# Online Appendix for *Strategic Civil War Aims and the Resource Curse*

CONTENTS

# A PROOFS FOR FORMAL RESULTS

**Table A.1: Summary of Parameters and Choice Variables**

| Stage | Variables/description |
|---|---|
| Parameters/choices for $G$ in period 1 | • $e_i$: parameterizes the exit option for (unmodeled) producers in each region, $i \in \{G, C\}$<br>• $R$: endowed government revenue in period 1, equals $2 - e_G - e_C$<br>• $m_G$: military spending; this is $G$'s endogenous *coercive input*<br>• $x$: proposed patronage transfer<br>• $d$: linear cost of war for $G$ |
| Parameters/choices for $C$ in period 1 | • $m_C$: $C$'s population share; this is $C$'s exogenous *coercive input*<br>• $\mu$: $C$'s civil war aims, 1 equals center-seeking and 0 equals separatist<br>• $p_c(\cdot)$: $C$'s probability of winning a center-seeking civil war<br>• $p_s(\cdot)$: $C$'s probability of winning a separatist civil war<br>• $j$: indexes civil war aims; $c$ for center-seeking and $s$ for separatist<br>• $\beta$: efficiency with which $G$'s military spending decreases $C$'s probability of winning |
| Payoffs for period 2 | • $\Delta$: value of consumption<br>• $t$: time<br>• $\theta$: $G$'s commitment ability; determines taxes and transfers for period 2 in s.q. regime<br>• $V^G_{\text{s.q.}}$ and $V^C_{\text{s.q.}}$: future continuation values in the status quo regime<br>• $V^G_{\text{center}}$ and $V^C_{\text{center}}$: continuation values following a successful center-seeking civil war<br>• $V^G_{\text{sep}}$ and $V^C_{\text{sep}}$: continuation values following a successful separatist civil war |
| Oil parameters | • $O_i$: fraction of economic output in region $i \in \{G, C\}$ that is oil<br>• $\gamma$: indicator for oil production in $C$'s territory |

## A.1 PROOF OF LEMMA 1

1. *Establish $\underline{m}_C$ and $\overline{m}_C$.* Show that for any $m_G > 0$, a unique $\tilde{m}_C \in (0, \infty)$ exists such that:

$$\frac{p_c(\tilde{m}_C, \beta \cdot m_G)}{p_s(\tilde{m}_C, \beta \cdot m_G)} = \pi_s,$$

for $\pi_s \in (0, 1)$ defined in Equation 15. Satisfying the conditions for the intermediate value theorem implies that at least one such $\tilde{m}_C$ exists: Equation 3 provides the needed boundary conditions, and $p_c(\cdot)$ and $p_s(\cdot)$ are each continuous in $m_C$. Equation 2 implies the unique threshold claim for $\tilde{m}_C$. Thus, we can implicitly define the thresholds $\underline{m}_C$ and $\overline{m}_C$ stated in the lemma:

$$\frac{p_c(0, \underline{m}_C)}{p_s(0, \underline{m}_C)} = \pi_s \quad \text{and} \quad \frac{p_c(\overline{m}_C, \beta \cdot R)}{p_s(\overline{m}_C, \beta \cdot R)} = \pi_s.$$

Applying the implicit function theorem yields:

$$\frac{d\tilde{m}_C}{dm_G} = -\frac{\partial}{\partial m_G}\left(\frac{p_c}{p_s}\right) \Bigg/ \frac{\partial}{\partial m_C}\left(\frac{p_c}{p_s}\right) > 0,$$

and the sign follows directly from Equation 2. This proves $\underline{m}_C < \overline{m}_C$.

2. *Establish* $\hat{m}_G$. Show that for any $m_C \in (\underline{m}_C, \overline{m}_C)$, a unique $\hat{m}_G \in (0, R)$ exists such that:

$$\frac{p_c(m_C, \beta \cdot \hat{m}_G)}{p_s(m_C, \beta \cdot \hat{m}_G)} = \pi_s.$$

Satisfying the intermediate value theorem conditions implies that at least one such $\hat{m}_G$ exists:

- $\frac{p_c(m_C,0)}{p_s(m_C,0)} > \pi_s$ follows from assuming $m_C > \underline{m}_C$.
- $\frac{p_c(m_C,\beta \cdot R)}{p_s(m_C,\beta \cdot R)} < \pi_s$ follows from assuming $m_C < \overline{m}_C$.
- $p_c(\cdot)$ and $p_s(\cdot)$ are each continuous in $m_C$.

Because $\underline{m}_C > 0$, Equation 2 yields the unique threshold claim for $\hat{m}_G$. Applying the implicit function theorem yields:

$$\frac{d\hat{m}_G}{dm_C} = -\frac{\partial}{\partial m_C}\left(\frac{p_c}{p_s}\right) \Big/ \frac{\partial}{\partial m_G}\left(\frac{p_c}{p_s}\right) > 0,$$

and the sign follows directly from Equation 2, which completes the proof. ■

## A.2 Proof of Lemma 2

Before proving Lemma 2, I first present a preliminary Lemma A.1 that establishes optimal armament when fixing $C$'s civil war aims, $m^*_{G,c}$ and $m^*_{G,s}$. Footnote 5 mentions that interior-optimal armament choices (for fixed civil war aims) require additional assumptions about the magnitude of the marginal benefit of military spending at the boundaries, which I formalize in Equations A.3 and A.6 in the proof for this lemma. I then present a preliminary Lemma A.2 to establish the thresholds, $\hat{m}_{C,s}$ and $\hat{m}_{C,c}$, that determine $G$ optimal armament as a function of $m_C$. As Footnote 6 previews, the uniqueness of the thresholds requires that key expressions are strictly monotonic in $m_G$, which requires additional assumptions about the steepness of diminishing marginal returns in $m_G$. I formalize these in Equations A.8 and A.10 in the proof for this lemma. (Note that the functional forms from Equation 4 satisfy both inequalities for all parameter values.) Then I prove Lemma 2. Finally, I present figures that complement Figure 3.

**Lemma A.1** (Optimal armament for fixed civil war aims)**.**

***Part a.*** *A unique interior optimizer* $m^*_{G,c} \in (0, R)$ *exists that maximizes* $R - m_G - x^*(m_G; \mu = 1)$.

***Part b.*** *A unique interior optimizer* $m^*_{G,s} \in (0, R)$ *exists that maximizes* $R - m_G - x^*(m_G; \mu = 0)$.

***Part c.*** $m^*_{G,s} < m^*_{G,c}$.

***Proof of part a.*** The first order condition for the unconstrained optimization problem implicitly characterizes $m^*_{G,c}$:

$$\underbrace{\Delta\cdot\overbrace{\left(-\frac{\partial p_c(m^*_{G,c})}{\partial m_G}\right)}^{>0}\cdot\beta\cdot(1-\theta)\cdot(2-e_G-e_C)}_{\text{MB}}=\underbrace{1}_{\text{MC}}. \tag{A.1}$$

which is the unique maximizer because the second-order condition is:

$$-\Delta\cdot\underbrace{\frac{\partial^2 p_c}{\partial m_G^2}}_{>0}\cdot\beta\cdot(1-\theta)\cdot(2-e_G-e_C)<0. \tag{A.2}$$

An interior solution requires:

$$-\frac{\partial p_c(m_C,\beta\cdot R)}{\partial m_G}<\frac{1}{\Delta\cdot\beta\cdot(1-\theta)\cdot(2-e_G-e_C)}<-\frac{\partial p_c(m_C,0)}{\partial m_G}. \tag{A.3}$$

***Proof of part b.*** The first order condition for the unconstrained optimization problem implicitly characterizes $m^*_{G,s}$:

$$\underbrace{\Delta\cdot\overbrace{\left(-\frac{\partial p_s(m^*_{G,s})}{\partial m_G}\right)}^{>0}\cdot\beta\cdot\overbrace{\big[(1-\theta)\cdot(1-e_C)-\theta\cdot(1-e_G)\big]}^{>0 \text{ by Assumption 1}}}_{\text{MB}}=\underbrace{1}_{\text{MC}}. \tag{A.4}$$

which is the unique maximizer because the second-order condition is:

$$-\Delta\cdot\underbrace{\frac{\partial^2 p_s}{\partial m_G^2}}_{>0}\cdot\beta\cdot\big[(1-\theta)\cdot(1-e_C)-\theta\cdot(1-e_G)\big]<0. \tag{A.5}$$

An interior solution requires:

$$-\frac{\partial p_s(m_C,\beta\cdot R)}{\partial m_G}<\frac{1}{\Delta\cdot\beta\cdot\big[(1-\theta)\cdot(1-e_C)-\theta\cdot(1-e_G)\big]}<-\frac{\partial p_s(m_C,0)}{\partial m_G}. \tag{A.6}$$

***Proof of part c.*** Combining Equations A.1 and A.4 yields:

$$-\frac{\partial p_c(m^*_{G,c})}{\partial m_G}=-\frac{\partial p_s(m^*_{G,s})}{\partial m_G}\cdot\pi_s,$$

for $\pi_s\in(0,1)$ defined in Equation 15. Because $\pi_s<1$ and $-\frac{\partial p_c}{\partial z}>-\frac{\partial p_s}{\partial z}$ $\big($for $z=\beta\cdot m_G\big)$, we have:

$$-\frac{\partial p_c(m^*_{G,c})}{\partial m_G}<-\frac{\partial p_s(m^*_{G,s})}{\partial m_G}<-\frac{\partial p_c(m^*_{G,s})}{\partial m_G}.$$

The claim follows from the assumption $\frac{\partial^2 p_c}{\partial z^2}>0$. ■

**Lemma A.2** (Thresholds for optimal military spending choice)**.**

***Part a.*** *A unique value* $\hat{m}_{C,c} \in (\underline{m}_C, \overline{m}_C)$ *exists such that:*

- *If* $m_C < \hat{m}_{C,c}$, *then* $\hat{m}_G < m^*_{G,c}$.
- *If* $m_C > \hat{m}_{C,c}$, *then* $\hat{m}_G > m^*_{G,c}$.

***Part b.*** *A unique value* $\hat{m}_{C,s} \in (\underline{m}_C, \overline{m}_C)$ *exists such that:*

- *If* $m_C < \hat{m}_{C,s}$, *then* $\hat{m}_G < m^*_{G,s}$.
- *If* $m_C > \hat{m}_{C,s}$, *then* $\hat{m}_G > m^*_{G,s}$.

***Part c.*** $\hat{m}_{C,s} < \hat{m}_{C,c}$.

***Proof of part a.*** Define $\hat{m}_{C,c}$ implicitly as:

$$\hat{m}_G(\hat{m}_{C,c}) - m^*_{G,c}(\hat{m}_{C,c}) = 0. \tag{A.7}$$

Satisfying the conditions for the intermediate value theorem implies that at least one such $\hat{m}_{C,c} \in (\underline{m}_C, \overline{m}_C)$ exists:

- $\hat{m}_G(\underline{m}_C) - m^*_{G,c}(\underline{m}_C) < 0$ follows from $\hat{m}_G(\underline{m}_C) = 0$ (see the proof for Lemma 1), and part a of Lemma A.1 shows $m^*_{G,c} > 0$.
- $\hat{m}_G(\overline{m}_C) - m^*_{G,c}(\overline{m}_C) > 0$ follows from $\hat{m}_G(\overline{m}_C) = R$ (see the proof for Lemma 1), and part a of Lemma A.1 shows $m^*_{G,c} < R$.
- These functions are continuous in $m_C$ because each constituent function is continuous in $m_C$.

