflict thresholds depend on parameters that may vary across countries. In particular, when onshore facilities are easily lootable or when rebels are more effective than the government in transforming resources into fighting capacity, the share of onshore wealth at which oil windfalls tilt the fighting capacity in favour of the rebels is (potentially much) lower. In this way, the model can also account for cases like Nigeria and Democratic Republic of Congo, where the limited state apparatus hampers the ability to secure onshore facilities and transform oil revenues into military power, making them subject to frequent spikes in rebel activity and conflict in spite of the limited share of onshore oil production.

The paper continues as follows. Section 2 places our contribution in the related literature. Section 3 formulates a simple model and derives the main hypotheses. Section 4 establishes the empirical model derived from the theory. Section 5 introduces the data. Section 6 provides the results from the empirical analysis, while Section 7 concludes.

2 Related literature

An early and influential literature in political science and economics investigates the relationship between resource abundance – oil in particular – and civil conflict using predominantly cross-country variation (Le Billon, 2003; Fearon and Laitin, 2003; Collier and Hoeffler, 2004). These studies generally point to a positive relationship between resource abundance and incidence of conflict. More recent studies, however, argue that identification of causal effects can be achieved with greater confidence using within-country variation. When focusing on within-country variation and using exogenous price shocks or resource discoveries for empirical identification, the results are more mixed. Lei and Michaels (2014) find that giant oil discoveries increase the incidence of internal armed conflicts within 4-8 years of discovery. Brunnschweiler and Bulte (2009), Cotet and Tsui (2013), Bazzi and Blattman (2014), instead, do not find a significant association between changes in oil wealth and the probability of conflict. We add on this literature by focusing on the geographical location of oil, which turns out to be a key element to understand the relationship between oil and conflict.

The only studies that we are aware of that explicitly focus on the location of oil to investigate civil conflict in a cross-country setting are Ross (2006) and Lujala (2010). Both studies find that only oil produced onshore is associated with the onset of conflict (see also Ross, 2012). One concern with these studies is that they do not account for time-invariant country characteristics and global trends, potentially related to oil production and conflict. We overcome these short-comings by focusing on within-country changes in oil wealth over time, weighting exogenous changes in international oil prices by the average share of onshore and offshore oil production in GDP.

Our identification strategy is similar to that used in the literature investigating the effects of income shocks induced by commodity price changes (Brückner and Ciccone, 2010; Berman and Couttenier, 2015; Caselli and Tesei, 2016; Dube and Vargas, 2013). An important distinction in these studies has to do with the extent of capital and labor intensity of different commodities. Dube and Vargas (2013), for example, show that price shocks to the capital-intensive oil sector in Colombia are positively related to violent conflict, while the relationship is negative for the labor-intensive coffee sector. This lends support to the hypothesis that oil income fosters rent-seeking behavior by increasing the state prize, while income from coffee triggers an opportunity cost effect by increasing worker wages. Our results show that other characteristics of natural resources contribute to explain their tendency to fuel conflict. We argue in particular that, while onshore and offshore oil are similar in terms of capital intensity, they are asymmetrically appropriable by the two sides in conflict, thus affecting the relative fighting capacities of government and rebels and the ensuing probability of conflict escalation.[3] This interpretation, based on the different ability of government and rebels to access onshore and offshore oil facilities, echoes similar arguments on the importance of conflict financing (e.g. Fearon, 2004; Collier et al., 2009). This is also in line with recent empirical evidence by Berman et al. (2017), who show that the appropriation of mining revenues by rebel groups contributes to the spreading of conflict to other parts of the country, something the authors attribute to the increased financial ability to sustain larger-scale insurgency.

Our focus on the fighting capacity of the contenders is complementary to other explanations of the impact of oil abundance on conflict. The already mentioned state prize hypothesis suggests that oil abundance increases the probability of conflict escalation by raising the prize that can be seized through the capture of the state (Bates et al., 2002; Fearon and Laitin, 2003). Alternative explanations focus on the lack of incentives for rentier states to develop a strong state capacity, which eventually makes them less able to prevent rebellions (Dunning, 2008; Ross, 2012); and on the inability of incumbent governments to credibly commit to oil rents redistribution, which exacerbate grievances of the excluded groups (Fearon, 2004; Besley and Persson, 2011). While these theories aim to explain the incidence of conflict in oil-rich countries, they cannot account for the opposite effect of onshore and offshore oil windfalls on the probability of conflict escalations observed in our data.

[3] In a similar spirit, Fetzer and Marden (2016) show that contestability of land title is associated to conflict. While their results refer to a form of "institutional lootability", we consider "technical lootability" of natural resources.

Our results are also broadly related to the class of contributions that have investigated the effects of oil price windfalls on political-economy outcomes other than civil conflict. For example, Haber and Menaldo (2011) and Brückner et al. (2012) present empirical evidence on oil abundance and democratization. Andersen et al. (2017), Caselli and Michaels (2013) and Dalgaard and Olsson (2008) look at oil windfalls and hidden wealth and corruption; Andersen and Aslaksen (2013) and Deaton and Miller (1996) at incumbents' survival; and Caselli et al. (2014) at international war.

Finally, our paper relates to Nordvik (2018), who studies the prevalence of coups d'etat in oil rich countries and documents strong asymmetries in the onshore-offshore dimension. While coups and civil conflict are different processes, our findings confirm that the location of oil may affect the political incentives of both incumbent governments and oppositions.

3 A model of oil location and conflict

3.1 Preliminaries

We consider an economy with both onshore and offshore oil production, occupied by two equally sized groups, the government (G) and the opposition (O). The groups engage in a violent conflict over the oil resources Q with value P, both exogenously given.

A minor share δn of the oil continuously leaks to the opposition (via, for example, looting or extortion), where δ is a 'looting' parameter and n is the share of the oil that is produced onshore.[4] The government oil revenues are thus given by $R_G \equiv (1 - \delta n)\, QP$, while $R_O \equiv \delta n QP$ revenues are controlled by the opposition.[5] We assume that the loot is small relative to total oil production (i.e., $\delta n \ll 1/2$), which ensures that the opposition has a strong incentive to fight for government control.

We model the fight over the government oil revenues using a Tullock-type conflict framework (Hirshleifer, 1991; Skaperdas, 1996).[6] The win probability of group i ($i = G, O$) can be defined

[4] In the real world, looting may come in the form of bunkering of oil pipelines (as in the Niger delta or in Mexico), extortion of oil companies (as in the case of Colombia), or outright occupation of oil production facilities and refineries (as in the case of ISIL).

[5] Alternatively, one could assume that some share ω of the offshore oil is also looted by the opposition. All our main results are confirmed as long as onshore oil is more susceptible to looting than offshore oil, i.e., if $\omega < \delta$. Our results are also preserved if we assume, albeit less realistically, that the opposition controls all of the onshore resources while the government controls all of the offshore resources, i.e., $\delta = 1$. Finally, while δ could be endogenized, our main results on the overall conflict equilibrium are maintained as long as $\delta > 0$.

[6] Consistent with our empirical setup, we restrict attention to mechanisms that may be relevant in the short run, while we disregard long-run mechanisms such as changes in investment and exploration policies, political and military strategies, strategic alliance formation, and geo-political dynamics. See Van der Ploeg and Rohner (2012) for a dynamic conflict model on the endogenous determination of both conflict and resource extraction, or Aslaksen and Torvik (2006) for the joint determination of political and conflict equilibria.

as $\frac{p_i e_i}{\sum\limits_{j=G,O} p_j e_j}$ (the "contest success function"), where p_i is the *relative fighting capacity* of the group (e.g. its ability to equip troops with weapons) and the strategic choice variable e_i is the extent of troops mobilization carried out by the group in the conflict. In the conflict equilibrium below, e_i thus represents a measure of conflict intensity, and positive and negative changes in e_i capture conflict escalations and de-escalations, respectively.

3.2 The fighting capacity mechanism

Crucially, we assume that oil revenues do not only constitute *a motive* for the conflict, but they also provide *the means* for fighting. In particular, we assume that an increase in the value of the resources looted by the rebels increases their fighting capacity relative to the government, while the opposite happens when the value of the offshore resources in the hands of the government increases.[7]

We define each group's relative fighting capacity $p_i \equiv f^i(R_i) / \left[\sum\limits_{j=G,O} f^j(R_j)\right]$ to depend positively on the group's oil revenues, that is, $df^i(R_i)/dR_i > 0$. Clearly, $\sum\limits_{j=G,O} p_j = 1$ and $p_G > 1/2$ (since, by assumption, $\delta n < 1/2$).[8]

We begin our analysis by first deriving the effect of an oil price shock on the relative fighting capacity of the government, $\frac{dp_G}{dP}$ (and, by symmetry, $\frac{dp_O}{dP} = -\frac{dp_G}{dP}$.) It is straightforward to show that $\frac{dp_G}{dP}$ may be either positive or negative, depending on whether the onshore oil share n is below or above a *fighting capacity threshold* $\overline{n}$, defined as:

$$\overline{n} = \frac{1}{\delta(1+\gamma_{OG})}, \tag{3.1}$$

where:

$$\frac{dp_G}{dP} \begin{cases} < 0 \quad if \quad n > \overline{n} \\ > 0 \quad if \quad n < \overline{n} \end{cases} . \tag{3.2}$$

We summarize this result in the following proposition (and refer the reader to Appendix A.1 for the formal proof):

PROPOSITION 1: The fighting capacity mechanism *A positive oil price shock: (i) increases the fighting capacity of the government relative to the opposition if the share of*

[7] That a group conflict technology is endogenous to its resource revenues is consistent with the argument and the empirical patterns in, for example, Berman et al. (2017).

