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Economic Grievances and Civil War: An Application to the Resource Curse

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A large body of scholarship suggests that economic grievances play an important role in civil wars. But what specific economic activities trigger such grievances, and why would governments not take proactive steps to limit economic grievances in order to stabilize their regimes? This article argues that specific economic activities—those that undermine a producer's ability to exit the formal economy—cause governments to make taxation decisions that, despite the costliness of fighting, increase the likelihood of civil war. An inability for producers to exit the formal economy also undermines regional autonomy deals by encouraging governments to grab short-term rents despite the risk of triggering civil war. After deriving this "redistributive grievance" mechanism by analyzing an infinite-horizon bargaining model with endogenous labor supply and economic production, I address a specific empirical source of such redistributive grievances: oil-rich regions fight separatist civil wars relatively frequently. Capital-intense, geographically concentrated, and immobile oil production corresponds with conditions in the formal model that predict redistributive grievances and war. Moreover, I argue that applying the redistributive grievances mechanism to understanding the oil-separatism relationship also highlights shortcomings of alternative "greed"-based explanations.

Economic grievances often catalyze civil war. Building on classic arguments such as Gurr (1970) and Horowitz (1985), extensive statistical (Boix 2008; Cederman, Weidmann and Gleditsch 2011) and case-based evidence (Wood 2003; Sambanis 2005, 323-24) demonstrates the importance of economic grievances and of other sources of grievances (Cederman, Gleditsch and Buhaug 2013). However, existing work leaves two important puzzles unanswered.

First, what types of economic production are likely to trigger grievances and civil war? Broader criticisms of grievance-based theories argue that, because grievances are ubiquitous, scholars need to identify more specific contributors to civil war (Collier and Hoeffler 2004; Fearon and Laitin 2003). Scholars often point to natural resources as a particular source of economic grievances, resulting in widespread proclamations of a "conflict resource curse." However, different natural resources vary considerably in key attributes of production such as their capital intensity, location, and value. Moreover, scholars disagree about the relative importance of grievances in comparison to other mechanisms linking natural resource production and civil war.

Even for the most-studied commodity—oil production—scholars propose an "embarrassment of mechanisms" (Humphreys 2005, 510) that generate divergent expectations. Some argue that *governments* easily accrue oil revenues and indiscriminately redistribute wealth away from oil-rich territories, which creates incentives for aggrieved oil-rich regions to secede in order to stop their exploitation (Sorens 2011, 574–75; Ross 2012, 151–52).[1] But the oil-grievances argument faces important challenges. Other scholars propose that oil production provides a particularly valuable opportunity for *rebels* to finance their insurgency (Collier and Hoeffler 2005a, 44; Collier and Hoeffler 2005b, 631; Collier, Hoeffler and Rohner 2009, 13; Lujala 2009, 2010). Does oil production contribute to conflict by enabling government exploitation and generating redistributive grievances, or by funding greedy rebels?[2] Comparing oil to other natural resources raises additional important questions about the grievance mechanism. Exploited local residents cannot move oil fields, an immobile asset (Boix 2003; Acemoglu and Robinson 2006, 300–7). However, the same is true for many other natural resources, such as alluvial diamonds, that weakly correlate with civil wars (Ross 2015, 250).

Second, why would governments not act to limit economic grievances and therefore avert fighting? Scholars in the broader conflict literature examine rationalist motives—such as inability to commit to future deals—for actors to engage in costly fighting rather than to strike Pareto-improving bargains.[3] However, researchers examining domestic conflict often do not apply these insights to purported causes of civil war, such as natural resources and broader economic grievances. For example, even if producing oil can potentially create grievances over unfair distribution, why would a government not limit exploitation—at least somewhat—to prevent fighting? Existing discussions of oil-conflict cases such as Angola and Sudan highlight that governments often exploit oil-rich groups, but do not explain the seemingly self-defeating nature of this behavior.

This article argues that we can understand these two puzzles by analyzing a specific strategic motive. Economic activities that undermine a producer's ability to exit the formal economy—for example, by diverting its production into an informal sector beyond the government's reach—cause

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[1] The idea of governments controlling oil revenues also plays an important role in studies of oil production and autocratic survival (Crystal 1995; Chaudhry 1997; Wright, Frantz and Geddes 2015).

[2] Many emphasize the importance of greed versus grievance arguments in the conflict resource curse literature, including Humphreys (2005) and, more recently, Smith's 2016 review: "the theorized mechanisms linking resource wealth to civil conflict track fairly well along a grievance-greed continuum."

[3] Fearon (1995) and Powell (2004) provide foundational results. Walter (2009a) overviews the bargaining framework for studying civil war.

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governments to strategically make taxation decisions that increase the likelihood of civil war, even though fighting imposes costs. Impediments to producers exiting the formal economy also create incentives for governments to renege on regional autonomy deals and instead to grab short-term rents despite eventually triggering civil war. The second half of the article shows how this mechanism can help to explain the statistical relationship between regional oil production and separatist civil war onset demonstrated in the literature.