The unique threshold claim follows from showing that the following term is strictly positive:

$$\frac{d}{dm_C}\Big[\hat{m}_G(m_C) - m^*_{G,c}(m_C)\Big] =$$

$$-\left[\frac{\partial p_c(\hat{m}_G)}{\partial m_C} - \frac{\partial p_s(\hat{m}_G)}{\partial m_C}\cdot \pi_s\right] \Bigg/ \left[\frac{\partial p_c(\hat{m}_G)}{\partial m_G} - \frac{\partial p_s(\hat{m}_G)}{\partial m_G}\cdot \pi_s\right] + \frac{\partial^2 p_c(m^*_{G,c})}{\partial m_G \partial m_C} \Bigg/ \frac{\partial^2 p_c(m^*_{G,c})}{\partial m_G^2}.$$

The proof for Lemma 1 proves that the first term is strictly positive, whereas the second term is ambiguous in sign because $\frac{\partial^2 p_c(m^*_{G,c})}{\partial m_G \partial m_C}$ is ambiguous in sign. Thus, we need steep-enough diminishing marginal returns to $m_G$:

$$\frac{\partial^2 p_c}{\partial m_G^2} > \frac{\partial^2 p_c}{\partial m_G \partial m_C} \Bigg/ \left\{ \left[\frac{\partial p_c}{\partial m_C} - \frac{\partial p_s}{\partial m_C}\cdot \pi_s\right] \Bigg/ \left[\frac{\partial p_c}{\partial m_G} - \frac{\partial p_s}{\partial m_G}\cdot \pi_s\right] \right\}. \tag{A.8}$$

***Proof of part b.*** Define $\hat{m}_{C,s}$ implicitly as:

$$\hat{m}_G(\hat{m}_{C,s}) - m^*_{G,s}(\hat{m}_{C,s}) = 0. \tag{A.9}$$

The structure of the proof is identical to that in part a. The condition for steep-enough diminishing marginal returns to $m_G$ is:

$$\frac{\partial^2 p_s}{\partial m_G^2} > \frac{\partial^2 p_s}{\partial m_G \partial m_C} \Bigg/ \left\{ \left[\frac{\partial p_c}{\partial m_C} - \frac{\partial p_s}{\partial m_C} \cdot \pi_s\right] \Bigg/ \left[\frac{\partial p_c}{\partial m_G} - \frac{\partial p_s}{\partial m_G} \cdot \pi_s\right] \right\}. \tag{A.10}$$

***Proof of part c.*** Combining Equations A.7 and A.9 yields:

$$\hat{m}_G(\hat{m}_{C,c}) - m^*_{G,c}(\hat{m}_{C,c}) = \hat{m}_G(\hat{m}_{C,s}) - m^*_{G,s}(\hat{m}_{C,s}).$$

Because $m^*_{G,c} > m^*_{G,s}$ (part c of Lemma A.1), this implies:

$$\hat{m}_G(\hat{m}_{C,c}) - m^*_{G,c}(\hat{m}_{C,c}) > \hat{m}_G(\hat{m}_{C,s}) - m^*_{G,c}(\hat{m}_{C,s}).$$

The result follows because Equation A.8 implies that $\hat{m}_G(m_C) - m^*_{G,c}(m_C)$ strictly increases in $m_C$. ■

***Proof of Lemma 2.*** It is straightforward to establish that when fixing $C$'s civil war aims, the optimal armament amounts are unique and exhibit the following structure:

- Restrict $G$'s choice of $m_G$ to make the center-seeking threat bind, $\mu^*(m_G) = 1$. Lemma A.1 shows that the unique interior optimum is $m_G = m^*_{G,c}$. Lemma A.2 shows that if $m_C > \hat{m}_{C,c}$, then $m^*_{G,c} < \hat{m}_G$; and Lemma 1 shows that $\hat{m}_G$ is the upper bound for $\mu^*(m_G) = 1$. Hence, $m_G = m^*_{G,c}$ is the optimal solution in this range (we know from Equation A.3 that $m_G = 0$ is not optimal). Conversely, if $m_C < \hat{m}_{C,c}$, then Lemma A.2 shows that $m^*_{G,c} > \hat{m}_G$, and hence $\mu^*(m^*_{G,c}) = 0$ (i.e., $C$ prefers separatist aims). The strict monotonicity of the second order condition (Equation A.2) implies that $m_G = \hat{m}_G$ is the optimal solution in this range.
- Restrict $G$'s choice of $m_G$ to make the separatist threat bind, $\mu^*(m_G) = 0$. Lemma A.1 shows that the unique interior optimum is $m_G = m^*_{G,s}$. Lemma A.2 shows that if $m_C < \hat{m}_{C,s}$, then $m^*_{G,s} > \hat{m}_G$; and Lemma 1 shows that $\hat{m}_G$ is the lower bound for $\mu^*(m_G) = 0$. Hence, $m_G = m^*_{G,s}$ is the optimal solution in this range (we know from Equation A.6 that $m_G = R$ is not optimal). Conversely, if $m_C > \hat{m}_{C,s}$, then Lemma A.2 shows that $m^*_{G,s} < \hat{m}_G$, and hence $\mu^*(m^*_{G,s}) = 1$ (i.e., $C$ prefers center-seeking aims). The strict monotonicity of the second order condition (Equation A.5) implies that $m_G = \hat{m}_G$ is the optimal solution in this range.

To solve the full maximization problem stated in Equation 16, the preceding results combined with part c of Lemma A.2 implies the need to examine three non-trivial parameter ranges: (1) $m_C \in \big(\underline{m}_C, \hat{m}_{C,s}\big)$, (2) $m_C \in \big(\hat{m}_{C,s}, \hat{m}_{C,c}\big)$, and (3) $m_C \in \big(\hat{m}_{C,c}, \overline{m}_C\big)$.

1. The following string of inequalities establishes that $m_G = m^*_{G,s}$ is the unique optimal solution in this parameter range:

$$m^*_{G,s} + x^*\big(m^*_{G,s}; \mu = 0\big) < \hat{m}_G + x^*\big(\hat{m}_G; \mu = 0\big) = \hat{m}_G + x^*\big(\hat{m}_G; \mu = 1\big).$$

The first term is the minimal amount of expenditures among all $\mu = 0$ in this parameter range, which in turn implies the inequality. The equality of the next two terms follows because $G$'s expenditures are constant in $\mu$ if $m_G = \hat{m}_G$. The last term is the minimal amount of expenditures among all $\mu = 1$ for this parameter range, hence establishing that $G$ prefers to induce separatism rather than center-seeking as the binding threat.

2. The above shows that, in this parameter range, $m_G = \hat{m}_G$ is the unique optimizer for $\mu = 0$ and $\mu = 1$.

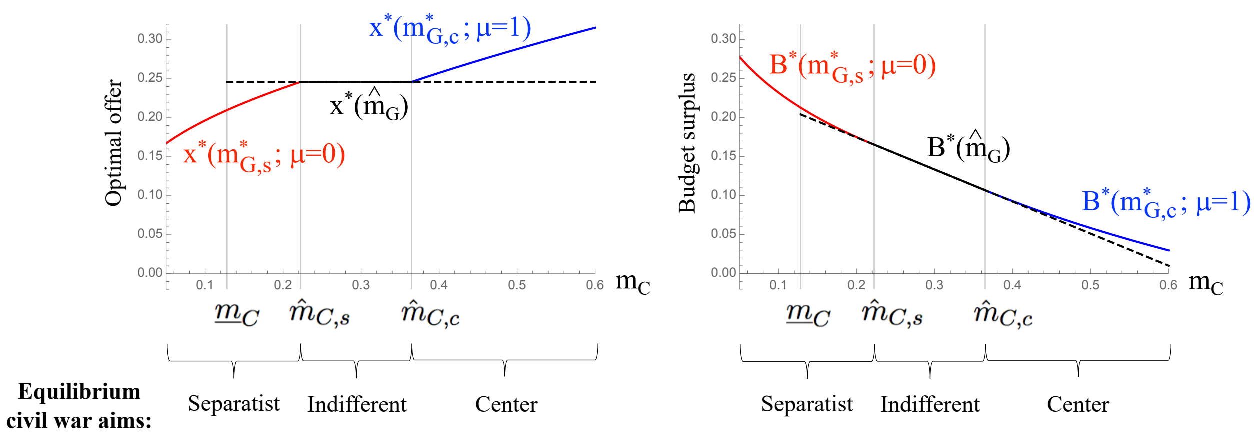
3. The following string of inequalities establishes that $m_G = m^*_{G,c}$ is the unique optimal solution in this parameter range:

$$m^*_{G,c} + x^*\big(m^*_{G,c}; \mu = 1\big) < \hat{m}_G + x^*\big(\hat{m}_G; \mu = 1\big) = \hat{m}_G + x^*\big(\hat{m}_G; \mu = 0\big).$$

The first term is the minimal amount of expenditures among all $\mu = 1$ in this parameter range, which in turn implies the inequality. The equality of the next two terms follows because $G$'s expenditures are constant in $\mu$ if $m_G = \hat{m}_G$. The last term is the minimal amount of expenditures among all $\mu = 0$ in this parameter range, hence establishing that $G$ prefers to induce center-seeking rather than separatism as the binding threat. ■

Figure A.1 depicts the equilibrium offer and equilibrium budget surplus for the same parameter values as used in Figure 3 to illustrate equilibrium military spending.

**Figure A.1: Equilibrium Offer and Budget Surplus**




*Notes*: Figure A.1 uses the same functional form assumptions and parameter values as Figure 3.

### A.3 Proof of Proposition 1

Given the preceding results, the only remaining components to prove for Proposition 1 are that $G$ prefers to induce peace, if possible; and, if not possible, that $G$'s optimal armament is unchanged.

- $G$ is better off in the status quo than from losing a war, which we can show for center-seeking civil wars by comparing Equations 5 and 7, and for separatist civil wars by comparing Equations 5 and 9 (given Assumption 1).
- Nor can *costly peace* motivate fighting in the present to prevent paying armament costs in the future (e.g., Powell, 1993). Regardless of what happens in period 1, $G$ does not arm in period 2.
- We also need to rule out a contemporaneous costly peace motivation for war. Even if a solution exists to Equation 16, does $G$ necessarily want to arm to the teeth to induce peace? Might $G$ prefer to save by spending a small amount on the military in period 1, even if means confronting a rebellion? The following lemma shows that if we restrict $C$ to not accept an offer, then $G$'s armament problem is an affine transformation of Equation 16. Thus, $G$'s optimal choice of $m_G$ is unchanged, and the costliness of rebellion ($d > 0$) induces $G$ to choose a pair $(m_G, x)$ that induces peace, if possible (i.e., if $B^* \geq 0$). Intuitively, and as is standard in conflict bargaining models, because $G$ makes the offers and can hold $C$ to indifference, the expected-utility-to-rebellion terms are already baked into the optimal bargaining offer, and hence $G$ benefits from preventing the surplus destroyed by a rebellion.
- The result from Lemma A.3 also implies that if $B^* < 0$, then $G$ chooses the same $m_G = m_G^*$ as when $B^* \geq 0$, which is the final element needed to prove part b.

**Lemma A.3** (Optimal armament conditional on facing a rebellion)**.** *When restricting $C$ to not accept an offer, $G$'s objective function for $m_G$ is identical to that in Equation 16 minus an additional cost $d$.*

***Proof.*** If $C$ rebels, then $G$'s lifetime expected utility is:

$$R - m_G - d + \Delta \cdot \Big\{ \mu^*(m_G) \cdot \Big[ p_c(m_G) \cdot V^G_{\text{center}} + \big(1 - p_c(m_G)\big) \cdot V^G_{\text{s.q.}} \Big]$$

$$+ \big(1 - \mu^*(m_G)\big) \cdot \Big[ p_s(m_G) \cdot V^G_{\text{sep}} + \big(1 - p_s(m_G)\big) \cdot V^G_{\text{s.q.}} \Big] \Big\}.$$

This easily rearranges to:

$$R - m_G - d + \Delta \cdot V^G_{\text{s.q.}} - \Delta \cdot \Big[ \mu^*(m_G) \cdot p_c(m_G) \cdot \big(V^G_{\text{s.q.}} - V^G_{\text{center}}\big) + \big(1 - \mu^*(m_G)\big) \cdot p_s(m_G) \cdot \big(V^G_{\text{s.q.}} - V^G_{\text{sep}}\big) \Big].$$

In period 2, the total surplus is $2 - e_G$. Hence each continuation value for $G$ is simply $2 - e_G$ minus the continuation value for $C$, which implies:

$$V^G_{\text{s.q.}} - V^G_{\text{center}} = V^C_{\text{center}} - V^C_{\text{s.q.}} \qquad \text{and} \qquad V^G_{\text{s.q.}} - V^G_{\text{sep}} = V^C_{\text{sep}} - V^C_{\text{s.q.}}.$$

Substituting these terms into the previous equation shows that the term in brackets equals $x^*\big(m_G, \mu^*(m_G)\big)$. Hence the entire term equals $R - m_G - x^*\big(m_G, \mu^*(m_G)\big) + \Delta \cdot V^G_{\text{s.q.}} - d$. ■

## A.4 Proofs of Propositions 3 and 4

The proof of Proposition 3 invokes a condition about the steepness of diminishing marginal returns to $m_G$ in the contest functions. Equation A.13 states a sufficient condition, which I assume is true. Because the role of steep-enough marginal returns to $m_G$ in the proof is subtle, I first explain the intuition in words and motivate why the additional assumption is natural. Proposition 3 is a statement about how $\theta$ alters the *magnitude of the oil effect*. That is, the proposition assesses the cross-partial of $B^*$ with respect to $O_i$ and $\theta$, and hence whether oil production and commitment ability are complements or substitutes. By contrast, imposing an assumption about the steepness of diminishing returns in $m_G$ would be irrelevant if I instead took the *first* derivative of $B^*$ with respect to $\theta$ because then envelope theorem would apply (indeed, the envelope theorem applies when deriving $B^*$ with respect to $O_i$ in Proposition 2).