[8] More formally, $p_G > 1/2$ requires $f^G(R_G) > f^O(R_O)$ at any shapes of $f^i(R_i)$ when $\delta n < 1/2$. We make this assumption throughout. We could easily relax this assumption without changing our main results, but at the cost of tractability.

onshore oil in the economy is sufficiently small, that is if $n < \overline{n}$; (ii) increases the fighting capacity of the opposition relative to the government if the onshore oil share is sufficiently large, that is if $n > \overline{n}$.

The fighting capacity threshold in equation (3.1) is a function of the share of onshore oil looted, δ, and of the fighting capacity effectiveness of the opposition relative to the government, $\gamma_{OG} \equiv \frac{\varphi_O}{\varphi_G}$, where $\varphi_i \equiv \frac{df_i/f(R_i)}{dR_i}$ describes the change in group i's fighting capacity per dollar change in the group's oil revenues. Considered together, equations (3.1) and (3.2) suggest that the more effective the opposition is in converting oil funds into fighting capacity relative to the government (i.e., the higher is γ_{OG}), and the higher the overall level of looting (i.e., the higher is δ), the more likely it is that an oil price windfall will reduce the relative fighting capacity of the government (at any given share of onshore production n), effectively reducing the threshold level $\overline{n}$.

3.3 Conflict equilibrium

We assume that each group is summarized by a representative agent with risk neutral preferences. Group i's expected payoff from mobilizing troops and fighting can thus be expressed as:

$$\Pi_i(e_i) = \frac{p_i e_i}{\sum\limits_{j=G,O} p_j e_j} R_G - W e_i \ , \tag{3.3}$$

where $\frac{p_i e_i}{\sum\limits_{j=G,O} p_j e_j} R_G$ is the expected economic benefit of gaining control of government oil, and the term We_i is the expected economic cost for group i of mobilizing e_i troops. We may interpret W as the income earned on the labor (and capital) markets per unit of e_i, which we take as exogenous.

The following timing of events describes the game between the government and the opposition:

1. Nature determines the state of the world, given by the shape of $f^i(R_i)$ and the vector $[n, \delta, Q, P, W]$.

2. Each group i simultaneously determines its level of troop mobilization, e_i, taking its own and the other group's expected payoff functions in equation (3.3) as given.

3. Payoffs are distributed across the government and the opposition according to the contest success function.

In the resulting game, all the strategic action takes place at Stage 2, where each group i maximizes equation (3.3) with respect to e_i, taking the other group's maximization as given.

Since the groups' expected payoff functions are symmetric, the solution to this problem implies a fully symmetric equilibrium level of troop mobilization, $e_G = e_O = e^*$, where

$$e^* = \frac{\Omega R_G}{W} \ , \tag{3.4}$$

and where $\Omega \equiv p_G p_O$ represents the power balance between the two contenders.[9] In the following, we consider e^* a measure of equilibrium conflict intensity, assumed proportional to the equilibrium level of troop mobilization.

Oil price shocks influence the conflict intensity e^* in two ways. First, through a standard state prize mechanism, whereby oil windfalls increase the government oil revenues R_G and raise the incentives to fight. Second, via *the fighting capacity mechanism* introduced in Section 3.2, since oil windfalls also change the balance of power between contenders, Ω. These two effects are shown in the following equation:

$$\frac{de^*}{dP} = \frac{\frac{d\Omega}{dp_G}\frac{dp_G}{dP}R_G + \Omega\frac{dR_G}{dP}}{W} \ , \tag{3.5}$$

where the first term ($\frac{d\Omega}{dp_G}\frac{dp_G}{dP}R_G$) in the numerator captures the fighting capacity mechanism and the second term ($\Omega\frac{dR_G}{dP}$) the state prize mechanism.

Importantly, the overall effect of an oil price windfall on the equilibrium level of conflict is ambiguous, depending on its effect on the relative fighting capacity of the government and the opposition (i.e., on the sign of $\frac{dp_G}{dP}$ discussed above).[10] Setting $\frac{de^*}{dP} = 0$, we derive an expression for the *equilibrium conflict threshold* of the onshore oil share, n, defined as:

$$\underline{n} = \left[1 + \frac{1}{(1-2p_G)\,\varphi_G R}\right]\overline{n} \ , \tag{3.6}$$

such that:

$$\frac{de^*}{dP}\begin{cases} > 0 \ \ if \ \ n > \underline{n} \\ < 0 \ \ if \ \ n < \underline{n} \end{cases} . \tag{3.7}$$

In equation 3.6, $R \equiv QP$ is the total value of oil production in the economy. Notice that, because $\frac{1}{(1-2p_G)\varphi_G R} < 0$, we have that $\underline{n} < \overline{n}$.[11]

[9] Notice that Ω is an inversely U-shaped function of p_i but that we restrict our analysis to the part of Ω that is downward-sloping in p_G (because $p_G > 1/2$).

[10] Notice that $\frac{d\Omega}{dp_G} = (1 - 2p_G) < 0$, since $p_G > 1/2$.

[11] The term $\frac{1}{(1-2p_G)\varphi_G R} < 0$ is negative because, by our assumptions, $2p_G > 1$, while both φ_G and R are positive. We assume $-1 < \frac{1}{(1-2p_G)\varphi_G R} < 0$, to ensure that $\underline{n} > 0$.

We summarize the results on the conflict effect of an oil price shock in the following proposition (and refer the reader to Appendix A.2 for the formal proof):

PROPOSITION 2: The conflict effect of an oil price shock *A positive oil price shock: (i) de-escalates the equilibrium level of conflict if the share of onshore oil in the economy is sufficiently small, that is if $n < \underline{n}$; (ii) escalates equilibrium conflict if the onshore oil share is sufficiently large, that is if $n > \underline{n}$.*

The results in Proposition 2 are graphically illustrated in Figure 1, which presents a schematic representation of the marginal effects of oil price windfalls on the equilibrium level of conflict (equation 3.7) and on the relative fighting capacity of the government (equation 3.2), both calculated as a function of the share of onshore oil production.

Starting with the marginal effect on the relative fighting capacity of the government, this is represented by the downward-sloping line in the figure. The effect turns from positive to negative when the share of onshore oil $n > \overline{n}$ (the fighting capacity threshold), above which an oil windfall raises relatively more the fighting capacity of the rebels. The marginal effect on the equilibrium level of conflict, on the contrary, is increasing in the share of onshore oil produced and changes from negative to positive when $n > \underline{n}$ (the equilibrium conflict threshold), above which an oil windfall raises the probability of conflict.

The intersection of the two lines with the x-axis identifies three areas for the relationship between oil price shocks and conflict escalation. At high shares of onshore oil production ($n > \underline{n}$), an oil windfall raises the probability of conflict escalation, by increasing both the prize at stake and the relative fighting capacity of the rebels, thus unequivocally raising their incentives to fight. The opposite happens at low shares of onshore oil production ($n < \overline{n}$), where instead an oil windfall de-escalates conflict. This happens because, when most of the production is located offshore, the windfall profits mostly accrue to the government, shifting the power balance in its favour and counterbalancing the increased incentives of the rebels to fight for the larger government revenues.[12] Finally, at intermediate shares of onshore oil production ($\underline{n} < n < \overline{n}$) an oil windfall escalates conflict despite the fact that the government becomes relatively stronger compared to the rebels. The intuition for this result is that, in this region, the increased value of holding power (the state prize effect) is sufficiently large to

[12] To see that there exists an equilibrium where a positive oil price shock has negative conflict effects (i.e., the case where $n < \underline{n}$), note that the term $\varphi_G R$ in equation (3.6) may be arbitrarily large, depending on the exact shape of the fighting capacity function $f_i(R_i)$ and on the economy's oil revenues. Evaluating equation (3.6) in the limiting case where $\varphi_G R \longrightarrow \infty$ – that is, when the fighting capacities are strongly (infinitely) responsive to changes in oil revenues (at any given level of γ_{OG}) – the equilibrium conflict threshold converges to the fighting capacity threshold ($\underline{n} \longrightarrow \overline{n}$), which is positive (for any value of $\delta \in (0, 1]$ and $\gamma_{OG} > 0$).

compensate the rebels for the reduced probability of winning the conflict (the conflict capacity effect).