I develop this "redistributive grievances" mechanism by analyzing a game that draws elements from existing dynamic bargaining models featuring commitment problems. The model endogenizes labor supply and economic production to provide a strategic choice for producers to escape government exploitation. Specifically, in each period of a repeated interaction between a government and regional challenger, the government proposes a tax rate on the challenger's formal economic production. However, the government cannot commit to future proposals—implying that offering a low tax rate on today's production does not prevent high taxation on tomorrow's production. Commitment inability yields different tax rates across periods because the challenger exogenously fluctuates between strong and weak rebellion capacity. After observing the tax proposal, the challenger allocates labor between the formal and informal economy, which corresponds to an economic exit option. The challenger also chooses whether or not to fight a civil war—which would prevent future government taxation if successful.[4]

The model analysis yields a general redistributive grievances mechanism: a government's inability to commit to low taxes only causes war for economic activities that undermine a producer's economic exit threat. Specifically, economic activities that limit the value of the challenger's economic exit option (a function of the labor elasticity of production and the value of the informal economy) create incentives for the government to tax at high rates in periods the challenger has weak capacity for rebellion because the challenger's threat to withhold labor minimally affects the government's tax intake. Combining this incentive with the government's inability to commit to limit taxes creates *redistributive grievances* in equilibrium, specifically, grievances that result from strategic government choices. This strategic government reaction raises the challenger's incentives to fight when temporarily strong. By contrast, although the government cannot *commit* to low taxes when the challenger cannot fight, if the challenger can credibly threaten to exit the formal economy, then the government faces *economic incentives* to offer low taxes even in weak periods. This strategic government reaction diminishes the challenger's incentives to fight when temporarily strong. Therefore, only economic activities that undermine the challenger's economic exit option create incentives to exercise its outside option—fighting—to prevent government exploitation.

The redistributive grievances mechanism also explains why regional autonomy agreements promising low permanent taxes—a seemingly viable real-world possibility for solving redistributive grievances—often break down.[5] If the challenger lacks a credible threat to exit the formal economy, then the government strategically reacts by undermining a regional autonomy deal—specifically, grabbing high short-term rents—despite eventually triggering civil war. In the model, a regional autonomy deal corresponds with a strategy profile in which the government offers the same tax rate in every period, backed by the challenger's threat to fight in the next period for which it has strong capacity for rebellion if the government deviates.[6] Therefore, even when the actors may in principle attempt to contract on low permanent taxes, the government may face strategic incentives to violate regional autonomy agreements and to *not* limit redistributive grievances—despite causing civil war.

Analyzing the redistributive grievances mechanism also provides insights into empirical patterns. A key empirical finding about natural resources and conflict shows that oil-rich regions fight separatist civil wars relatively frequently.[7] I argue that core properties of oil production help to explain this pattern because—given the logic of the model—they should generate redistributive grievances. Capital-intense, geographically concentrated, and immobile oil production facilitates easy government taxation by diminishing the extent to which withholding local labor reduces output and by lowering the viability of the informal economy. By contrast, governments face greater constraints to taxing most other economic activities because withholding local labor more greatly diminishes their output (for example, many types of manufacturing) or because societal actors can more easily pivot to an informal sector (for example, alluvial diamonds). These arguments contribute to existing resource curse research that discusses redistributive grievances (for example, Sorens 2011, 574–75; Ross 2012, 151–52) by isolating grievance-inducing properties of oil production and analyzing their effects in the context of a strategic government-rebel interaction.

Applying the model to understand the relationship between oil production and separatism also highlights shortcomings of alternative "greed"-based explanations. Scholars focus on how oil production provides opportunities for rebels to *loot* and otherwise finance an insurgency during an ongoing civil war, to gain an *arming advantage*, to *disrupt* production and earn revenues during peacetime, and to create a lucrative *prize* of predation (Collier and Hoeffler 2005a, 44; Collier, Hoeffler and Rohner 2009, 13; Lujala 2010). Strikingly, most of these arguments assume that rebels routinely access or can influence the distribution of oil revenues—contrasting with the core premise of grievances theories that governments easily control oil revenues. Combining the logic of greed and grievance mechanisms with empirical considerations about oil production shows that, contrary to existing arguments, greed mechanisms logically *diminish* separatist incentives, or raise equilibrium separatist civil war prospects only under unlikely empirical conditions.

The model also relates to different strands of the applied formal theoretic literature. It builds off existing bargaining models of civil war (Fearon 2004) and regime transitions (Acemoglu and Robinson 2006) that use a general commitment problem mechanism (Powell 2004; Krainin 2017). The model differs from these, as well as models that examine asset mobility and taxation (Boix 2003, 2008; Acemoglu and Robinson 2006, 300–7), by endogenizing

[4] The specific war option in the model is separatist, in which rebels seek to create an independent territory. Although some of the logic should generalize beyond this type of civil war, the model setup section defends the separatist focus.