The sign of the cross-partial derivative in Proposition 3 is ambiguous because $\theta$ affects $\frac{dB^*}{dO_i}$ through two channels:

- The direct effect is straightforward: greater commitment ability increases the amount of central transfers and reduces the amount of regional taxes in the status quo regime. Both components of the direct effect decrease the magnitude of the predation effect by raising the opportunity cost of rebelling. This highlights a complementarity between oil production and commitment ability by enhancing the magnitude of a positive-signed effect of $O_i$ on $B^*$.
- An indirect substitution effect cuts in the opposite direction. Higher $\theta$ reduces the marginal benefit of arming (as can be seen in Equations A.1 and A.4), and because the envelope theorem does not apply, $\frac{dm_G^*}{d\theta}$ appears in the corresponding expression (Equation A.11). By decreasing $m_G^*$, this effect of higher $\theta$ *increases* the magnitude of the predation effect, which highlights a channel through which greater commitment ability substitutes from a positive-signed effect of $O_i$ on $B^*$.

Assuming steep-enough diminishing returns in $m_G$ is sufficient for the direct effect to outweigh the indirect effect in magnitude. Otherwise, the net effect of greater commitment ability would substitute from oil production for some values of $m_G$. Why is it reasonable to assume that Equation A.13 holds? Any strictly positive, strictly decreasing, and strictly convex function $f$ in which higher-order derivative functions become increasingly steep over its support satisfy this condition, that is, $\frac{f''}{f'} > \frac{f'}{f}$. This is true for all positive values of the input variables for many common contest functions, including the functional forms in Equation 4 as well as $\frac{m_C^\sigma}{m_C^\sigma + m_G^\sigma}$ with $\sigma \geq 1$, which Garfinkel and Skaperdas (2006) highlight is a commonly used contest function. Thus, at least in standard contest function models, this is a natural assumption. For separatist civil wars, there is an additional term for the ratio of central to regional spoils, but the logic is identical.

***Proof of Proposition 3.***

$$\frac{d}{d\theta}\Big[1-\Delta\cdot(1-\theta)\cdot p_j\big(m_C, \beta\cdot m_G^*(\theta)\big)\Big]\cdot\left(-\frac{de_i}{dO_i}\right) = \Delta\cdot\left[p_j(m_G^*)-(1-\theta)\cdot\frac{\partial p_j(m_G^*)}{\partial m_G}\cdot\frac{dm_G^*}{d\theta}\right]\cdot\left(-\frac{de_i}{dO_i}\right).$$

Need to show:

$$p_j(m_G^*) > (1-\theta)\cdot\frac{\partial p_j(m_G^*)}{\partial m_G}\cdot\frac{dm_G^*}{d\theta}. \tag{A.11}$$

For $\mu^* = 1$, applying the implicit function theorem to $m^*_{G,c}$ defined in Equation A.1 yields:

$$\frac{dm^*_{G,c}}{d\theta} = -\frac{-\frac{\partial p_c(m^*_{G,c})}{\partial m_G}}{\frac{\partial^2 p_c(m^*_{G,c})}{\partial m_G^2} \cdot (1-\theta)}. \tag{A.12}$$

Substituting Equation A.12 into Equation A.11 and rearranging yields:

$$\frac{\partial^2 p_c(m^*_{G,c})}{\partial m_G^2} > \left(\frac{\partial p_c(m^*_{G,c})}{\partial m_G}\right)^2 \Big/ p_c(m^*_{G,c}).$$

Thus, a sufficient condition is that this inequality holds for all $m_G$:

$$\frac{\partial^2 p_c}{\partial m_G^2} > \left(\frac{\partial p_c}{\partial m_G}\right)^2 \Big/ p_c. \tag{A.13}$$

The structure of the proof for $\mu^* = 0$ is identical (starting by applying the implicit function theorem to Equation A.4) except the sufficient condition contains an additional term for the fraction of spoils that $C$ wins from seceding relative to capturing the center (see Equation 15):

$$\frac{\partial^2 p_s}{\partial m_G^2} > \left(\frac{\partial p_s}{\partial m_G}\right)^2 \Big/ \left(p_s \cdot \pi_s\right).$$

■

***Proof of Proposition 4.***

$$\frac{d}{d\beta}\Big[1 - \Delta \cdot (1-\theta) \cdot p_j\big(m_C, \beta \cdot m^*_G(\beta)\big)\Big] \cdot \left(-\frac{de_i}{dO_i}\right)$$

$$= \Delta \cdot (1-\theta) \cdot \left(-\frac{\partial p_j(m^*_G)}{\partial z}\right) \cdot \left[m^*_G + \beta \cdot \frac{\partial m^*_G}{\partial \beta}\right] \cdot \left(-\frac{de_i}{dO_i}\right),$$

for $z = \beta \cdot m_G$. Applying the implicit function theorem to Equations A.1 and A.4 further yields:

$$= \Delta \cdot (1-\theta) \cdot \underbrace{\left(-\frac{\partial p_j(m^*_G)}{\partial z}\right)}_{>0} \cdot \left[m^*_G + \underbrace{\left(-\frac{\partial p_j(m^*_G)}{\partial m_G}\right)}_{>0} \Big/ \underbrace{\left(\frac{\partial^2 p_j(m^*_G)}{\partial m_G^2}\right)}_{>0}\right] \cdot \left(-\frac{de_i}{dO_i}\right) > 0.$$

■

# B Main Empirical Appendix

In this section, I first substantiate the motivating empirical patterns for this article: regional oil abundance covaries with more frequent separatist civil war onset, and country-level oil production covaries with less frequent center-seeking civil war onset. I then describe the data in depth and provide supporting information for the conditional results shown in Figures 5 and 6. I present the most pertinent information here and save supporting details (such as the regression tables that accompany each figure) for Appendix D.

## B.1 Evidence on the Mixed Oil-Conflict Relationship

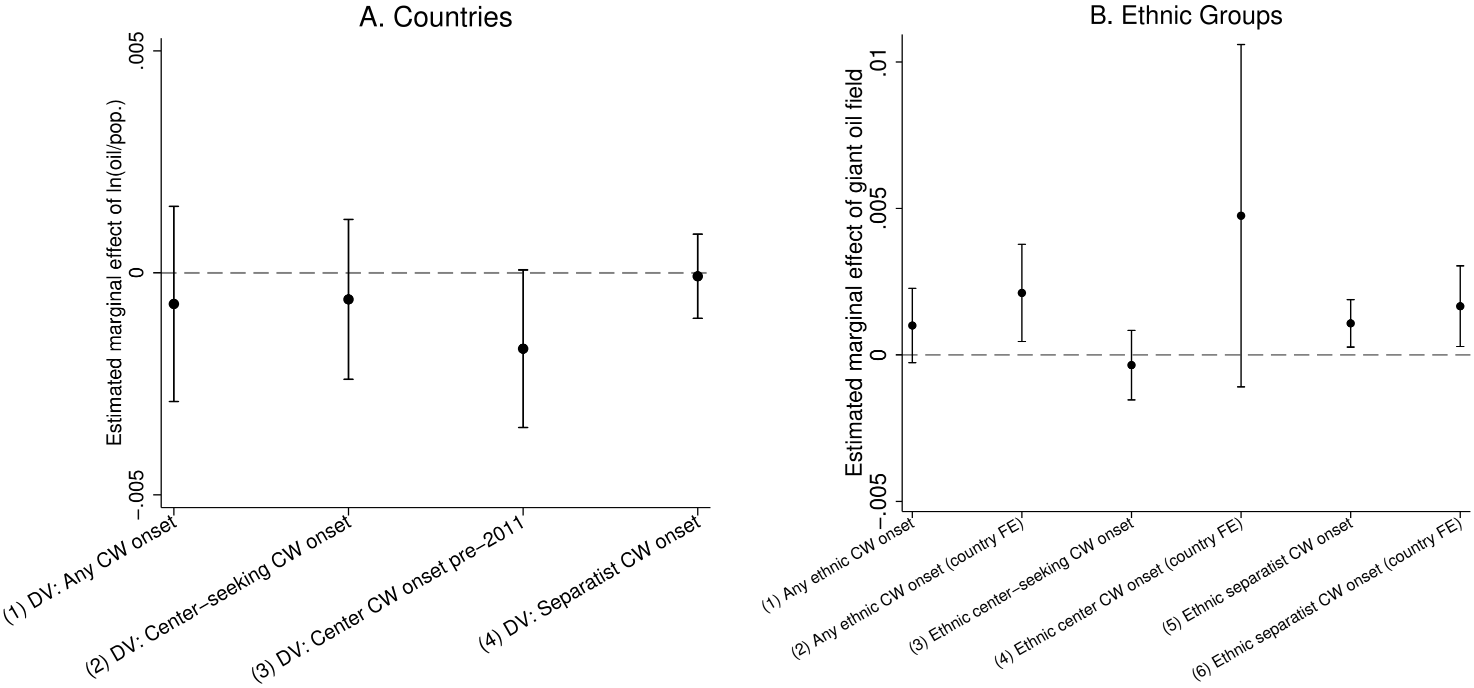
Considerable research analyzes the relationship between oil production and civil war onset, producing a diversity of findings and an emerging consensus that the *aggregate* relationship is null (Ross, 2015, 251). However, studying oil highlights the importance of disaggregating civil war aims. Whereas countries with greater oil wealth tend to experience relatively few center-seeking civil wars (at least, before 2011), oil-rich ethnic groups fight separatist civil wars at elevated rates. Because existing research usually examines these patterns in isolation, or overlooks them by aggregating civil wars, here I present regression results that establish the motivating empirical puzzle using a common sample and dataset. The country-level specifications relate most closely to those in Paine (2016), and the ethnic group-level specifications to those in Morelli and Rohner (2015) and Hunziker and Cederman (2017).

The civil war onset variables draw from Fearon and Laitin's (2003) dataset on major civil war onsets (at least 1,000 battle deaths; often denoted *major* civil wars), updated through 2013 along with other alterations described in the following subsections. It has advantages over the commonly used UCDP/PRIO conflict data because Fearon and Laitin use rigorous criteria for coding civil war *onset* as well as exclude minor conflicts. Empirically, almost all post-1945 civil wars enable relatively unambiguous codings about center-seeking versus separatist goals. For my civil war variables, I combined information from Fearon and Laitin and other conflict datasets to code war aims. I code a single rebel group as exhibiting both center-seeking and separatist aims for only two cases: the SPLM/A in Sudan, and the EPRDF and constituent groups in Ethiopia, which I examine in more depth in Appendix C.3. More frequently, center-seeking and separatist civil wars occur simultaneously within the same *country*, including Angola, Burma, and India. However, each *rebel group* in these conflicts pursued either center-seeking or separatist aims, but not both.

Panel A of Figure B.1 summarizes a series of logit regressions with country-years as the unit of analysis between 1946 and 2013 among 150 independent non-Western European countries. Every specification in Panel A includes logged annual oil and gas production per capita, log population (the only substantive covariate in Ross' 2012 core specification), and peace years and cubic splines. The dependent variable is any type of civil war onset in model 1, center-seeking civil war onset in models 2 and 3, and separatist civil war onset in model 4.

Model 1 of Panel A shows that the estimated marginal effect of oil production on any civil war onset is negative. Although this result is inconsistent with earlier proclamations of an oil curse, it corresponds with more recent findings that show no evidence of an unconditional oil-conflict relationship. Disaggregating civil war aims, model 2 presents a similar estimate for center-seeking civil wars. However, until recently, oil production exhibited a relatively strong negative correlation with center-seeking civil war onset. Model 3 estimates the same specification prior to the Arab Spring in 2011 and shows a large-magnitude and statistically significant negative marginal effect estimate. Holding the temporal dependence controls at their means in model 3, the predicted probability of center-seeking civil onset is 1.09% in country-years with no oil production compared to 0.57% in country-years with $1,000 in oil income per capita, a 48% decline. The empirical section in the article discusses why the Arab Spring and related events should weaken the negative

**Figure B.1: Correlations for Oil and Civil War**




*Notes*: Panel A presents semi-elasticity (because oil is logged) marginal effect estimates for annual oil income per capita from logit models, with 95% confidence intervals. The unit of analysis is country-years. Panel B presents marginal effect estimates for an giant oil/gas field indicator from logit models, with 95% confidence intervals. The unit of analysis is ethnic group-years. Appendix D.1 provides additional details on the specifications.

relationship between oil production on center-seeking civil wars (see the empirical evaluation of Hypothesis 3).[1] Finally, model 4 shows no correlation for separatist civil wars.