4 From the model to the empirics

The simple model presented in Section 3 delivers a number of testable implications that we bring to the data. First, the model predicts that a positive oil price shock is expected to escalate the conflict intensity if the share of onshore oil is above a certain level ("the equilibrium conflict threshold", $\underline{n}$), while conflict is expected to de-escalate if the onshore share is below this level. Second, following an oil price windfall, the fighting capacity of the opposition is expected to increase relative to the government if the share of onshore oil is sufficiently high (above "the conflict capacity threshold", $\overline{n}$), while it is the government that grows relatively stronger if the onshore share is below this level. Finally, the conflict capacity threshold is expected to be (weakly) higher than the equilibrium conflict threshold (i.e., $\overline{n} > \underline{n}$).

We test these predictions in the following empirical model, which maps directly from the theory:[13]

$$\Delta y_{it} = \beta_1 \theta_i^{ons} \Delta Pr_t + \beta_2 \theta_i^{off} \Delta Pr_t + \mu_i + \delta_t + e_{it} \; , \tag{4.1}$$

where Δy_{it} is an indicator for a change in conflict status (onset, escalation, de-escalation, termination) or a change in the rebels' relative strength, ΔPr_t is the oil price growth rate, μ_i captures country fixed effects, δ_t captures a common time trend, and e_{it} is an error term clustered at the country level. The variables θ_i^{ons} and θ_i^{off} are (time invariant) measures of the onshore and offshore oil intensities (i.e., ratios of the values of onshore and offshore oil production, respectively, to GDP).

The coefficient estimates of β_1 and β_2 capture that the impact of oil price shocks should be greater in countries with greater oil production over GDP. Interpreting the empirical coefficients in the light of our theory, we expect β_1 to be positive and β_2 to be negative, in both the conflict and the rebel strength regressions. In addition, given some estimates of β_1 and β_2, the (in sample) equilibrium conflict ($\overline{n}$) and fighting capacity ($\underline{n}$) thresholds correspond to $-\frac{\beta_2}{\beta_1 - \beta_2}$ in their respective empirical estimations.[14]

[13] See Appendix A.3 for details of the mapping between equation (3.5) in the theoretical model and equation (4.1) in the empirical model, and how this mapping informs our key hypotheses on the signs and relative sizes on the estimated coefficients in the empirical model.

[14] See Appendix A.3 for derivation.

5 Data and summary statistics

In order to recover the parameters of equation (4.1), we first construct measures of onshore and offshore petroleum intensity using data from Rystad Energy's UCube database (2013). Rystad is an independent oil and gas consulting services company headquartered in Oslo, Norway, which collects production data from oil and gas companies' annual reports as well as authorities' historical production accounts. Based on their data, we calculate for each country the average share of onshore and offshore oil production in GDP over the sample period 1962-2009. We check the quality of the Rystad Energy data against the *total* share of oil production in GDP from the World Development Indicators and find a correlation of 0.99 between the two measures.

Table A.1 reports the averages of total, onshore and offshore oil production as share of GDP for all countries in our sample. A large number of countries produce significant amounts of oil: on average, oil accounts for more than 1% of GDP in 51 countries and more than 5% in 33. There is also significant variation in the onshore/offshore composition of total production. Among countries with at least an average 5% share of total oil production in GDP, 19 produce more onshore than offshore (10 onshore only), while 14 produce more offshore than onshore (4 offshore only).

We interact our country-specific weights of onshore and offshore production with oil price data from the BP Statistical Review of World Energy.[15] We assume that annual changes in the oil price are stationary and can be interpreted as oil price shocks, while the price level follows a random walk. This is in line with previous studies (Liang and McDermott, 1999; Brückner et al., 2012) and is confirmed by a variety of tests of stationarity on our oil price series.[16]

The conflict data come from the UCDP/PRIO Armed Conflict Dataset (Gleditsch et al., 2002; Themnér and Wallensteen, 2012). Civil conflict is defined for armed confrontations resulting in at least 25 battle-related deaths in a year, while the threshold for civil war is set at 1,000 battle-related deaths. We use these data to construct our main dependent variables. First, a conflict escalation dummy, equal to one when a country's conflict status changes from peace

[15] Price is money-of-the-day, as the correlation between real and nominal percentage changes in the price in this period is 99.7%. Data are available at www.bp.com.

[16] First, an augmented Dickey Fuller test fails to reject the null hypothesis that the series contains a unit root. Second, since unit root tests have notoriously low power against competing alternative (Cochrane, 1991) we complement it with the Kwiatkowski test for time-series stationarity, which rejects the null at the 95% confidence level. Finally, the Lo-MacKinlay test, which more specifically tests for the time series being a random walk, fails to reject the null at conventional levels. All three tests therefore indicate, under alternative null hypotheses, that the oil price series in levels is best characterized as a random walk process. Applying the same tests on the first-difference of the oil price series gives evidence against a unit root at the 99% confidence level, and strongly indicates that the first-difference of the oil price is stationary.

to conflict (or directly to war), or from conflict to war, and zero otherwise. Second, a conflict de-escalation dummy, defined analogously for reductions in conflict intensity.[17]

We measure the relative strength of rebel groups using data from the Non-State Actor (NSA) database (Cunningham et al., 2013). The dataset provides an indicator on the military capabilities of non-state actors relative to the government in ongoing civil conflicts in the UCDP/PRIO dataset. The rebel strength indicator ranges from 1 to 5 (from "much weaker" to "much stronger than the government"), and is based on observations of the number of troops possessed by the rebel group(s) relative to the government.[18] Governments may be facing contemporaneous conflict dyads with different rebel groups. For each conflict-year we calculate the average and maximum strength of rebel groups, as well as their number.[19]

Key summary statistics for the full sample of countries are reported in Table 1. The average share of total oil in GDP is 6.4%, roughly two thirds of which come from onshore production (4.0%) and the remainder from offshore production (2.4%). The total number of oil producing countries is 87, two thirds of which (59 countries) produce mainly or only from onshore sources, with the remaining 28 countries producing mainly or only from offshore sources. The geographic distribution of onshore and offshore producers in the sample is illustrated by a world map in Figure 2. Turning to the measures of conflict intensity, both escalations and de-escalations are relatively infrequent events, which jointly account for about 6% of total observations in the sample, compared to an overall conflict incidence of 14%. Table 1 also details the average number of rebel groups faced by the government (0.31, ranging from 0 to 11) and their average strength according to the relative strength indicator (0.31, ranging from 0 to 5).

The simple cross-country association between the location of oil and the extent of conflict can be appreciated in Figure 3. The left panel ranks the 15 oil producers (at least 1% of GDP) with the highest incidence of civil conflict between 1962 and 2009, distinguishing them by the location of their main oil facilities. The right panel performs a similar exercise, but focusing on conflict escalation. In both panels, onshore producers represent the clear majority of conflict countries, consistent with the hypothesis that onshore facilities are more easily looted by rebels, providing the means to fight and increasing the probability of conflict. In the following, we move

[17] In the empirical analysis below, we also consider variables capturing the subset of conflict onsets and terminations only.

[18] There are only about 20-25 recorded cases in our data where the rebels are coded as stronger than the government (i.e., where the rebel strength variable takes on the values 4 or 5). This corresponds to less than 3% of the total number of conflict observations (= 850). The fact that the government is usually stronger than the rebels is consistent with the assumptions made in our theoretical model.

[19] In country-years when there is no conflict we code the rebel strength indicator to zero, indicating non-active rebel groups.

beyond cross-country correlations and turn to a formal quantitative analysis of the relationship between oil location and conflict to substantiate this interpretation.

6 Results

6.1 Main results

Table 2 investigates the impact of oil price windfalls on conflict escalation (columns 1 and 2) and de-escalation (columns 3 and 4). In column (1), we start by estimating a constrained version of model (4.1), where the location of oil plays no role (i.e., where $\beta_1 = \beta_2$). Consistent with previous studies, we find a small and statistically insignificant average effect of oil price shocks on conflict escalation. In column (2), we move to test more directly our theoretical predictions, allowing the coefficients β_1 and β_2 to be different. The estimates reveal a heterogeneous response to oil price windfalls in onshore and offshore countries, as predicted by our model. A one standard deviation increase in the price of oil is associated with a 8% increase in the probability of conflict escalation for average onshore producers, but to a 3% decrease in the same probability for average offshore producers.[20]

Clearly, many countries produce a combination of both onshore and offshore oil. It is therefore interesting to calculate the share of onshore oil at which the effect of oil windfalls turns from having a negative to a positive impact on conflict escalation. This corresponds to the equilibrium conflict threshold $\underline{n}$ in our theory. We estimate this threshold to be at 38% of onshore oil in total production.[21] Countries with a share of onshore production above the threshold include conflict-ridden ones like Syria, Sudan, Libya, Iraq and Chad, while countries below the threshold include relatively stable oil-rich countries like Azerbaijan, Cameroon and Mexico.

Turning to the estimates of the probability of conflict de-escalation, the results in column (3) confirm the small and statistically insignificant average effect of oil price shocks. As in the case of escalation, however, this masks considerable heterogeneity in the response to oil windfalls by onshore and offshore producers. Estimates in column (4) indicate that oil windfalls reduce the probability of conflict de-escalation for onshore countries, while they raise it for offshore countries, with an effect that is statistically significant at the 5% level.