Panel B of Figure B.1 summarizes a similar set of logit regressions, except the unit of analysis is ethnic group-years. The sample contains 763 politically relevant ethnic groups from the Ethnic Power Relations (EPR) dataset (Vogt et al., 2015), using similar country and year restrictions as Panel B. I coded the ethnic civil war data by merging Fearon and Laitin's (2003) civil war list with the EPR dataset, therefore coding major civil wars at the ethnic group level. I also matched EPR ethnic groups with giant oil and gas field locations, and the oil variable indicates if (a) the ethnic group's territory contains any giant oil or gas fields or (b) there is a nearby offshore oil field. Every specification contains peace years, cubic splines, and lagged country-level civil war incidence. Even-numbered columns additionally control for country fixed effects. The dependent variable is any ethnic civil war onset in models 1 and 2, ethnic center-seeking onset in models 3 and 4, and ethnic separatist onset in models 5 and 6.

Models 1 and 2 of Panel B demonstrate a positive association between oil wealth and any ethnic civil war onset. The remaining columns demonstrate that this relationship is limited to separatist civil wars. In the model 5 specification, holding temporal dependence controls at their means, the annual predicted probability of separatist civil onset is 2.2 times greater for oil-rich than oil-poor groups: 0.30% versus 0.13%. Furthermore, whether or not controlling for country fixed effects, the association is statistically

[1] No other estimates in Figure B.1 qualitatively differ when truncating the sample to pre-2011 (not reported).

significant at 5%. By contrast, the marginal effect estimate for the giant oil field indicator on center-seeking civil wars is inconsistent in sign and not statistically significant in models 3 and 4. Model 4 is imprecisely estimated because adding country fixed effects to the logit models drops many ethnic groups (see Table D.2). Unreported estimates from linear models do not alter the statistical significance or lack thereof in any model, but decrease the magnitude of the standard error estimates in model 4.

## B.2 COUNTRY-LEVEL DATA AND REGRESSIONS (PANEL A OF FIGURE B.1)

The following details the data used to produce Panel A of Figure B.1. For countries $j$ and years $t$, the regression equation for Panel A of Figure B.1 and its corresponding regression table, Table D.1, is:

$$\ln\left(\frac{Y_{jt}}{1-Y_{jt}}\right) = \beta_0 + \beta_O \cdot \text{ln(oil/pop)}_{jt} + \beta_P \cdot \text{ln(pop)}_{jt} + \boldsymbol{T}'_{jt} \cdot \beta_T + \epsilon_{jt}, \tag{B.1}$$

where $Y_{jt}$ indicates either all civil war onset, center-seeking civil war onset, or separatist civil war onset; and $\boldsymbol{T}'_{jt}$ is a vector of peace years and cubic splines calculated since the last year in a which a conflict of the specified type ended.

**Sample.** The unit of analysis is country-years. Among countries with a population of at least 200,000 in the year 2000, the sample contains annual data for all independent non-Western European countries between (a) the later of 1946 and their year of independence and (b) 2013. Western European countries and their four New World offshoots are excluded because they do not meet a key scope condition of conflict resource curse theories: weakly institutionalized states in which civil war may occur with a non-trivial probability.

**Civil war data.** The civil war onset variable equals 0 in years without a conflict, 1 in the first year of a conflict, and is set to missing during subsequent conflict years. The civil war data draw from Fearon and Laitin (2003), updated through 2013. Fearon and Laitin code whether the civil war was center-seeking or separatist. I verified their coding of civil war aims with two other civil war datasets, Correlates of War (COW) and the UCDP/PRIO Armed Conflict Dataset (ACD), and additional secondary sources when necessary. This enabled me to assign aims to wars that Fearon and Laitin code as mixed or ambiguous. Most cases that they code as mixed are aggregated rebellions that contain distinct rebel groups fighting center-seeking and separatist civil wars, whereas I further distinguish each case by war aims. By contrast, COW or ACD code each war as *either* center-seeking or separatist, but never both. My coding scheme allows for the possibility of coding a rebellion as exhibiting both aims. However, after disaggregating Fearon and Laitin's civil war entries that contain multiple distinct rebel groups, I coded only two cases as exhibiting both aims (Ethiopia and Sudan; Appendix C.3 describes each). By contrast, in countries such as Burma (coded as mixed war aims by Fearon and Laitin), distinct center-seeking and separatist rebellions broke out in 1948, and several other countries such as Angola and India have experienced center-seeking civil wars and separatist civil wars at the same time despite not beginning in the same year.

The major advantage of using data based off Fearon and Laitin's (2003) coding procedure rather than ACD is that ACD does not provide a coherent scheme for coding distinct civil wars, and hence civil war *onsets*. Scholars use a lapse rule, typically two years, for translating ACD's incidence data into distinct conflict onsets, which often leads scholars to code the same long-running, low-intensity civil wars as multiple onsets. Paine (2016, 2019*b*) provides more details on these issues and how Fearon and Laitin's (2003) dataset improves upon these problems.

**Oil and population data.** Ross and Mahdavi (2015) provide annual data between 1932 and 2014 on the total value of oil and natural gas production at the country level, measured in 2014 dollars. The variable has consistent coverage, especially since 1960, before which many countries in the sample were under colonial rule. For any country with missing observations for some years—which, in any country with some missingness, occurs before the first data point for that country in the dataset—I used the following procedure. If there was less than $2 in oil and gas income per capita in the first year of data, I inputted all previous years as $0. If oil and gas income per capita exceeded this amount in the first year, I inputted corresponding data points from Haber and Menaldo (2011).

Ross and Mahdavi (2015) also provide population data, drawn mostly from World Bank (2017) and Maddison (2008). I used their data to create a variable for *per capita* oil production, and I also control for population as a separate covariate in every country-level regression specification (following Ross 2012). For country-years in the sample during the 1940s, the country's 1950 population data point is used because the World Bank and Maddison each exhibit sparse coverage before 1950. Only Afghanistan had missing population data for any year after 1950; their first year in the dataset is 1961, and I use that population figure for all previous years.

I lag oil and gas income per capita and population by one year. If the country has missing data in their first year in the dataset (because of the lagging), they are assigned the next year's oil and/or population data. Overall, no country-years that meet the sample criteria discussed above are dropped because of missing data.

### B.3 Ethnic Group-Level Data and Regressions (Panel B of Figure B.1)

The following details the data used to produce Panel B of Figure B.1. For ethnic groups $i$, countries $j$, and years $t$, the regression equation for Panel B of Figure B.1 and the corresponding regression table, Appendix Table D.2, is:

$$\ln\left(\frac{Y_{it}}{1-Y_{it}}\right) = \beta_j + \beta_O \cdot \text{Oil}_{it} + \boldsymbol{T}'_{it} \cdot \beta_T + \epsilon_{it}, \tag{B.2}$$

where $Y_{it}$ indicates either all civil war onset, center-seeking civil war onset, or separatist civil war onset; and $\boldsymbol{T}'_{it}$ is a vector of peace years and cubic splines calculated since the last year in a which a conflict of the specified ended, plus a lagged country-level civil war incidence variable. The even-numbered specifications include country-level intercepts $\beta_j$, and the odd-numbered columns contain a constant intercept.

**Sample.** The unit of analysis is ethnic group-years. The sample contains every politically relevant ethnic group with a location polygon in the 2014 version (Update 2) of the Ethnic Power Relations (EPR; Vogt et al. 2015) dataset that meet the country and time criteria described in the previous subsection.

**Civil war data.** Paine (2019*b*) assigns civil wars from Fearon and Laitin's (2003) dataset to EPR ethnic groups in Sub-Saharan Africa. There I discuss the advantages of this procedure over existing scorings of civil war onset at the ethnic group level in which scholars translate incidence data from the Armed Conflict Dataset into onsets. I extended Paine's (2019*b*) coding for the global sample used here. As discussed above for the country-level data, rebelling ethnic groups have almost always articulated clear aims for either the center or to separate, with certain rebel groups in Ethiopia and Sudan providing the only exceptions. Also as with the country-level regressions, the civil war onset variable equals 0 in years without a conflict, 1 in the first year of a conflict, and is set to missing during subsequent conflict years.

**Oil data.** The oil variable indicates whether the EPR ethnic group has any onshore or offshore giant oil/gas fields. Onshore means that the giant oil field lies with the group's spatial location polygon, and offshore means that the giant oil field is in water within 250 kilometers of a segment of the group's location polygon (assuming the polygon touches the relevant coast) and is within the maritime boundaries for the country in which the group resides. An updated version of Horn's (2003) dataset provides coordinates for every major oil field discovered in the world between 1868 and 2010 (Horn, 2015). A giant oil field contains ultimate recoverable reserves of at least 500 million barrels of oil equivalent before extraction began. Because the source provides data on when the field was initially discovered (with no missing data), the oil variable can vary over time for ethnic groups; the variable is coded as a 1 in every year including and after the year of discovery. To calculate the variable, I combined the giant oilfield variable with EPR spatial data from GeoEPR (Vogt et al., 2015) and maritime boundary spatial data from Flanders Marine Institute (2016). Appendix D.5 discusses differences between onshore and offshore oil.

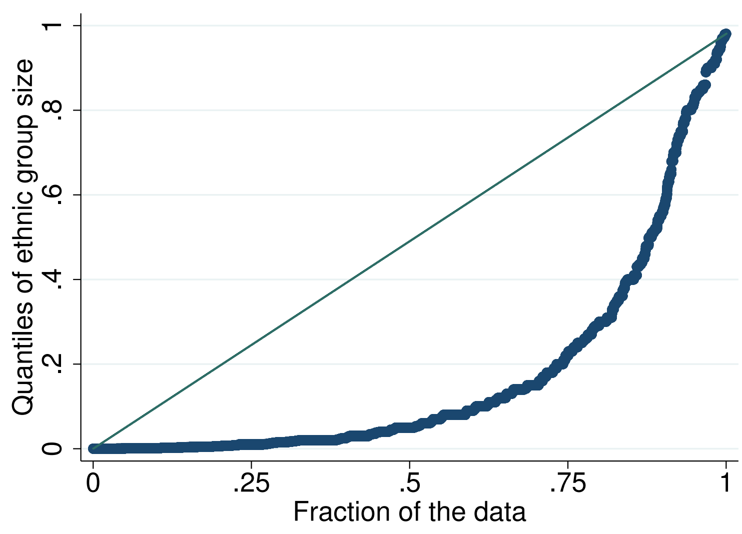
### B.4 Conditional Results for Oil and Separatist Civil Wars (Figure 5)

**Sample.** The sample differs slightly from that in Panel A of Figure B.1. Because Figure 5 focuses only on separatist civil wars, it excludes ethnic groups without a concentrated territory to minimize heterogeneity in the estimates. The absence of geographic concentration nearly perfectly predicts the absence of separatist, but not center-seeking, civil wars (see Appendix D.4).

**Conditioning variables.** The conditioning factors examined in Figure 5 are measured as follows:

- *Excluded minorities.* Minorities are groups that EPR codes as composing less than 50% of their country's population. An ethnic group is coded as excluded from political power in a particular year if it is politically relevant and does not score any of the following on EPR's ethnopolitical inclusion variable: *monopoly*, *dominant*, *senior partner*, or *junior partner*. Figure 4 uses the same ethnopolitical representation variable. In Figures 2 and 4, I present plots based on a continuous variable for ethnic group size as a fraction of the country's population. This variable is quite left-skewed, as the following quantile plot shows, which is why these figures present average values over five bins of roughly equal size.

**Figure B.2: Quantile Plot for Ethnic Group Size**




- *Favorable separatist geography.* An ethnic group scores 1 on the favorable separatist geography variable if any of the following are true, and 0 otherwise: distance from the capital exceeds the median in the sample, mountainous percentage of territory exceeds the median in the sample, or the territory is noncontiguous from the capital. I calculated the distance between each ethnic group's centroid and the capital city by combining GeoEPR with the CShapes dataset (Weidmann, Kuse and Gleditsch, 2010). I use percent mountainous from Hunziker and Cederman (2017), who used Blyth (2002) for the source mountain data. I coded an indicator for EPR ethnic groups that reside in territory that is noncontiguous from the country's capital.

**Regression equation.** For ethnic groups $i$, countries $j$, and years $t$, the regression equation for Columns 2 and 3 of Table D.3 is:

$$\ln\left(\frac{Y_{it}}{1-Y_{it}}\right) = \beta_0 + \beta_O \cdot \text{Oil}_{it} + \beta_C \cdot \text{Cond}_{it} + \beta_{OC} \cdot \text{Oil}_{it} \cdot \text{Cond}_{it} + \boldsymbol{T}'_{it} \cdot \beta_T + \epsilon_{it}, \tag{B.3}$$

where $\text{Cond}_{it}$ is a conditioning variable that differs by column.