[20] These figures are based on the estimates in column (2) and are calculated as [(0.229 x 0.04 x 0.29)/0.033] and [(-0.143 x 0.024 x 0.29)/0.033].

[21] In the empirical model, equation (4.1), the threshold is defined as the level of n at which the marginal effect of a price change is zero, such that $\beta_1 n + \beta_2 (1-n) = 0$. This implies $\underline{n}$=- β_2/(β_1- β_2). Using our estimates of β_1 and β_2 from Table 2, Column (2), we thus have $\underline{n}$ =[0.143/(0.229+0.143)]≈ 0.38.

We find a similar pattern of results in Table 3, where we restrict to the subset of events of conflict onset and termination, as well as to the overall incidence of conflict.[22] Oil price windfalls appear to raise the probability of conflict onset and incidence among onshore oil producers, as well as to reduce the probability of terminating an existing conflict in these countries. The opposite happens in offshore-producing countries. The estimates are statistically and economically meaningful. For example, according to the estimates in column (1) of Table 3, a 30% increase in the price of oil - similar to what observed at the beginning of the first Gulf war or in the aftermath of the 2011 financial crisis - triples the probability of starting a conflict in large onshore producers like Iraq. For large offshore producers like Azerbaijan, on the contrary, a similar oil price shock *reduces* the probability of initiating a conflict by 25%, while it increases the probability of ending an existing conflict by more than 50%.[23]

Overall, the empirical estimates in Table 2 and Table 3 provide support for the main theoretical prediction in Proposition 2, namely that oil price windfalls have opposite effects on the escalation and intensity of conflict depending on whether oil is produced onshore or offshore. We now move to test the second prediction of our model, that these heterogeneous effects are due to the different impact that windfalls have on the balance of power between contenders in onshore and offshore producing countries.

To test the fighting capacity mechanism, in Table 4 we estimate model (4.1) where the dependent variable is now the change between $t-1$ and t in the relative strength of rebels vis-à-vis the government. We consider different measures of strength: in column (1) we calculate the number of rebel groups; in column (3) the average strength of all rebel groups; in column (5) the strength of the strongest group. Irrespective of the measure considered, the estimated coefficients are in line with the predictions of our theoretical model: oil price windfalls increase the number and strength of rebel groups relative to the government in onshore-rich countries, while they reduce it in offshore-rich countries. Focusing on the most precisely estimated effects in column (1), a one standard deviation increase in the price of oil in large onshore producers like Iraq increases the number of rebel groups by 0.04 points, or 13% of the mean number of active groups. For offshore-rich countries like Azerbaijan, on the contrary, a similar oil price shock reduces the number of groups by 0.03 points, or 10% of the mean number of groups.

[22] The estimates refer to instances of civil conflict. Results for civil war, available upon request, are qualitatively similar but less precisely estimated.

[23] Iraq's onshore oil share is 45% of GDP; its probability of conflict onset is compared to that of countries of equal or larger onshore share, which is 0.01. Azerbaijan's offshore share of GDP is 40%; its probability of onset (termination) is compared to that of countries of equal or larger offshore share, which is 0.049 and 0.042 respectively.

The even columns of Table 4 additionally include the interaction between the onshore-weighted price shock and an indicator variable equal to one for countries subject to documented cases of oil looting, from the Rebel Contraband data set (Walsh et al., 2018).[24] Irrespective of the measure of strength considered, the estimates indicate that oil lootability plays a crucial role in tipping the balance of power in favour of the rebels during oil windfalls.

As in the previous case of conflict escalation, we can calculate the share of onshore production above which oil windfalls raise the relative strength of the rebels against the government (i.e., the fighting capacity threshold $\overline{n}$ in our model). The estimates in column (1) indicate that when more than 49% of total oil production is extracted onshore, the overall effect of an oil price shock is to increase the number of rebel groups active in a country. Note that the fighting capacity threshold is larger than the conflict equilibrium threshold, consistent with equation (3.6) in the theoretical model, although the two cannot be statistically distinguished from each other at conventional levels of significance.

6.2 Robustness checks

In this section we present a number of checks meant to probe the robustness of our findings, focusing in particular on the effect of oil windfalls on conflict escalation and de-escalation. We discuss robustness to: (i) an alternative weighting scheme; (ii) inclusion of country-specific linear trends; (iii) accounting for the potentially endogenous location of oil production; (iv) dropping countries where oil shares are identified with relatively low accuracy; (v) dropping non-oil producers; (vi) dropping large oil producers with the potential of influencing the world price. The results are reported in Table 5, where the upper panel refers to conflict escalation and the lower panel to de-escalation.

In column (1), we start by running our baseline specification with population weights to recover effects for an average person in the population rather than for an average country. Point estimates are effectively insensitive to the use of this alternative weighting scheme, and are largely in line with our baseline results.

In column (2), we include country-specific linear trends. This accounts for the possibility that countries may have embarked on different conflict paths due to trends in variables that may correlate with oil production (e.g., institutional or economic development). The inclusion of country-specific trends does not affect the baseline results, which continue to show an opposite and statistically significant effect of oil wealth on the probability of conflict in onshore and offshore countries.

[24] These countries are Colombia, India, Indonesia, Sudan, Iraq, Russia, Congo, Nigeria.

In column (3), we address the potential endogeneity of oil production to conflict. One may worry, for example, that in periods of conflict a government may strategically decide to move from onshore to offshore oil production, which is at lower risk of being seized by the rebels. Or that a deterioration in the international economic outlook may increase the probability of conflict in a country, while also inducing the government to downsize the expensive offshore oil industry. We try to assuage these concerns by replacing the average production weights (i.e., the θ's) by initial measures of onshore and offshore production, calculated in 1962. Fixing the weights at the initial sample-year captures the country's natural predisposition to oil exploitation rather than the result of the balance of power between government and rebels. The results using fixed weights are similar to our baseline results. If anything, estimates of the parameter on the interaction term between the oil price shock and the offshore share become larger (by around 70%) when considering conflict escalation in the upper panel. In the lower panel, the point estimates on both interaction terms remain similar but are less precisely estimated.

Columns (4) and (5) show the robustness of our results to only including countries with high-quality information on the quantity of oil produced onshore and offshore. Column (4) includes countries for which the average share of oil production is calculated over more than half of the sample-years, while column (5) restricts the sample to countries for which we observe onshore and offshore shares at least once before 1986, which is the mid-point of the sample period. Both exercises lead to a drop of about 20% of the sample observations. In spite of the reduction in the sample size, the estimated effects remain precisely identified and in line with our baseline results.

Columns (6) to (8) check the robustness of our results to the exclusion of very small and very big producers. Since non-oil producing countries and countries with very low shares of oil production in GDP are unlikely to be affected by oil price changes, focusing on a smaller sample of countries with significant oil shares is arguably a better test for our model. At the other end of the spectrum, however, one might fear that our results are driven by a limited number of major oil producers, whose expected future political developments have the potential to affect the international oil prices. Column (6) excludes non-oil producers, which represent one third of countries in our sample. The point estimates remain very similar to the baseline specification, confirming that our main results are not spuriously driven by non-oil producing countries. In column (7) we perform a more stringent test, excluding any country-year observation in which total production accounts for less than 5% of GDP. This amounts to including all observations for large producers, plus medium-size producers in years of significant oil production or periods when the oil price level is relatively high. Despite the considerable sample reduction, which only includes about one third of all observations, the results remain similar to the baseline specification. Finally, in column (8) we exclude from the sample all countries belonging to the OPEC. The estimates remain qualitatively similar, although in this case the effect on onshore oil becomes marginally insignificant.

In Table 6 we address the additional concern that our model assigns all differential variations in conflict activity following an oil price windfall to differences in the composition of a country's oil production. However, if onshore and offshore producers also differ in other - political, socio-economic or institutional - dimensions that influence their response to oil windfalls, the estimates of our key interaction terms will be biased. To test for this possibility, we present estimates of the parameters of the model where we interact oil price shocks, not only with onshore and offshore shares, but also with a large array of observable cross-country characteristics. Odd columns in Table 6 refer to conflict escalation, while even columns to de-escalation.

We start by considering the interaction of oil price shocks with measures of religious and ethnic polarization.[25] A large literature (e.g., Montalvo and Reynal-Querol, 2005) has argued that conflict is more likely to break out in more polarized countries, where a large minority, be it ethnic or religious, faces a majority belonging to a different group. If polarized countries are systematically characterized by a specific geographical distribution of oil and if they also respond differently to oil price windfalls, omitting information on polarization will lead to wrongly attributing the entire effect of windfalls on conflict to the location of oil production. While theoretically possible, this concern does not find support in the data. Columns (1) and (2), in particular, show that the estimated coefficients on the interaction terms of ethnic and religious polarization are both individually and jointly insignificant. Accordingly, their inclusion affects only marginally the precision of our main variables of interest, which remain individually and jointly significant and, if anything, larger in absolute value compared to our baseline specification.