### B.5 Conditional Results for Oil and Center-Seeking Civil Wars (Figure 6)

**Government vulnerability variable.** A country-year is scored as 1 on the government vulnerability variable used in Figure 6 if any of the following three conditions are true, and 0 otherwise:

- *Lost war or violent independence.* This condition equals 1 if any of the following are true within the previous two years: defeat in international war (Correlates of War; Dixon and Sarkees 2015); executive turnover caused by government defeat in a center-seeking civil war (coded by author drawing from the list of civil wars used throughout the article); government defeat in a separatist civil war, meaning rebels get significant autonomy concessions, de facto autonomy, or an independent state (coded from Fearon and Laitin's 2003 dataset); or independence from foreign occupation in which an internal war (i.e., war fought within the country's territory) occurred in the lead-up to independence (coded by author).
- *Oil shock decade.* Any year between 1973 and 1982, inclusive.
- *Arab Spring.* Any country in the Middle East and North Africa in 2011.

**Regression equation.** For countries $j$ and years $t$, the regression equation for Column 2 in Table D.4 is:

$$\ln\left(\frac{Y_{jt}}{1-Y_{jt}}\right) = \beta_0 + \beta_O \cdot \ln(\text{oil/pop})_{jt} + \beta_V \cdot V_{jt} + \beta_{OV} \cdot \ln(\text{oil/pop})_{jt} \cdot V_{jt} + \beta_P \cdot \ln(\text{pop})_{jt} + \boldsymbol{T}'_{jt} \cdot \beta_T + \epsilon_{jt}, \tag{B.4}$$

where $V_{jt}$ is an indicator variable for government vulnerability.

# C Model Extensions

This appendix presents three extensions to the core model. Appendix C.1 parameterizes the size of economic production in each region. Appendix C.2 allows for the possibility that the challenger prefers winning a separatist over center-seeking civil war. Appendix C.3 allows the challenger to change civil war aims during the conflict.

## C.1 Large Prize of Winning

Many argue that oil production contributes to civil war by creating a *large prize of winning*. For example, Collier and Hoeffler (2005, 44) proclaim that one of two major reasons that natural resources might be a powerful risk factor for civil wars is "the lure of capturing resource ownership permanently if the rebellion is victorious." Laitin (2007, 22) proclaims: "If there is an economic motive for civil war in the past half-century, it is in the expectation of collecting the revenues that ownership of the state avails, and thus the statistical association between oil (which provides unimaginably high rents to owners of states) and civil war." Contest function models such as Garfinkel and Skaperdas (2006) and Besley and Persson (2011, ch. 4) derive equilibrium conditions under which larger spoils increase prospects for fighting.

I can assess these claims by altering the model in a straightforward way. Assume economic production in each region is $Y_i > 0$, for $i \in \{G, C\}$, replacing the assumption from the core model that production equals 1. Also assume that an increase in oil production $O_i$ strictly increases $Y_i$. This extension produces mechanisms identical to the revenue effect and predation effect from the core model—implying that, contrary to existing arguments, a larger prize does not unambiguously raise prospects for equilibrium conflict.

In this extension, the equilibrium budget constraint changes from Equation 17 to:

$$B^*(Y_i) \equiv \underbrace{\big(1 - e_G\big) \cdot Y_G + \big(1 - e_C\big) \cdot Y_C}_{\approx \text{ Revenue effect}} - m_G^* - x^* \geq 0, \tag{C.1}$$

with the corresponding equilibrium interior transfer amount changing from Equation 12 to:

$$x^*(m_G^*, Y_i) \equiv \Delta \cdot \Bigg[\mu^* \cdot \underbrace{p_c(m_G^*) \cdot (1-\theta) \cdot \Big[\big(1 - e_G\big) \cdot Y_G + \big(1 - e_C\big) \cdot Y_C\Big]}_{\text{Predation effect (center-seeking)}}$$

$$+ (1-\mu^*) \cdot \underbrace{p_s(m_G^*) \cdot \Big[(1-\theta) \cdot (1-e_C) \cdot Y_C - \theta \cdot (1-e_G) \cdot Y_G\Big]}_{\text{Predation effect (separatist)}}\Bigg]. \tag{C.2}$$

## C.2 Does Oil Production Influence Civil War Aims?

In the core model, $C$ prefers to win a center-seeking rather than win a separatist civil war because it gains perpetual revenues from the central region in addition to protecting all the spoils from its own region. The following alteration to the setup creates the possibility that an oil-rich $C$ would prefer to win a separatist rather than center-seeking civil war. Now, a victorious $C$ needs to transfer spoils to the deposed governing actor. This is a relevant consideration not only for thinking more deeply about strategic causes of civil war aims, but also for addressing a possible alternative explanation for the mixed oil-conflict pattern: separatist civil wars in oil-rich regions substitute for center-seeking civil wars that would have occurred if secession was not possible. However, combining the theoretical logic with empirical evidence casts doubt on this possibility.

**Setup.** Consider a setup with the following alterations to the core model:

- In the core model, $C$ ends any interaction with the former governing actor if it wins either type of civil war. I continue to assume this is true for victorious secession, but not for winning a center-seeking civil war. Instead, I assume that a successful center-seeking war simply increases share of spoils that $C$ retains from its own region and that it collects from $G$'s region in every period. Denote $\theta$ from the core model as $\theta_{\text{s.q.}}$, and assume that winning a center-seeking civil war increases this parameter to $\theta_{\text{center}} \in \big(\theta_{\text{s.q.}}, 1\big)$. Implicitly, the core model assumes $\theta_{\text{center}} = 1$, whereas now I assume that $C$ must provide some spoils to the former governing actor if they remain together in the same country.
- For simplicity, I assume that the probability that $C$ wins either type of civil war is fixed at $p \in (0, 1)$. Correspondingly, $G$'s only strategic choice is a transfer amount, and it does not invest in the military. This simplification enables isolating the main finding that arises from changing the structure of $C$'s consumption following a center-seeking victory.

**Analysis.** $C$'s expected utility to each of its three options has the same structure as in the core model. The continuation values $V^C_{\text{s.q.}}$ and $V^C_{\text{sep}}$ are also the same as in the core model, except replacing $\theta$ with $\theta_{\text{s.q.}}$. The only different term is:

$$V^C_{\text{center}} = e_C + \theta_{\text{center}} \cdot (2 - e_G - e_C), \tag{C.3}$$

as opposed to $2 - e_G - e_C$ in the core model. Given the motivating substantive question I want to address in this extension—does oil production cause separatist civil wars to substitute for center-seeking civil wars?—I focus on parameter values in which $C$ prefers to fight either type of civil war rather than accept $G$'s offer in period 1. That is, we know a civil war occurs in equilibrium, but what are its aims? Hence, I impose the following condition:

$$\Delta \cdot p \cdot \min\Big\{\big(\theta_{\text{center}} - \theta_{\text{s.q.}}\big) \cdot (2 - e_C - e_G),\ \ (1 - \theta_{\text{s.q.}}) \cdot (1 - e_C) - \theta_{\text{s.q.}} \cdot (1 - e_G)\Big\} > 2 - e_G. \tag{C.4}$$

In the core model, if $C$ faces the same probability of winning for center-seeking and separatist civil wars, then it prefers center-seeking. However, this may not be true in the present extension. Separating enables $C$ to consume all production from its territory, whereas it has to share some of these resources with $G$ if it captures the center (unlike in the core model). $C$ prefers separatism to center-seeking if and only if production in its region is sufficiently easy to tax, which increases the opportunity cost of remaining in the same country as $G$. The preceding equations show that the inequality is:

$$e_C < 1 - \frac{\theta_{\text{center}}}{1 - \theta_{\text{center}}} \cdot \big(1 - e_G\big). \tag{C.5}$$

High regional oil production corresponds with parameter values in which Equation C.5 holds because of the assumption from the core model that $e_C$ strictly decreases in $O_C$. Proposition C.1 presents the main result.

**Proposition C.1.** *Assume that Equation C.4 holds. A unique threshold $\tilde{e}_C$ exists such that if $e_C < \tilde{e}_C$, then a separatist civil war occurs in equilibrium; if and if $e_C > \tilde{e}_C$, then a center-seeking civil war occurs in equilibrium.*

Under the conditions stated in Proposition C.1, oil production causes separatist civil wars to substitute for center-seeking civil wars. If $C$'s region does not produce oil, then we would observe a center-seeking civil war in equilibrium; but if it produces oil, we would instead observe a separatist civil war.

**Application to empirical cases.** Although theoretically coherent, it is unlikely that Proposition C.1 can explain many empirical cases. The typically low share of the national population for oil-rich separatist groups made them unlikely to seek the center absent oil wealth. Of the seventeen wars listed in Panel A of Figure 5, only six involve fighting by groups with at least 10% of their national population share, and all but one are below 25%. Furthermore, anecdotal considerations about the three largest groups in Panel A of Figure 5 suggest that seeking the center was not a viable option—or, at least, historical precedents favored secession. A separatist civil war occurred in Yemen in 1994, initiated by Southerners that composed a majority of the population. However, South Yemen had merged with North Yemen only four years prior, creating a concrete distinct state that Southerners could recreate. In Nigeria, Britain governed Igbos in the southeast region as a separate territory from the north for much of the colonial era. Thus, when northerners gained control of the state at independence, Igbos had a viable separatist narrative after a series of coups and purges in 1966 left them powerless at the center. In Iraq, the Ottomans governed Mosul (Kurds) as a separate province prior to Britain colonization and creation of Iraq. The historical difficulty that Iraq's Kurds faced to constructing durable political organizations suggests that they could more easily fight in the mountains rather than organize an attack on the capital.

## C.3 Evolving Civil War Aims

For simplicity, the core model assumes that civil wars last a single period and that civil war aims are fixed throughout this one-period conflict. However, it is also of interest to understand why rebels might change civil war aims during a conflict. Considering how the model could account for this phenomenon (which has occurred in Ethiopia and Sudan) while also acknowledging its empirical rarity may provide deeper insights into civil war aims and open new questions for future research. The following highlights conditions under which, in a multi-period war, the challenger might switch from center-seeking to separatist aims or vice versa.

**Setup.** Consider a setup with the following alterations from the core model:

- Now there are 3 periods, with each denoted by $t \in \{1, 2, 3\}$. The third period is identical to period 2 in the baseline model. The second period in this extension is also identical to period 2 in the baseline model if either: $C$ does not initiate a conflict in period 1, or the conflict is *decisive*.
- If $C$ initiates either type of civil war in period 1, then with probability $\kappa \in (0, 1)$, the war *stalemates* after the first period. If this occurs, then $C$ chooses civil war aims in period 2. This is the only strategic move in period 2 if a non-decisive war occurs in period 1, and no negotiated settlement is possible if the war stalemates. The possible war outcomes in period 2 are identical to those in the core model, that is, the war necessarily ends after period 2.
- $C$'s group size $m_{C,t}$ is a function of time. It begins the game with $m_{C,1} > 0$. If $C$ does not fight in period 1 or if the war is decisive after period 1, then $m_{C,t} = m_{C,1}$ for all $t$. If instead $C$ fights and the war stalemates, then Nature chooses $m_{C,2}$ from a Bernoulli distribution: $m_{C,\text{low}} > 0$ with probability $q \in (0, 1)$ and $m_{C,\text{high}} > m_{C,\text{low}}$ with probability $1 - q$. This parameter cannot change again in period 3, $m_{C,3} = m_{C,2}$. The Ethiopia and Sudan cases below interpret changes in group size as alliances formed (or not formed) among multiple ethnic groups during a war to try to capture the center.
- The probability of $C$ winning either type of civil war is a function only of $m_{C,t}$, and $G$ does not make an arming choice. Therefore, I denote $C$'s contest functions as $p_c(m_{C,t})$ and $p_s(m_{C,t})$. The following logic does not depend on $G$'s arming decision, and therefore this simplification enables focusing on the core mechanism of interest.