Columns (3) and (4) augment the baseline model with the interaction between oil price shocks and measures of a country's colonial past. This accounts for the possibility that colonization may have shaped a country's social and institutional features (e.g. in terms of economic inequality, Acemoglu et al., 2001; Dell, 2010) in a way that influence their response to oil price windfalls. We build two indicator variables, one for whether a country is a former European colony and one for whether the country has only recently achieved independence (i.e., post-1945). Also in this case, the additional interaction terms turn out to be individually and jointly insignificant, and do not significantly affect the magnitude and precision of the onshore and offshore coefficients, which continue to display an opposite and significant effect on the probability of conflict.

[25] These measures range between 0 and 1, with higher values indicating a more bipolar distribution.

Columns (5) and (6) interact oil price shocks with a number of country-specific socioeconomic and geographical features (total area, an indicator for whether the country is landlocked, urbanization rate). There is some evidence that conflict is more likely to escalate after oil price windfalls in larger countries, consistent with the idea that government control is more difficult to achieve far from the capital city (Fearon and Laitin, 2003). These additional interaction terms are also jointly significant at the 90% confidence level. Their inclusion, however, does not affect our main conclusion that oil price windfalls increase the probability of conflict in onshore-rich countries, while they decrease it in offshore-rich ones, where they instead raise the probability of de-escalation.

Columns (7) and (8) allow for a differential response to oil price shocks across countries that belong to different regions. There is some evidence that oil windfalls have a stronger impact on conflict escalation across countries in Asia and North America and the Caribbeans, but the inclusion of regional dummies is overall jointly insignificant (F-tests for joint significance are 1.079 and 0.599 for conflict escalation and de-escalation, respectively). Moreover, the interaction terms for onshore and offshore oil shares are once again unaffected by the inclusion of additional interaction terms.

Finally, in columns (9) and (10) we consider all the previous interaction terms simultaneously, obtaining results that are largely in line with those in the previous columns. In particular, the point estimates on the interaction terms of the onshore and offshore oil shares are similar to the baseline specification, although less precisely estimated and not always significant at conventional statistical level. The additional interaction terms are instead jointly insignificant, both for conflict escalation and de-escalation.

7 Conclusion

In this paper, we re-examine the relationship between oil wealth and conflict, focusing on the location of oil production and on the short-run effects of oil price changes. We start from the observation that offshore and onshore oil facilities may be asymmetrically appropriated by the parts in conflict, with the latter more likely to be attacked, looted, and even seized by rebel groups, which can use the proceeds from the looting to increase their fighting capacity. We formalize this insight in a standard conflict model *a la* Tullock (1980), modified to account for the endogenous fighting capacity of the opponents. The model predicts that an exogenous increase in oil wealth tilts the balance of power in favour of the rebels when the share of onshore oil production in a country exceeds a certain threshold. When onshore production is below this threshold, instead, an increase in oil wealth raises relatively more the fighting capacity of the government compared to the rebels. These heterogeneous effects on the relative balance of power of the contenders in onshore and offshore producing countries, in turn, have consequences for their level of conflict. Our model predicts that, following an oil price windfall, conflict should escalate in onshore producing countries, while the opposite should happen in offshore producing countries, where most of the profits associated to oil windfalls accrue to the government.

Our empirical results from a large panel of countries support these predictions: exogenous spikes in the price of oil on international markets appear to escalate conflict in onshore-rich countries and to de-escalate it in offshore-rich ones. We also provide evidence consistent with our interpretation of the results, by showing that changes in the relative fighting capacity of rebels and governments – measured by their observed abilities to maintain and equip troops – depend on the location of oil. Finally, by aggregating over the onshore and offshore effects of oil price windfalls, we show that the two almost exactly offset each other, plausibly explaining the zero average effect of oil wealth on conflict found in recent studies.

While our results indicate that onshore-rich countries are more prone to civil conflict, this is not to say that offshore-oil abundance necessarily represents a blessing for the citizens of a country. Indeed, offshore oil revenues have often guaranteed steady resources and increased stability to oppressive governments, like in Congo, Angola and Equatorial Guinea. An overall welfare assessment of the consequences of oil abundance and its location remains a first order question for future research.

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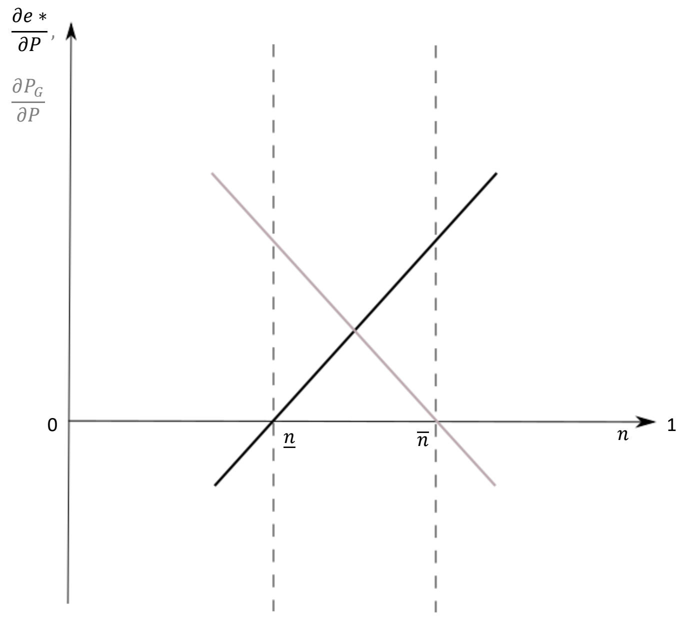
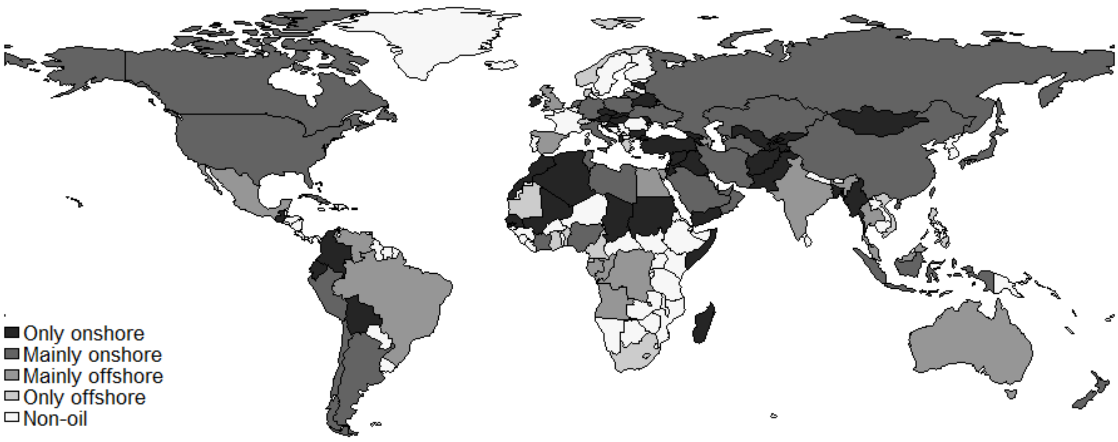
Figure 1 Marginal effects of oil price windfalls as a function of the share of onshore oil



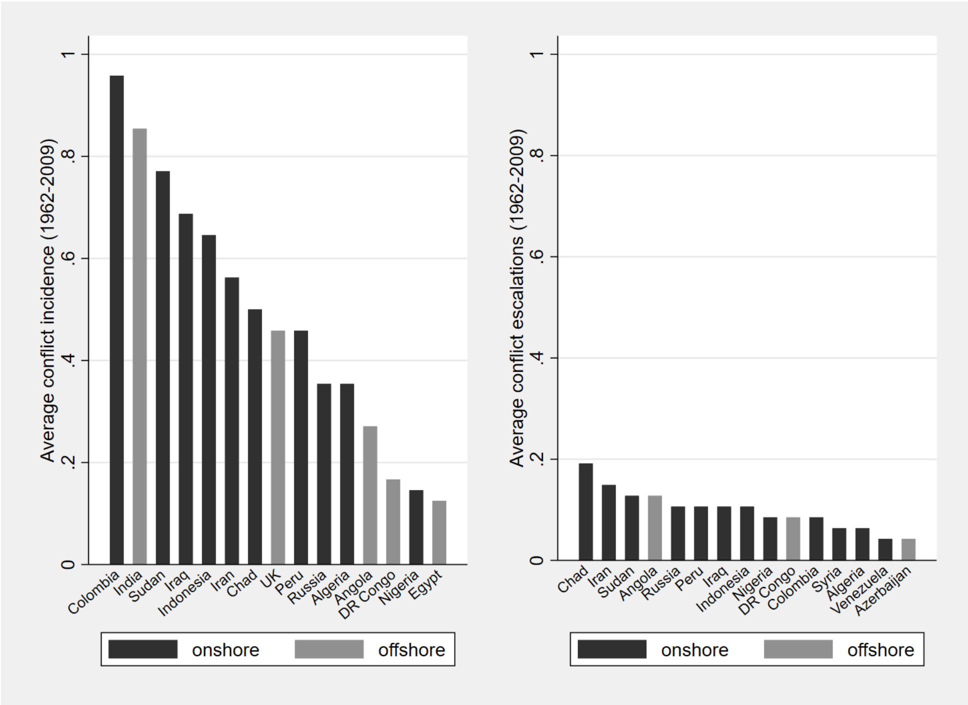
Note: The Figure shows the marginal effects of oil price windfalls on the equilibrium level of conflict (equation 3.7) and on the relative fighting capacity of the government (equation 3.2), both calculated as a function of the share of onshore oil produced.