**Analysis.** If a war occurs and stalemates after period 1, then $C$ (again) chooses civil war aims in period 2. Its expected utility functions are:

$$E\big[U_C(\text{center}, m_{C,2})\big] = e_C + \Delta \cdot \Big[p_c(m_{C,2}) \cdot V^C_{\text{center}} + \big[1 - p_c(m_{C,2})\big] \cdot V^C_{\text{s.q.}}\Big] \tag{C.6}$$

$$E\big[U_C(\text{separatist}, m_{C,2})\big] = e_C + \Delta \cdot \Big[p_s(m_{C,2}) \cdot V^C_{\text{sep}} + \big[1 - p_s(m_{C,2})\big] \cdot V^C_{\text{s.q.}}\Big]. \tag{C.7}$$

The future continuation values are identical to those in the core model because I assume that fighting is necessarily decisive in period 2. The only alteration is to rewrite $m_C$ as $m_{C,t}$ in those functions. At this information set, $C$ chooses between pursuing center-seeking and separatist aims; which does it prefer? Lemma C.1—which restates Lemma 1 for the special case considered here in which $G$'s military capacity is exogenous—characterizes $C$'s optimal civil war aims.

> **Lemma C.1.** *Small groups optimally prefer separatist over center-seeking civil wars, and vice versa for large groups. Formally, a unique threshold $\tilde{m}_C \in (0,1)$ exists, implicitly defined as $p_c(\tilde{m}_C) = \pi_s \cdot p_s(\tilde{m}_C)$, such that:*
>
> ***Part a.*** *If $m_C < \tilde{m}_C$, then $C$'s preferred civil war aims are separatist.*
>
> ***Part b.*** *If $m_C > \tilde{m}_C$, then $C$'s preferred civil war aims are center-seeking.*

Assumption C.1 focuses the analysis on the substantively interesting parameter range in which there is a positive probability of $C$ proclaiming either center-seeking $\big($if $m_{C,2} = m_{C,\text{high}}\big)$ or separatist civil war aims $\big($if $m_{C,2} = m_{C,\text{low}}\big)$ following a stalemate in period 1.

> **Assumption C.1.** $m_{C,low} < \tilde{m}_C < m_{C,high}$.

Given the Nature draw of $m_{C,2}$, $C$'s expected continuation value if the war stalemates after period 1 is:

$$\begin{aligned} V^C_{\text{stale}} = e_C + \Delta \cdot \Big\{ q \cdot \Big[p_c(m_{C,\text{high}}) \cdot V^C_{\text{center}} + \big[1 - p_c(m_{C,\text{high}})\big] \cdot V^C_{\text{s.q.}}\Big] \\ + (1-q) \cdot \Big[p_s(m_{C,\text{low}}) \cdot V^C_{\text{sep}} + \big[1 - p_s(m_{C,\text{low}})\big] \cdot V^C_{\text{s.q.}}\Big]\Big\}, \end{aligned} \tag{C.8}$$

These expressions enable writing $C$'s expected utility to its three choices in period 1.

$$E\big[U_C(\text{accept } x; m_{C,1}, \theta)\big] = e_C + x + \Delta \cdot (1 + \Delta) \cdot V^C_{s.q.}. \tag{C.9}$$

$$E\big[U_C(\text{center}; m_{C,1}, \theta)\big] =$$
$$e_C + \Delta \cdot \Big\{(1-\kappa) \cdot (1+\Delta) \cdot \Big[p_c(m_{C,1}) \cdot V^C_{\text{center}} + \big[1 - p_c(m_{C,1})\big] \cdot V^C_{\text{s.q.}}\Big] + \kappa \cdot V^C_{\text{stale}}\Big\}. \tag{C.10}$$

$$E\big[U_C(\text{separatist}; m_{C,1}, \theta)\big] =$$

$$e_C + \Delta \cdot \Big\{(1-\kappa)\cdot(1+\Delta)\cdot\Big[p_s(m_{C,1})\cdot V^C_{\text{sep}} + \big[1-p_s(m_{C,1})\big]\cdot V^C_{\text{s.q.}}\Big] + \kappa \cdot V^C_{\text{stale}}\Big\}. \tag{C.11}$$

Combining Equations C.10 and C.11 shows that the possibility of stalemates does not alter $C$'s calculus for preferring center-seeking over separatist because $V^C_{\text{stale}}$ and $\kappa$ cancel out. Therefore, Lemma C.1 characterizes $C$'s optimal civil war aims in period 1.

Equation C.12 implicitly defines the equilibrium transfer proposal, $x^*(\theta)$. This expression can be algebraically rearranged to resemble Equation 12, with the difference that it contains additional terms for the possibility of a stalemate.

$$E\big[U_C(\text{accept } x^*(\theta); m_{C,1}, \theta)\big] = \max\Big\{E\big[U_C(\text{center}; m_{C,1}, \theta)\big], E\big[U_C(\text{separatist}; m_{C,1}, \theta)\big]\Big\}. \tag{C.12}$$

Rather than analyze all possible cases, I highlight two in which $C$ switches civil war aims in equilibrium. As in the core model, low $\theta$ is necessary to cause $C$ to initiate either type of war.

**Proposition C.2.** *A unique threshold $\tilde{\theta} < 1$ exists such that if $\theta > \tilde{\theta}$, then $x^*\big(\tilde{\theta}\big) < R$. If $\theta < \tilde{\theta}$, then:*

> ***Switch from separatist to center-seeking.*** *Assume $m_{C,1} < \tilde{m}_C$, the war stalemates after period 1, and Nature draws $m_{C,2} = m_{C,high}$. Then $C$ initiates a separatist civil war in period 1 and switches to center-seeking aims in period 2.*
>
> ***Switch from center-seeking to separatist.*** *Assume $m_{C,1} > \tilde{m}_C$, the war stalemates after period 1, and Nature draws $m_{C,2} = m_{C,low}$. Then $C$ initiates a center-seeking civil war in period 1 and switches to center-seeking aims in period 2.*

**Application to empirical cases.** In Ethiopia, rebel groups switched from separatist to center-seeking aims after more than a decade of fighting. In the first phase, between the 1960s and 1980s, Ethiopia experienced separatist rebellions in seven different regions. Four generated at least 1,000 battle deaths before 1991: Tigray, Eritrea, Ogaden (Somali), and Oromiya (Oromo). According to the Armed Conflict Database, various rebel groups also sought center-seeking aims in the 1980s. A second phase began in 1989. TPLF (a rebel group that proclaimed ethnic aims and primarily recruited from ethnic Tigray, 6% of population) joined forces with EPDM (Amhara, 28%) and OPDO (Oromo, 29%) to form the Ethiopian People's Revolutionary Democratic Front (EPRDF), which sought to overthrow the government.[2] The EPRDF also launched joint operations with EPLF (Eritreans, 6%), which retained separatist aims. EPRDF captured Addis Ababa in 1991, and EPLF gained territorial control over Eritrea and voted to secede in 1993.

The switch from the first to second phase corresponds with an increase in $m_{C,t}$ between periods 1 and 2 in the model extension. It is plausible that the EPRDF coalition was not feasible at the outset of the war, and came together only following major government losses in 1988 (Dixon and Sarkees, 2015, 638), consistent with the assumed Nature draw for $m_{C,2}$. These major government losses also could have presumably facilitated various regions to gain autonomy or independence, but the larger prize of capturing the center assumed in the model explains why groups would take the center given the large coalition that had recently become feasible.

[2] Note that other members of Amhara controlled the government, and the Armed Conflict Database codes EPDM as center-seeking in the 1980s.

Sudan's second civil war provides an opposite case of switching war aims: a center-seeking rebel group accepted a peace agreement that called for regional autonomy and, eventually, independence. Prior to the beginning of the second civil war in 1983, Sudan experienced a separatist conflict between 1963 and 1972 in which members of several different southern ethnic groups participated. Despite this legacy of separatism, when conflict began in the 1980s, war aims differed. John Garang formed the largest rebel group, SPLM/A, and a quote from the 1980s articulates his clear aims for the center: "I would like to reiterate that the SPLA/SPLM is a genuine Sudanese movement that is not interested in concessions for the south, but a movement that is open to all people of the Sudan to join and participate in the building of a new and democratic Sudan" (quoted in Roessler, 2016, 115-116). Early phases of the second civil war can be conceived as period 1 in the model. Yet despite these clear center-seeking aims, SPLM-Garang signed a peace agreement with the Sudanese government in 2005 (period 2) that yielded self-determination for the African south, with a distinct Arab and Muslim government in the north. South Sudan gained independence in 2011 following an earlier referendum.[3]

A plausible explanation for changed civil war aims is that in period 1, Garang expected his appeal to broad Sudanese aims to correspond with an increase in $m_{C,t}$ during the conflict, but instead the realization of $m_{C,2}$ was $m_{C,\text{low}}$ rather than $m_{C,\text{high}}$. Why was Garang's expectation at the outset of the war reasonable? Not only did the mostly African south broadly harbor sharp distaste toward the Arab-dominated Khartoum government, but "[i]n terms of marginalization, Arab groups outside of the Nile River Valley are more similar in terms of their material conditions to non-Arab groups in the periphery than riverain Arabs [the ruling group]" (Roessler, 2016, 117). This created reasonable expectations that a broad-based rebellion could attract widespread support. However, Roessler (2016, 117) states that "since the war was nationalized in the 1980s, almost all of Sudan's rebel movements have come predominantly from 'African groups' . . . In contrast, members of 'Arab groups' have tended to stay on the sidelines or have pre-dominantly fought in pro-government militias." He argues that SPLM failed to overcome the government's relatively dense information networks among Arab groups, despite seemingly similar economic incentives to rebel as the south. In-fighting among southern groups further exacerbated organizational difficulties.[4] After two decades of deadly fighting with complicated coalitions among different rebel groups and fluctuating international support, Garang may have concluded that he would not be able to muster significant support to capture the capital, and instead settled for regional concessions. In fact, Garang proclaimed that the comprehensive peace agreement of 2005 yielded a "New Sudan," but the agreement lacked provisions that could have generated true national integration (Young, 2005).

Ethiopia and Sudan are exceptional cases. I do not classify any other rebel groups as proclaiming both center-seeking and separatist aims (either at different times, as in Ethiopia; or simultaneously, as in Sudan). Although some countries experience simultaneous center-seeking and separatist conflicts, *distinct* rebel groups proclaimed center-seeking and separatist aims. Other civil wars also involve complicated alliances among disparate rebel groups—for example, see Christia's (2012) discussion of alliance formation in Afghanistan—but do not mix groups with center-seeking and separatist aims.

This model extension provides insight into why any particular rebel group is rarely associated with both center-seeking and separatist aims. Ethiopia combined two rare conditions. First, multiple regions experienced both the motivation and opportunity for rebellion, creating numerous separatist groups, as opposed more typical separatist cases in which only a single separatist movement exists. Second, these separatist groups overcame organizational hurdles to combine forces, as opposed to cases like India where the geo-

[3] This case also features further complications in war aims, as competing rebel groups or SPLM/A factions articulated separatist aims. Dixon and Sarkees (2015, 390-394) provide additional details.

[4] Collectively, the six ethnic groups that ACD2EPR codes as involved in SPLM composed 36% of the population: 6% Beja, 10% Dinka, 5% Nuba, 5% Nuer, 9% Other Southern groups, and 1% Shilluk.

graphical challenges of coordinating disparate rebel movements alone would seem to be insurmountable. Sudan also featured a relatively large coalition of different ethnic groups (36% of the population, as Appendix footnote 4 states) that, through shared pre-colonial and colonial history, composed a politically coherent region (South Sudan). John Garang and rebel factions could draw on the legacy of the earlier separatist movement, while Garang could also plausibly gamble that he could muster enough support to take the center. By contrast, most groups that reside in a geographically concentrated territory are too small to contemplate taking the center.

# D Supplemental Empirical Appendix

This appendix section provides miscellaneous supporting information about various empirical patterns discussed in the article and Appendix B.

## D.1 Regression Tables

The following presents the corresponding regression tables for Figures B.1, 5, and 6.

**Table D.1: Regression Table for Panel A of Figure B.1**

| Dependent variable: | All CW onset | Center CW onset | Center CW onset | Sep CW onset |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| ln(Oil & gas p.c.) | -0.000700 | -0.000597 | -0.00171 | -7.65e-05 |
| | (0.00112) | (0.000919) | (0.000906) | (0.000483) |
| ln(Population) | 0.0582 | 0.0248 | 0.0226 | 0.0290 |
| | (0.0122) | (0.00793) | (0.00792) | (0.00588) |
| Country-years | 6,416 | 6,828 | 6,411 | 6,906 |
| Countries | 150 | 150 | 149 | 150 |
| Time controls? | YES | YES | YES | YES |
| Sample | Full | Full | Pre-2011 | Full |

*Notes*: Table D.1 estimates Equation B.1 using a logit link. It presents semi-elasticity marginal effect estimates (because oil is logged) evaluated at coefficient means, with country-clustered standard error estimates (calculated using two-sided hypothesis tests) in parentheses. The dependent variable in each column is civil war onset (either all civil wars, center-seeking, or separatist), and ongoing years are set to missing. Every regression contains peace years and cubic splines generated from the last year in which a war of the specified type was ongoing for each country. The unit of analysis is country-years.