Figure 2 Onshore and offshore oil countries



Note: The Figure shows the geographical distribution of onshore and offshore producers. The data come from Rystad Energy (2014). Mainly onshore (offshore) refers to countries with more than 50% of oil production coming from onshore (offshore) sources.

Figure 3 Civil Conflict and the Location of Oil



Note: The Figure ranks the 15 oil producers with the highest incidence of civil conflict (left panel) and the most conflict escalations (right panel) over the period 1962-2009, separated into onshore and offshore producers.

Table 1 Summary Statistics

	Mean	**s.d.**	**Min**	**Max**
Total oil share	.064	.130	0	.596
Onshore share	.040	.096	0	.512
Offshore share	.024	.075	0	.583
Oil price change	.075	.292	-.650	1.260
Conflict escalation	.033	.180	0	1
Conflict de-escalation	.031	.175	0	1
Conflict incidence	.137	.344	0	1
Avg. rebel strength	.292	.704	0	5
Max rebel strength	.311	.748	0	5
N. of rebel groups	.312	.921	0	11

Notes: The table reports descriptive statistics for the 132 countries in our sample. Rows 1, 2 and 3 report information about shares of oil production in GDP. Row 4 reports oil's yearly growth rate. Rows 5, 6 and 7 report information about different measures of conflict intensity, while rows 8, 9 and 10 about different measures of rebels' strength.

Table 2 Conflict and the Location of Oil Production

	(1)	(2)	(3)	(4)
	Conflict Escalation		Conflict De-escalation	
$\Delta Pr * Total$	0.081 (0.073)		0.005 (0.040)	
$\Delta Pr * Onshore$		0.229** (0.107)		-0.061 (0.044)
$\Delta Pr * Offshore$		-0.143*** (0.053)		0.106** (0.051)
N. of countries	132	132	132	132
Observations	6,204	6,204	6,204	6,204

Notes: The dependent variable in columns (1) and (2) is an indicator variable equal to one for all conflict escalations, from peace to civil conflict (or directly to civil war) and from civil conflict to civil war. The dependent variable in columns (3) and (4) is defined similarly for conflict de-escalations. $\Delta Pr*Total$ is the percentage change in the price of crude oil from period t-1 to t, multiplied by the average share of total oil in GDP over the sample period. $\Delta Pr*Onshore$ and $\Delta Pr * Offshore$ measure the percentage change in the price of crude oil from period t-1 to t, multiplied by the country's average share of onshore and offshore oil in GDP, respectively. All specifications include country and year fixed effects. Standard errors are clustered at the country level. Significantly different from zero at the *90% level, **95% level, ***99% level.

Table 3 Conflict Onset, Incidence, and Termination

	(1)	(2)	(3)
	Civil Conflict		
	Onset	Incidence	Termination
$\Delta Pr * Onshore$	0.156*	0.100	-0.069
	(0.089)	(0.084)	(0.045)
$\Delta Pr * Offshore$	-0.099**	-0.262*	0.186**
	(0.043)	(0.147)	(0.090)
N of countries	132	132	132
Observations	6,204	6,204	6,204

Notes: The dependent variable in column (1) is conflict onset; in column (2) conflict incidence; in column (3) conflict termination. All columns refer to civil conflict, defined as internal armed conflict with more than 25 battle-related deaths. All specifications include country and year fixed effects. Standard errors are clustered at the country level. Significantly different from zero at the *90% level, **95% level, ***99% level. See also notes to Table (2).

Table 4 Changes in Rebels' Strength

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Number Rebel groups		Δ Average Rebel strength		Δ Maximum Rebel strength	
$\Delta Pr * Onshore$	0.307*	0.212	0.304*	0.130	0.358**	0.128
	(0.160)	(0.202)	(0.154)	(0.214)	(0.175)	(0.221)
$\Delta Pr * Offshore$	-0.291***	-0.626**	-0.019	0.176	-0.061	0.068
	(0.095)	(0.255)	(0.120)	(0.316)	(0.125)	(0.328)
$\Delta Pr * Onshore * Loot$		3.774***		3.605**		4.812***
		(1.098)		(1.691)		(1.401)
N. of countries	132	132	132	132	132	132
Observations	6,204	2,640	6,204	2,640	6,204	2,640

Notes: The dependent variable in columns (1) and (2) is the change in the number of active rebel groups in the country from period *t*-1 to *t*; in columns (3) and (4) it is the change in the average rebel strength score across all rebel groups active in the country; in columns (5) and (6) it is the change in the rebel strength score of the strongest rebel group in the country. In columns (2), (4) and (6) the variable $\Delta Pr * Onshore$ is interacted with *Loot*, an indicator variable equal to one for country-years with documented evidence of oil looting during the period 1990-2009. These specifications also include the variable $\Delta Pr * Loot$ (coefficient not reported). All specifications include country and year fixed effects. Standard errors are clustered at the country level. Significantly different from zero at the *90% level, **95% level, ***99% level. See also notes to Table (2) and Section 5 in the main text for information about the sources used in this Table.

Table 5 Robustness checks: Alternative Specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Population Weights	Country Trends	Share 1^{st} year	> 1/2 Share observations	Observations before 1986	Ex. non-oil producers	Ex. share $\leq$ 5%	Ex. OPEC countries
				Panel A: Conflict Escalation				
$\Delta Pr * Onshore$	0.241**	0.220**	0.201*	0.260*	0.263*	0.213**	0.206**	0.155
	(0.114)	(0.106)	(0.111)	(0.136)	(0.136)	(0.101)	(0.101)	(0.112)
$\Delta Pr * Offshore$	-0.165***	-0.122**	-0.250**	-0.143**	-0.141**	-0.157***	-0.152***	-0.139***
	(0.057)	(0.058)	(0.103)	(0.067)	(0.067)	(0.046)	(0.045)	(0.035)
				Panel B: Conflict De-escalation				
$\Delta Pr * Onshore$	-0.069	-0.073	-0.050	-0.071	-0.067	-0.062	-0.064	-0.065
	(0.049)	(0.046)	(0.040)	(0.058)	(0.058)	(0.041)	(0.040)	(0.052)
$\Delta Pr * Offshore$	0.120**	0.124**	0.132	0.124**	0.128**	0.105**	0.116**	0.112**
	(0.054)	(0.061)	(0.109)	(0.059)	(0.058)	(0.047)	(0.046)	(0.050)
N. of countries	130	132	132	105	102	87	82	119
Observations	6,080	6,204	6,204	4,935	4,794	4,089	2,182	5,593

Notes. The dependent variable in Panel A is conflict escalation, while in Panel B is conflict de-escalation. Column (1) weighs observations by country population. Column (2) adds country-specific linear trends. Column (3) weighs oil price shocks by country production in the first available year of data (instead of average over the sample period). Column (4) only includes countries for which the average share of oil production is calculated on more than half of all sample-years. Column (5) only includes countries for which onshore and offshore shares are observed at least once before 1986. Column (6) only considers oil-producing countries. Column (7) only considers country-year observations where total oil represents at least 5% of GDP. Column (8) excludes OPEC member countries. All specifications include country and year fixed effects. Standard errors are clustered at the country level. Significantly different from zero at the *90% level, **95% level, ***99% level. See also notes to Table (2).

Table 6 Robustness Checks: Interactions with Country Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Polarization		Colonial Past		Geography		Regional Dummies		All Characteristics	
	Escal.	De-escal.	Escal.	De-escal.	Escal.	De-escal.	Escal.	De-escal.	Escal.	De-escal.
$\Delta Pr * Onshore$	0.284**	-0.062	0.211**	-0.053	0.234**	-0.079	0.181*	-0.061	0.234*	-0.120
	(0.138)	(0.062)	(0.103)	(0.041)	(0.108)	(0.048)	(0.097)	(0.046)	(0.141)	(0.081)
$\Delta Pr * Offshore$	-0.154*	0.154**	-0.142**	0.119**	-0.137**	0.102*	-0.145**	0.103*	-0.056	0.115
	(0.080)	(0.059)	(0.062)	(0.050)	(0.055)	(0.057)	(0.071)	(0.053)	(0.070)	(0.076)
$\Delta Pr * Rel.\ Pol.$	0.001	-0.007							-0.025	-0.001
	(0.036)	(0.022)							(0.054)	(0.030)
$\Delta Pr * Ethnic\ Pol.$	-0.048	-0.024							-0.043	-0.042
	(0.049)	(0.031)							(0.063)	(0.033)
$\Delta Pr * Colony$			-0.016	0.006					-0.096	0.043*
			(0.016)	(0.011)					(0.060)	(0.024)
$\Delta Pr * Date\ Indep.$			-0.002	-0.012					0.025	-0.053**
			(0.017)	(0.012)					(0.039)	(0.023)
$\Delta Pr * Area$					0.004**	-0.001			0.004*	-0.002
					(0.002)	(0.001)			(0.002)	(0.002)
$\Delta Pr * Landl.$					0.005	-0.006			0.026	-0.019
					(0.023)	(0.015)			(0.034)	(0.022)
$\Delta Pr * Urbaniz.$					-0.000	0.000			-0.001	0.001*
					(0.000)	(0.000)			(0.001)	(0.000)
$\Delta Pr * Africa$							0.018	0.004	-0.028	0.065*
							(0.029)	(0.015)	(0.054)	(0.034)
$\Delta Pr * Asia$							0.060*	-0.001	0.029	0.026
							(0.034)	(0.012)	(0.053)	(0.027)
$\Delta Pr * Europe$							0.022	-0.004	-0.076	0.007
							(0.022)	(0.007)	(0.069)	(0.032)
$\Delta Pr * M.\ East$							0.053	-0.003	-0.027	0.060*
							(0.033)	(0.018)	(0.055)	(0.031)
$\Delta Pr * N.\ America$							0.039*	-0.019*	0.046	-0.009
							(0.023)	(0.011)	(0.036)	(0.023)
$\Delta Pr * S.\ America$							0.034	0.015	0.049	0.009
							(0.041)	(0.036)	(0.048)	(0.040)
Observations	4,559	4,559	6,063	6,063	6,063	6,063	6,204	6,204	4,512	4,512
F-stat. oil location	[3.502]**	[4.234]**	[4.131]**	[3.868]**	[4.522]**	[3.032]**	[3.548]**	[3.433]**	[1.468]	[2.509]*
F-stat. polar.	[787]	[0.798]								
F-stat. colonial			[0.485]	[0.522]						
F-stat. geogr.					[2.397]*	[0.776]				
F-stat. region							[1.079]	[0.599]		
F-stat. all									[1.031]	[1.305]

Notes: The dependent variable in odd (even) columns is conflict escalation (de-escalation). Columns (1) and (2) consider the interaction of ΔPr with indices of religious and ethnic polarization; columns (3) and (4) with dummies for European colonial past and recent independence (post-1945); columns (5) and (6) with socio-economic and geographic characteristics: area, percentage of urban population, dummy for being landlocked; columns (7) and (8) with regional dummies; columns (9) and (10) consider all interaction terms simultaneously. All specifications include country and year fixed effects. Standard errors are clustered at the country level. F-statistics for the joint significance of different groups of variables are reported at the bottom of the Table. Significantly different from zero at the *90% level, **95% level, ***99% level. See also notes to Table (2).

Table A.1 Composition by Country

Country	Total Oil (Avg. % of GDP)	Onshore Oil (Avg. % of GDP)	Offshore Oil (Avg. % of GDP)	Country	Total Oil (Avg. % of GDP)	Onshore Oil (Avg. % of GDP)	Offshore Oil (Avg. % of GDP)
Angola	0.596	0.013	0.583	Estonia	0.002	0.002	0
Kuwait	0.512	0.512	0	Austria	0.002	0.002	0
Saudi Arabia	0.484	0.342	0.142	New Zealand	0.002	0.001	0.001
Qatar	0.467	0.226	0.242	Netherlands	0.001	0.001	0
Libya	0.454	0.429	0.025	Ghana	0.001	0	0.001
Oman	0.452	0.452	0	Bulgaria	0.001	0.001	0
Iraq	0.451	0.452	0	Greece	0.001	0	0.001
Azerbaijan	0.431	0.027	0.404	Italy	0.001	0	0
Gabon	0.394	0.167	0.227	Germany	0.001	0.001	0
Nigeria	0.319	0.181	0.138	Poland	0.001	0	0
Turkmenistan	0.297	0.266	0.031	Spain	0.001	0	0.001
UAE	0.286	0.130	0.156	Philippines	0.001	0	0.001
Iran	0.269	0.241	0.029	Czech Republic	0.001	0.001	0
Venezuela	0.269	0.164	0.105	Senegal	0	0	0
Equatorial Guinea	0.260	0	0.270	Sierra Leone	0	0	0
Kazakhstan	0.216	0.216	0	Slovenia	0	0	0
Trinidad & Tobago	0.195	0.053	0.141	Somalia	0	0	0
Algeria	0.171	0.171	0	Sweden	0	0	0
Syria	0.163	0.163	0	Switzerland	0	0	0
Russia	0.160	0.159	0.001	South Africa	0	0	0
Congo	0.133	0.009	0.124	Afghanistan	0	0	0
Egypt	0.121	0.029	0.093	Slovakia	0	0	0
Ecuador	0.110	0.110	0	Morocco	0	0	0
Indonesia	0.100	0.071	0.029	Israel	0	0	0
Norway	0.082	0	0.082	Jordan	0	0	0
D.R.C.	0.068	0.014	0.054	Japan	0	0	0
Bahrain	0.067	0.067	0	Bangladesh	0	0	0
Vietnam South	0.065	0	0.065	Armenia	0	0	0
Cameroon	0.065	0	0.065	Belgium	0	0	0
Tunisia	0.063	0.043	0.019	Botswana	0	0	0
Mexico	0.060	0.025	0.035	Burundi	0	0	0
Albania	0.059	0.059	0	Cambodia	0	0	0
Chad	0.058	0.058	0	C.A.R.	0	0	0
Colombia	0.047	0.047	0	Costa Rica	0	0	0
China	0.041	0.040	0.001	Djibouti	0	0	0
Peru	0.036	0.030	0.006	Dominican Rep.	0	0	0
Argentina	0.031	0.031	0	Gambia	0	0	0
Uzbekistan	0.028	0.028	0	Guinea-Bissau	0	0	0
Canada	0.026	0.025	0.001	Honduras	0	0	0
Romania	0.025	0.022	0.003	Ireland	0	0	0
Belarus	0.020	0.020	0	Jamaica	0	0	0
Bolivia	0.017	0.017	0	Kenya	0	0	0
United Kingdom	0.014	0	0.014	Laos	0	0	0
Brazil	0.013	0.004	0.009	Latvia	0	0	0
Mauritania	0.012	0	0.012	Lebanon	0	0	0
Sudan	0.012	0.012	0	Liberia	0	0	0
Ukraine	0.012	0.011	0.001	Macedonia, FYR	0	0	0
Australia	0.012	0.001	0.010	Madagascar	0	0	0
United States	0.011	0.010	0.002	Malawi	0	0	0
India	0.010	0.005	0.006	Mali	0	0	0
Cote d'Ivoire	0.010	0	0.010	Moldova	0	0	0
Mongolia	0.009	0.009	0	Mozambique	0	0	0
Kyrgyzstan	0.009	0.009	0	Namibia	0	0	0
Serbia	0.008	0.008	0	Nepal	0	0	0
Cuba	0.008	0.007	0.002	Nicaragua	0	0	0
Benin	0.007	0	0.007	Niger	0	0	0
Denmark	0.007	0	0.007	Paraguay	0	0	0
Georgia	0.007	0.007	0	Portugal	0	0	0
Chile	0.006	0.003	0.003	Rwanda	0	0	0
Guatemala	0.005	0.005	0	Sao Tome	0	0	0
Pakistan	0.004	0.004	0	Tanzania	0	0	0
Hungary	0.004	0.004	0	Togo	0	0	0
Lithuania	0.004	0.003	0.001	Uganda	0	0	0
Turkey	0.003	0.003	0	Uruguay	0	0	0
Thailand	0.003	0.001	0.002	Zambia	0	0	0
Tajikistan	0.003	0.003	0				

Theory Appendix:

A.1 (Proof of Proposition 1):

We take the derivative of p_G with respect to P, to demonstrate that the fighting capacity threshold is given by $\overline{n} = \frac{1}{\delta(1+\gamma_{OG})} > 0$. Proposition 1 then immediately follows.