**Table D.2: Regression Table for Panel B of Figure B.1**

| Dependent variable: | All CW onset | | Center CW onset | | Separatist CW onset | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Giant oil/gas field | 0.00100 | 0.00212 | -0.000349 | 0.00475 | 0.00108 | 0.00166 |
| | (0.000649) | (0.000847) | (0.000606) | (0.00298) | (0.000412) | (0.000703) |
| Ethnic group-years | 30,741 | 16,965 | 31,519 | 6,035 | 30,984 | 13,817 |
| Ethnic groups | 762 | 398 | 763 | 168 | 762 | 293 |
| Country FE? | NO | YES | NO | YES | NO | YES |
| Time controls? | YES | YES | YES | YES | YES | YES |

*Notes*: Table D.2 estimates Equation B.2 using a logit link. It present marginal effect estimates evaluated at coefficient means, with ethnic group-clustered standard error estimates (calculated using two-sided hypothesis tests) in parentheses. The coefficient estimates are the marginal effects evaluated at coefficient means. The dependent variable in each column is ethnic civil war onset (either all civil wars, center-seeking, or separatist), and ongoing years are set to missing. Every regression contains peace years and cubic splines generated from the last year in which a war of the specified type was ongoing for each ethnic group, and a lagged country-level civil war incidence variable. The unit of analysis is ethnic group-years.

## Table D.3: Regression Table for Figure 5

| | DV: Separatist civil war onset | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Giant oil/gas field | 0.821 | 0.208 | 0.280 |
| | (0.304) | (0.775) | (0.727) |
| Excluded minority | | 1.114 | |
| | | (0.367) | |
| Giant oil/gas field*Excluded minority | | 0.875 | |
| | | (0.828) | |
| Favorable geography | | | 0.781 |
| | | | (0.328) |
| Giant oil/gas field*Favorable geography | | | 0.591 |
| | | | (0.794) |
| Ethnic group-years | 24,552 | 24,552 | 24,552 |
| Ethnic groups | 599 | 599 | 599 |
| Country FE? | NO | NO | NO |
| Time controls? | YES | YES | YES |
| | Marginal effects | | |
| Giant oil/gas field (unconditional) | 0.00161 | | |
| | (0.000654) | | |
| Giant oil/gas field \| Excluded minority | | 0.00451 | |
| | | (0.00206) | |
| Giant oil/gas field \| Included and/or majority | | 0.000176 | |
| | | (0.000703) | |
| Giant oil/gas field \| Favorable geography | | | 0.00311 |
| | | | (0.00168) |
| Giant oil/gas field \| Unfavorable geography | | | 0.000333 |
| | | | (0.000958) |

*Notes*: Table D.3 estimates Equation B.3 using a logit link. The top of the table presents untransformed coefficient estimates, with ethnic group-clustered standard errors (calculated using two-sided hypothesis tests) in parentheses. The bottom of the table reports marginal effect estimates for different values of the conditioning variables, evaluated at coefficient means; and the associated standard error estimates in parentheses. Every regression contains peace years and cubic splines generated from the last year in which a separatist civil war was ongoing for each ethnic group, and a lagged country-level civil war incidence variable. The unit of analysis is ethnic group-years.

**Table D.4: Regression Table for Figure 6**

| | DV: Center-seeking CW onset | |
|---|---|---|
| | (1) | (2) |
| ln(Oil & gas p.c.) | -0.0291 | -0.154 |
| | (0.0452) | (0.0681) |
| Vulnerable gov. | | 0.499 |
| | | (0.363) |
| ln(Oil & gas p.c.)*Vulnerable gov. | | 0.241 |
| | | (0.0885) |
| ln(Population) | 0.176 | 0.197 |
| | (0.0536) | (0.0555) |
| Country-years | 6,828 | 6,828 |
| Countries | 150 | 150 |
| Time controls? | YES | YES |
| | Marginal effects | |
| ln(Oil & gas p.c.), unconditional | -0.000597 | |
| | (0.000919) | |
| ln(Oil & gas p.c.) \| Vulnerable gov.=0 | | -0.00225 |
| | | (0.000898) |
| ln(Oil & gas p.c.) \| Vulnerable gov.=1 | | 0.00355 |
| | | (0.00215) |

*Notes*: Table D.4 estimates Equation B.4 using a logit link. The top of the table presents untransformed coefficient estimates in the top part, with country-clustered standard errors (calculated using two-sided hypothesis tests) in parentheses. The bottom of the table reports semi-elasticity marginal effect estimates (because oil is logged) for different values of the conditioning variables, evaluated at coefficient means; and the associated standard error estimates in parentheses. Note that the marginal effect estimate in Column 1 is identical to that in Column 2 of Table D.1. Every regression contains peace years and cubic splines generated from the last year in which a center-seeking civil war was ongoing. The unit of analysis is country-years.

## D.2 Rule by Small Ethnic Groups

In the model setup in the article, I discuss ethnic group size as a key factor that affects the contest functions. There, I briefly summarized modes through which small ethnic groups (20% of their country's population or less) have gained control of the government. Here I describe the sample and list every case. Using the set of ethnic-group years that meet the sample criteria described in Appendix B, I calculated the numerical size of the ethnic group with the highest power status in the central government. In the Ethnic Power Relations (EPR; Vogt et al. 2015) coding scheme, this corresponds with groups with a status of *monopoly*, *dominant*, or *senior partner* (if multiple senior partners, I counted only the largest one). Table D.5 lists 59 cases, and states the first year of the new ruling group (see additional notes below for more details on the sample). I then coded the mode by which each regime gained power. For sources, I consulted the EPR Atlas (the codebook for EPR's power status variable) and two Africa-specific sources because most cases are in Africa: Roessler's (2011) appendix with information on transitions among ruling ethnic groups, and Meng and Paine's (2020) appendix with information on regimes that gained power via a civil war.

Table D.5 lists every case. Ten involved a rebellion, whether on its own or in conjunction with other modes of gaining power. However, this is somewhat of an overcount because in two cases, the ruling ethnic group does not correspond directly to the group that controlled the government after the rebellion ended. In South Africa, EPR codes "Blacks" as a politically relevant ethnic group prior to 1994 because Africans versus Europeans was the relevant political cleavage, whereas divisions among Africans lacked political salience. Blacks (77% of the population) were the rebelling group despite members of a specific African group Xhosa (18% of the population) becoming the senior partner in government after 1994. In Liberia, the rebel groups MODEL and LURD that participated in the struggle to depose Charles Taylor were not politically relevant actors in the post-war settlement (Käihkö, 2015, 2018).

Table D.5: Rule by Small Ethnic Groups

| Ethnic group | Country | Year of entry | Group % | Mode of entry |
|---|---|---|---|---|
| Northern (Bariba, etc.) | Benin | 1960 | 15 | Decolonization |
| Northern (Bariba, etc.) | Benin | 1968 | 15 | Coup |
| Northern (Bariba, etc.) | Benin | 1996 | 15 | Election |
| Ngalops (Drupka) | Bhutan | 1989 | 20 | Ethnic narrowing |
| Tutsi | Burundi | 1966 | 14 | Coup |
| Fulani (and other northern Muslim peoples) | Cameroon | 1960 | 17.5 | Decolonization |
| Beti (and related peoples) | Cameroon | 1983 | 18 | Succession |
| Riverine groups (Mbaka etc.) | CAR | 1960 | 14.5 | Decolonization |
| Yakoma | CAR | 1982 | 4 | Coup |
| Sara | CAR | 1994 | 10 | Election |
| Toubou | Chad | 1980 | 4 | Rebellion |
| Zaghawa, Bideyat | Chad | 1991 | 1 | Rebellion |
| Bakongo | Congo | 1964 | 9 | Coup |
| Mbochi | Congo | 1969 | 12 | Coup |
| Bembe | Congo | 1992 | 1 | Election |
| Mbochi (proper) | Congo | 1998 | 9 | Rebellion |
| Bakongo | DRC | 1960 | 10.3 | Decolonization |
| Ngbandi | DRC | 1961 | 2 | Coup |
| Tutsi-Banyamulenge | DRC | 1998 | 2 | Rebellion |
| Luba Shaba | DRC | 1999 | 5 | Coup (purge) |
| Baule (Akan) | Cote d'Ivoire | 1960 | 20 | Decolonization |
| Southern Mande | Cote d'Ivoire | 2000 | 10 | Coup |
| Kru | Cote d'Ivoire | 2001 | 11 | Election |
| Tigry | Ethiopia | 1992 | 6.08 | Rebellion |
| Mbede (Nzebi, Bateke, Obamba) | Gabon | 1968 | 20 | Succession |
| Wolof | Gambia | 1965 | 14.5 | Decolonization |
| Ga-Adangbe | Ghana | 1967 | 8 | Coup |
| Asante (Akan) | Ghana | 1972 | 15 | Coup |
| Ewe | Ghana | 1982 | 13 | Coup |
| Asante (Akan) | Ghana | 2001 | 15 | Election |
| Susu | Guinea | 1985 | 20 | Coup |
| Cape Verdean | Guinea-Bissau | 1974 | 2 | Decolonization |
| Papel | Guinea-Bissau | 1981 | 7 | Coup |
| Papel | Guinea-Bissau | 2006 | 7 | Election |
| Sunni Arabs | Iraq | 1946 | 19 | Decolonization |
| Kalenjin-Masai-Turkana-Samburu | Kenya | 1979 | 15 | Succession |
| Sunnis (Arab) | Lebanon | 1971 | 20 | Demographic shift |
| Americo-Liberians | Liberia | 1946 | 2 | Decolonization |
| Krahn (Guere) | Liberia | 1981 | 5 | Coup |
| Americo-Liberians | Liberia | 1997 | 2 | Rebellion/election |
| Gio | Liberia | 2004 | 8 | Rebellion/transition gov't |
| Americo-Liberians | Liberia | 2006 | 2 | Election |
| Ijaw | Nigeria | 2011 | 10 | Succession |
| Tutsi | Rwanda | 1995 | 15 | Rebellion |
| Serer | Senegal | 1960 | 15 | Decolonization |
| Limba | Sierra Leone | 1968 | 8 | Coup |
| English Speakers | South Africa | 1946 | 4.5 | Decolonization |
| Afrikaners | South Africa | 1948 | 8 | Election |
| Xhosa | South Africa | 1994 | 18 | Rebellion/election |
| Shaygiyya, Ja'aliyyin and Danagla (Arab) | Sudan | 1956 | 15 | Decolonization |
| Kurds | Syria | 1949 | 8 | Coup |
| Alawi | Syria | 1966 | 13 | Coup |
| Mainland Chinese | Taiwan | 1949 | 14 | Foreign invasion |
| Northerners (Langi etc.) | Uganda | 1966 | 17.3 | Coup |
| Far North-West Nile (Kakwa-Nubian etc.) | Uganda | 1972 | 7.9 | Coup |
| Northerners (Langi etc.) | Uganda | 1980 | 18 | Election/foreign invasion |
| South-Westerners (Ankole etc.) | Uganda | 1986 | 20 | Rebellion |
| Europeans | Zimbabwe | 1965 | 3 | Decolonization |

Nineteen regimes in Table D.5 achieved power via a coup d'état. Although these cases also involved coercion, coups are distinct from center-seeking rebellions. Whereas rebellions require belligerents to build a private military and defeat the state military in battle, coups involve quick strikes by individuals that are part of the state military. Many researchers posit explicit differences in the mechanisms that trigger coups rather than civil wars (Roessler, 2016; Paine, 2020). A useful task in future research would be to better integrate causes of coups into the conflict resource curse literature, which to this point has almost exclusively focused on rebellions (although see Nordvik 2019 and Lango, Bell and Wolford 2020).

Among the remaining regimes, thirteen gained power during decolonization from European rule (and thus ruled at independence), nine by winning an election, and four through normal constitutional succession rules. The remaining three are heterogeneous. In Taiwan, the Kuomintang conquered the island in 1949 after losing a civil war in mainland China, hence bringing to power a minority of mainland Chinese. In Lebanon, a constitutionally ordained power-sharing arrangement made both Sunni Arabs and Maronite Christians senior partners in the government. Based on the country's original census, Maronite Christians constituted 29% of the population and Sunni Arabs were 22%. However, a new census yielded revised estimates in 1971 with Maronite Christians as 16% of the population and Sunni Arabs as 20%. Thus, demographic shifts meant that although the ruling coalition remained unchanged with regard to the identity of the ethnic groups, the largest senior partner no longer exceeded 20% of the population. In Bhutan, a change in the definition of who was eligible to rule the kingdom narrowed the monopoly group from all Bhutanese (50% of the population) to the subgroup of Ngalops (Drupka).