First, note that p_G ($\equiv 1 - p_O$) can be written as a function of the oil price, P:

$$\begin{aligned} p_G(\delta, n, Q, P) &= \frac{f_G(R_G)}{f_G(R_G) + f_O(R_O)} \\ &= \frac{f_G((1-\delta n) QP)}{f_G((1-\delta n) QP) + f_O(\delta n QP)}. \end{aligned}$$

The derivative of this expression with respect to P may, after som manipulation be written as:

$$\frac{dp_G}{dP} = \left[1 - \delta n \left(1 + \frac{\frac{df_O/f(R_O)}{dR_O}}{\frac{df_G/f(R_G)}{dR_G}}\right)\right] p_O p_G \frac{df_G/f(R_G)}{dR_G} Q$$

We define $\gamma_{OG} \equiv \frac{\frac{df_O/f(R_O)}{dR_O}}{\frac{df_G/f(R_G)}{dR_G}} \equiv \frac{\varphi_O}{\varphi_G}$ the *relative fighting capacity effectiveness* of the opposition, that is, the percentage change of opposition troops per dollar increase in oil revenues, φ_O, relative to the same change for the government, φ_G. Using that $p_O p_G \equiv \Omega$, we may express $\frac{dp_G}{dP}$ as:

$$\frac{dp_G}{dP} = [1 - \delta(1+\gamma_{OG}) n] \Omega \varphi_G Q.$$

The fighting capacity threshold of the onshore share ($\overline{n}$) is, by definition, the level of n at which $\frac{dp_G}{dP} = 0$ (at any positive values of Ω, φ_G, and Q):

$$\begin{aligned} \frac{dp_G}{dP} &= [1 - \delta(1+\gamma_{OG}) n] \Omega \varphi_G Q = 0 \Longleftrightarrow \\ \overline{n} &= \frac{1}{\delta(1+\gamma_{OG})}. \end{aligned}$$

The results in Proposition 1 then immediately follows (using that $p_G \equiv 1 - p_O$): $\frac{dp_G}{dP} < 0$ and $\frac{dp_O}{dP} > 0$ if $n > \overline{n}$; $\frac{dp_G}{dP} > 0$ and $\frac{dp_O}{dP} < 0$ if $n < \overline{n}$.

A.2 (Proof of Proposition 2):

We take the derivative of e^* with respect to P and compare with the expression for the fighting capacity threshold from Theory Appendix A1, to evaluate the sign of $\frac{de^*}{dP}$ and show that the equilibrium conflict threshold is given by $\underline{n} = \left[1 + \frac{1}{(1-2p_G)\varphi_G R}\right] \overline{n}$. Proposition 2 immediately follows.

First, note that:

$$\frac{de^*}{dP} = \frac{\frac{d\Omega}{dp_G}\frac{dp_G}{dP}R_G + \Omega\frac{dR_G}{dP}}{W} = \frac{(1-2p_G)\frac{dp_G}{dP}(1-\delta n)QP + p_G(1-p_G)(1-\delta n)Q}{W}.$$

Evaluating the sign of $\frac{de^*}{dP}$ – using that $W>0$, $Q>0$, $\Omega>0$, $(1-2p_G)<0$, and inserting for $\frac{dp_G}{dP}$ and $\overline{n}$ from Theory Appendix A1 – we have (after some manipulation):

$$\frac{de^*}{dP} > 0 \quad \text{iff} \quad n > \left[1 + \frac{1}{(1-2p_G)\varphi_G R}\right]\overline{n}.$$

and, by symmetry,

$$\frac{de^*}{dP} < 0 \quad \text{iff} \quad n < \left[1 + \frac{1}{(1-2p_G)\varphi_G R}\right]\overline{n}.$$

The equilibrium conflict threshold ($\underline{n}$) at which the conflict effect of an oil price shock innovation changes sign is then given by:

$$\underline{n} = \left[1 + \frac{1}{(1-2p_G)\varphi_G R}\right]\overline{n},$$

where $\underline{n} < \overline{n}$ (and, by assumption, $\underline{n} > 0$). Note that the results in Proposition 2 immediately follows (using the results in Theory Appendix A1, on the level and sign of $\overline{n}$): $\frac{de^*}{dP} > 0$ if $n > \underline{n}$; $\frac{de^*}{dP} < 0$ if $n < \underline{n}$.

A.3 (Proof of a direct mapping from theoretical to empirical model, and the resulting hypotheses):

First, we want to show that our main empirical specification (surpressing the country and time indexes, i and t) on the change in conflict intensity, Δy,

$$\Delta y = \beta_1 \theta^{ons}\Delta Pr + \beta_2 \theta^{off}\Delta Pr \ ,$$

is a direct mapping of our key comparative static result from our theory model,

$$\frac{de^*}{dP} = \frac{\frac{d\Omega}{dp_G}\frac{dp_G}{dP}R_G + \Omega\frac{dR_G}{dP}}{W} = \frac{(1-2p_G)\left[1-\delta(1+\gamma_{OG})n\right]\Omega\varphi_G Q(1-\delta n)QP + \Omega(1-\delta n)Q}{W}.$$

Second, we want to show how this direct mapping informs our key hypotheses on the signs and relative sizes of β_1 and β_2, as well as the equilibrium conflict threshold, $\underline{n}$.

We start by re-organizing the expression for $\frac{de^*}{dP}$ (substituting $\frac{R}{W} \equiv \theta$):

$$\frac{de^*}{dP} = = (1-2p_G)\left[1-\delta(1+\gamma_{OG})n\right]\varphi_G R\Omega(1-\delta n)\theta\frac{dP}{P} + \Omega(1-\delta n)\theta\frac{dP}{P}$$

Note that $\theta \equiv \frac{R}{W}$ may be interpreted as the amount of oil revenue relative to the size of the non-oil economy (which we take as given). Next, to allow for a more compact formulation, we reformulate to express parameters in terms of the theoretically derived threshold values for n, $\underline{n}$ and $\overline{n}$ (which are uniquely defined by the exogenous parameters in of our theory, and which have well-characterized properties by Theory Appendixes A1 and A2):

$$\begin{aligned}
\frac{de^*}{dP} &= \underbrace{[1-\delta(1+\gamma_{OG})n]}_{1-\frac{n}{\overline{n}}}\underbrace{(1-2p_G)\varphi_G R}_{\frac{\overline{n}}{\underline{n}-\overline{n}}}(1-\delta n)\Omega\theta\frac{dP}{P} + (1-\delta n)\Omega\theta\frac{dP}{P} \\
&= \frac{1}{\overline{n}-\underline{n}}\Omega(1-\delta n)n\theta\frac{dP}{P} - \frac{\underline{n}}{\overline{n}-\underline{n}}\Omega\ (1-\delta n)\theta\frac{dP}{P}.
\end{aligned}$$

We then have:

$$\begin{aligned}
\frac{de^*}{dP} &= \underbrace{\frac{1-\underline{n}}{\overline{n}-\underline{n}}\Omega(1-\delta n)}_{\beta_1}\underbrace{n\theta}_{\theta^{ons}}\frac{dP}{P} + \underbrace{\left[-\frac{\underline{n}}{\overline{n}-\underline{n}}\Omega(1-\delta n)\right]}_{\beta_2}\underbrace{(1-n)\theta}_{\theta^{off}}\frac{dP}{P} \\
&= \beta_1\theta^{ons}\frac{dP}{P} + \beta_2\theta^{off}\frac{dP}{P},
\end{aligned}$$

where we define the share of onshore and offshore oil in the economy (respectively) as:

$$\theta^{ons} \equiv n\theta,$$

and

$$\theta^{off} \equiv (1-n)\theta.$$

Finally, replacing the theoretical terms for changes in the conflict intensity, $\frac{de^*}{dP}$, and in the oil price, $\frac{dP}{P}$, by our empirical counterparts, Δy and ΔPr, we have:

$$\Delta y = \beta_1\theta^{ons}\Delta Pr + \beta_2\theta^{off}\Delta Pr,$$

where the empirical parameters β_1 and β_2 have the following theoretical interpretations:

$$\beta_1 \equiv \frac{1-\underline{n}}{\overline{n}-\underline{n}}\Omega(1-\delta n) > 0,$$

$$\beta_2 \equiv -\frac{\underline{n}}{\overline{n}-\underline{n}}\Omega(1-\delta n) < 0.$$

As the empirical coefficients β_1 and β_2 can be estimated on the data, we may calculate an empirical estimate of the equilibrium conflict threshold, $\underline{n}$, by setting $\Delta y = 0$ to get:

$$\Delta y = \beta_1\theta^{ons}\Delta Pr + \beta_2\theta^{off}\Delta Pr = 0 \Longleftrightarrow$$

$$
\begin{aligned}
\beta_1 \underline{n} \theta \Delta Pr + \beta_2 (1 - \underline{n}) \theta \Delta Pr &= 0 \Longleftrightarrow \\
\beta_1 \underline{n} + \beta_2 (1 - \underline{n}) &= 0 \Longleftrightarrow
\end{aligned}
$$

$$
\underline{n} = -\frac{\beta_2}{\beta_1 - \beta_2},
$$

where we have used the definitions: $\theta^{ons} \equiv \underline{n}\theta$ and $\theta^{off} \equiv (1 - \underline{n}) \theta$. Note that, it can easily be verified, by substituting $\beta_1 \equiv \frac{1-n}{\overline{n}-\underline{n}} \Omega (1 - \delta n)$ and $\beta_2 \equiv -\frac{n}{\overline{n}-\underline{n}} \Omega (1 - \delta n)$, that the empirically calculated level of $\underline{n}$ is identical to the theoretically derived $\underline{n}$:

$$
\begin{aligned}
\underline{n} &= -\frac{\beta_2}{\beta_1 - \beta_2} \\
&= -\frac{-\frac{n}{\overline{n}-\underline{n}} \Omega (1 - \delta n)}{\frac{1-n}{\overline{n}-\underline{n}} \Omega (1 - \delta n) - \left[-\frac{n}{\overline{n}-\underline{n}} \Omega (1 - \delta n) \right]} \\
&= \underline{n}.
\end{aligned}
$$