I do not list cases in which the size of the ruling group changed but (a) there was no regime change and (b) the original ruling group was below 20% of the country's population (the latter criterion was not true for Bhutan, which is why I include this case). For example, Idi Amin staged a coup that, using EPR's list of ethnic groups, brought "Far North-West Nile (Kakwa-Nubian, Madi, Lugbara, Alur)" into power in 1972, who composed 7.9% of the country's population; the table includes this case. In 1974, the ruling group changed to "Kakwa-Nubian," who constituted 3.1% of the population. Idi Amin remained in power, but narrowed the set of individuals with access to high level positions from Far North-West Nile groups broadly defined to a specific subgroup, Kakwa-Nubian; the table excludes this case.

## D.3 Rebel Tactics and Civil War Aims

In the model setup in the article, I discuss the geography of rebellion as a key factor that affects the contest functions. There, I mentioned statistical evidence on the association between separatist aims and irregular tactics, which I substantiate here. Kalyvas and Balcells (2010) analyze rebel tactics and conceptualize technologies of rebellion based on rebel and government strength. This includes irregular conflicts between weak rebels and a strong government, and conventional conflicts between strong rebels and a strong government. They estimate correlates of civil war tactics (Table 3 on pg. 425 of their article). They do not, however, examine civil war aims, and the interest here is to see if civil war aims correlate with civil war tactics. To do so, I coded civil war aims for each conflict in their list (which is similar to the civil war list used in Panel A of Figure B.1; their years span from 1944 to 2004) and added a separatist civil war indicator to the specifications in their Table 3, which includes a handful of control variables listed below in Table D.6. Using multinomial logit models, they compare the outcomes *conventional tactics* and *symmetric non-conventional wars*—their third category of civil war aims, in which both the rebels and government are weak—to the basis category of irregular tactics. Here, I estimate standard logit models with conventional tactics equaling 1 on the dichotomous outcome variable and irregular tactics equaling 0, thus ignoring symmetric non-conventional wars. The unit of analysis in Table D.6 is civil wars.

The table shows that separatist civil wars covary negatively and significantly with conventional tactics—indicating that separatism and irregular tactics tend to coincide. Using a multinomial logit model that additionally compares symmetric non-conventional wars to the basis category of irregular wars (not shown) yields a null correlation for separatist civil wars, as expected because both symmetric non-conventional wars and irregular wars involve guerrilla tactics.

**Table D.6: Adding a Separatist Indicator to Kalyvas and Balcells**

| | DV: Civil war fought with conventional tactics | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Separatist aims | -1.147 | -1.574 | -1.457 | -1.398 | -1.598 | -1.636 |
| | (0.498) | (0.525) | (0.510) | (0.568) | (0.569) | (0.589) |
| Rough terrain | 0.00306 | 0.00224 | 0.00710 | 0.00184 | 0.00210 | 0.00271 |
| | (0.00750) | (0.00383) | (0.00910) | (0.00383) | (0.00348) | (0.00567) |
| Ethnic war | 0.596 | 0.746 | 0.135 | 0.491 | 0.612 | 0.125 |
| | (0.493) | (0.477) | (0.540) | (0.510) | (0.496) | (0.555) |
| GDP/capita | 0.104 | 0.0227 | 0.347 | 0.113 | 0.0930 | 0.271 |
| | (0.154) | (0.162) | (0.157) | (0.169) | (0.174) | (0.172) |
| Post-1990 | 1.381 | | | 0.947 | | |
| | (0.512) | | | (0.539) | | |
| New post-communist country | | 3.255 | | | 1.871 | |
| | | (1.211) | | | (1.394) | |
| Marxist rebels | | | -1.873 | | | -1.499 |
| | | | (0.593) | | | (0.591) |
| Military personnel | | | | 9.12e-05 | 6.22e-05 | 4.56e-05 |
| | | | | (0.000192) | (0.000193) | (0.000195) |
| # of civil wars | 120 | 120 | 120 | 108 | 108 | 108 |

*Notes*: Table D.6 summarizes a series of logit models in which the dependent variable equals 1 if the civil war is fought using conventional tactics and 0 if fought with irregular tactics. The unit of analysis is civil wars, and the sample is all civil wars in Kalyvas and Balcells's (2010) dataset between 1944 and 2004 (except symmetric non-conventional wars).

## D.4 Territorial Concentration and Civil War Aims

In footnote 21 of the article and in Appendix B.4, I mentioned that the results for separatist civil wars include only groups with a geographically circumscribed territory in order to reduce causal heterogeneity—specifically, because non-concentrated groups almost never initiate separatist civil wars. Toft (2014, 191) summarizes existing evidence on the importance of territorial concentration for facilitating a separatist rebellion: "[R]egional concentration of a group within a circumscribed territory serves as a practically necessary condition for a self-determination movement and secessionist war to emerge . . . Why is this? It appears to be the case that group concentration (1) makes political organization easier over a compact territory, thus overcoming the collective action problem; (2) facilitates military operations; and (3) defines the territory over which claims can be made."

Table D.7 presents two specifications. Using the same sample of ethnic groups as in Panel B of Figure B.1, Column 1 regresses separatist civil onset on an indicator variable for territorial concentration, coded by EPR, and temporal dependence controls. The Column 2 specification is identical except the dependent variable is center-seeking civil war onset. The table shows that territorial concentration strongly and positively correlates with separatist civil war onset, but not with center-seeking civil wars (p=0.697). The Column 1 regression shows only one case of a non-territorially-concentrated group launching a separatist civil war, Sahrawis in Morocco in 1976.

**Table D.7: Territorial Concentration and Civil War Aims**

| Dependent variable: | Sep. CW onset | Center CW onset |
|---|---|---|
| | (1) | (2) |
| Territorially concentrated | 0.00310 | 0.000186 |
| | (0.000827) | (0.000478) |
| Ethnic group-years | 30,984 | 31,519 |
| Ethnic groups | 762 | 763 |
| Time controls? | YES | YES |

*Notes*: See the note for Table D.2. The only difference is that the specification for Table D.7 replaces the oil indicator with the territorial concentration indicator.

## D.5 Rebel Finance Theories and Evidence for Onshore/Offshore Oil

When presenting the statistical evidence for separatist civil wars in the article, I mentioned that the findings are largely unchanged even when disaggregating onshore and offshore oil production. These results, presented here, pertain to an often-discussed alternative mechanism that oil located near potential rebel groups makes conflict likely by providing rebels with an opportunity to steal oil production to finance their rebellion (Collier and Hoeffler, 2005; Lujala, 2010; Ross, 2012). However, in the article, when introducing oil wealth into the model, I mention that, empirically, oil rarely provides large-scale finance for rebel groups. Instead, my theory incorporates the better substantively grounded premise that governments control the preponderance of oil revenues (Colgan 2015, 8, Paine 2016), which follows from core attributes of oil production such as high capital-intensity and fixed location that facilitate easy taxation (Le Billon 2005, 34, Paine 2019*a*). The grounds the assumption in my model that only the government can use oil wealth to fund armaments.

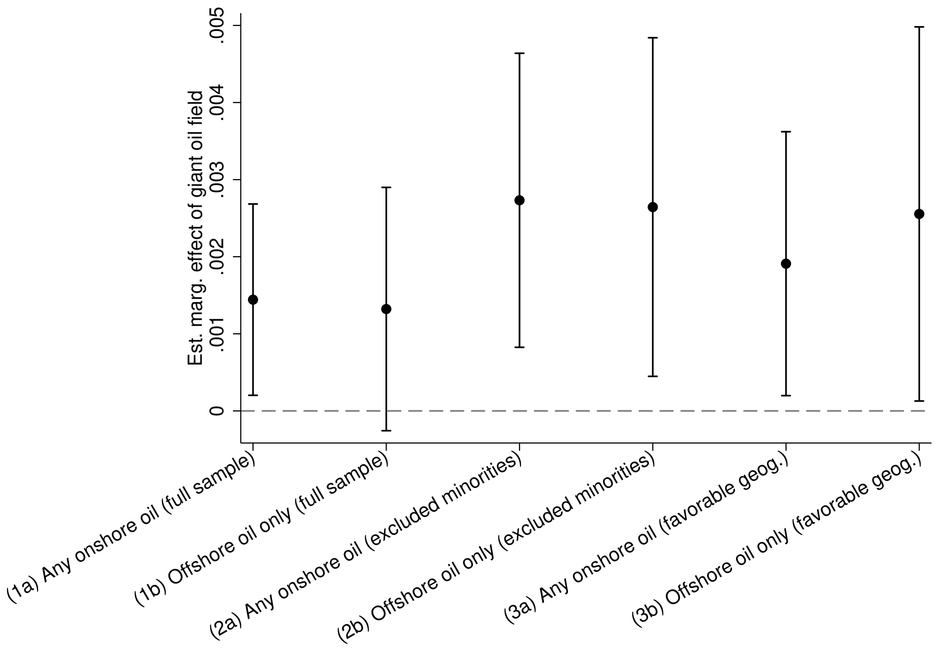
One observable implication that distinguishes mine from existing theories is based on disaggregating onshore and offshore oil production. My theory suggests that this distinction should not matter. If a politically excluded minority group would gain control over specific oil fields by seceding, then my model highlights a trigger for war: separatism is attractive because the challenger fears predation under the status quo regime. Whether the oil fields are onshore or offshore does not affect this calculus. By contrast, rebel finance theories anticipate that groups with offshore oil production only should not rebel more frequently than oil-poor groups because offshore oil is almost impossible to loot (Lujala, 2010; Ross, 2012).

Here, I show empirically that offshore oil production is indeed positively correlated with separatist civil war onset—in fact, the estimates are very similar to those for onshore oil. Specifically, I re-run the specifications used to assess Hypotheses 1 and 2 while distinguishing ethnic groups with offshore oil production only from those with onshore or mixed production (Appendix B.3 describes how I coded onshore and offshore oil). However, few oil-rich groups have offshore oil production only, and thus the offshore correlation is based on a small number of cases. The regression equation for Figure D.1 and Table D.8 is:

$$\ln\left(\frac{Y_{it}}{1-Y_{it}}\right) = \beta_0 + \beta_{\text{on}} \cdot \text{Onshore}_{it} + \beta_{\text{off}} \cdot \text{Offshore}_{it} + \boldsymbol{T}'_{it} \cdot \beta_T + \epsilon_{it}, \quad \text{(D.1)}$$

where $\beta_{\text{on}}$ is the coefficient estimate for onshore oil and $\beta_{\text{off}}$ is the coefficient estimate for offshore oil.

**Figure D.1: Figure 5 with Disaggregated Onshore and Offshore Oil**




*Notes*: See the note for Figure 5. The only difference in specification is that the oil indicator is disaggregated into onshore and offshore oil.

In Figure D.1 and Table D.8, Column 1 uses the same sample as in Figure 5, and Columns 2 and 3 consider more theoretically relevant samples by subsetting the data, respectively, to either excluded minorities (Hypothesis 1) or favorable separatist geography (Hypothesis 2). The figure shows that, among either excluded minorities or favorable separatist geography groups, onshore oil and offshore oil each positively and significantly covary with separatist civil war onset; and in the full sample-specification (Column 1), the p-value for offshore oil is 0.101.

An important caveat for interpreting the results in Figure D.1 is that separatist civil war in oil-rich territories (onshore or offshore) is itself a rare event, and separatist civil wars in territories rich only in offshore oil are even rarer: Bakongo in Angola, Cabindan Mayombe in Angola, East Timorese in Indonesia, and Malay Muslims in Thailand (see Figure 5). Therefore, although civil wars have occurred relatively more frequently in offshore oil-rich territories than in oil-poor territories (0.7% of group-years compared to 0.3% among excluded minorities), the offshore oil correlation is based on only four *positive-positive* cases, hence rendering the statistical tests somewhat inconclusive. The discussion of Angola in the article provides evidence of the proposed mechanisms.

**Table D.8: Regression Table for Figure D.1**

| | DV: Separatist civil war onset | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Giant onshore oil field | 0.00144 | 0.00273 | 0.00191 |
| | (0.000633) | (0.000973) | (0.000873) |
| Giant offshore oil field (only) | 0.00132 | 0.00264 | 0.00255 |
| | (0.000805) | (0.00112) | (0.00124) |
| Ethnic group-years | 24,552 | 14,824 | 14,692 |
| Ethnic groups | 488 | 355 | 280 |
| Time controls? | YES | YES | YES |
| Sample | Full | Excluded minorities | Favorable geography |

*Notes*: See the note for Table D.3. The only difference in specification is that the oil indicator is disaggregated into onshore and offshore oil, as described above.

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