[5] Although some scholars in the broader grievances literature examine regional autonomy deals (Cederman, et al. 2015), the resource curse literature does not closely analyze this possibility for averting conflict. More broadly, we can conceive of regional autonomy deals as one type of institution that determines whether or not natural resource wealth is a curse (Luong and Weinthal 2006, 2010; Kennedy and Tiede 2013; Paler 2013).

[6] Formally, the previous paragraph describes the unique Markov perfect equilibrium of the game, whereas this paragraph focuses on a non-Markovian subgame perfect Nash equilibrium.

[7] For the broader literature on separatist civil wars, see Toft (2005, 2014), Walter (2009b), Cunningham (2011, 2014), and Lacina (2015).

labor supply and economic production. This setup provides microfoundations for why fixed-location assets—as well as other less-studied attributes of economic production such as high capital intensity and dense geographic concentration—undermine a producer's economic exit option.[8] Although Acemoglu and Robinson's (2000, 1170) model of franchise expansion allows an out-of-power faction to allocate labor between a taxable and nontaxable sector, they introduce this assumption only to generate interior tax rates and do not analyze how aspects of the challenger's economic exit option affect prospects for bargaining breakdown. The model also provides findings distinct from other formal models that apply a conflict-bargaining framework to study oil politics, such as Dunning (2005, 2008), by integrating oil production into a general model of endogenous economic exit and civil war. Fearon (2004) mentions how lootable natural resources that facilitate contraband—as opposed to difficult-to-loot oil production—lengthen civil wars, but does not discuss oil production.

The conclusion discusses broader theoretical, empirical, and policy implications. The model raises important questions about various proposed civil war risk factors ranging from ethnopolitical access to the central government (Cederman, Gleditsch and Buhaug 2013) to rebels looting diamonds, while also generating empirical implications about different economic commodities. Furthermore, similar mechanisms based on inside versus outside options may also inform international conflict.

Baseline Model

This section presents and solves the baseline model and then analyzes the key mechanism linking an ineffective economic exit option to economic grievances and civil war.

Setup

A government (G) and regional challenger (C) interact in an infinite time horizon. A common factor $\delta \in (0, 1)$ discounts future payoffs, and $t \in \mathbb{Z}_+$ denotes time. The stage game played in each period contains up to four sets of actions.

Distribution of Power Stage

Nature chooses whether C exhibits strong (probability σ) or weak (probability $1 - \sigma$) capacity for rebellion in each period. C can initiate hostilities only in a strong period (see the fighting decision stage) and wins a separatist civil war with probability $p \in (0, 1)$.[9] If C previously won a separatist civil war, then the distribution of power stage is degenerate because, as described below, successful secession ends G and C's interaction. Overall, this stochastic game features three states of the world: weak C in the status quo regime, strong C in the status quo regime, and postsecession.

Empirically, political actors can only occasionally solve collective action problems and effectively challenge the government (Acemoglu and Robinson 2006, 123–28), which motivates modeling stochastic shifts in C's secession ability. Temporary government vulnerability often provides windows of opportunity. For example, Iran's oil-rich Arab and Kurd minorities perceived temporary regime weakness when the shah fell in 1979, facilitating separatist attempts (Ward 2009, 230–33). Demonstration effects from the Iranian Revolution perhaps also facilitated mobilization in nearby countries. "There is little doubt that the Iranian Revolution helped galvanize politics and energize dissent among Shiites in neighboring countries. The revolution helped explain both the timing and some of the forces that encouraged Saudis to take to the streets" (Jones 2010, 186). Saudi Arabia's Shiites reside primarily in the east, which contains the majority of Saudi Arabia's oil wealth. Similarly, Angola's long-running center-seeking civil war resumed after the opposition party National Union for the Total Independence of Angola (UNITA) rejected election results in 1992. The rebel group Front for the Liberation of the Enclave of Cabinda (FLEC-FAC) escalated its low-intensity separatist fight for oil-rich Cabinda shortly afterward, "at a time when the government was facing its toughest military challenge yet from UNITA" (Porto 2003, 5). This provided a window for FLEC-FAC to achieve military aims and to gain concessions.

Taxation Stage

G proposes a tax rate $\tau_t \in [0, 1]$ that would transfer τ_t percentage of C's period t formal-sector economic output to G if C accepts. For simplicity, G lacks a budget that would enable offering transfers to C, although Appendix Section A.3 discusses why introducing this possibility would not qualitatively change the results.

Fighting Decision Stage

Two constraints prevent G from taxing all of C's production. First, in a strong period, C can initiate a one-period separatist war to create an independent territory.[10] Empirically, successfully separating from the government may yield a newly independent country, as in South Sudan or East Timor, or de facto territorial control without international recognition, as in Somaliland. In weak periods, however, C cannot fight. A later section introduces the additional possibility that, in any period, C can engage in a "simple revolt" (for example, a strike or riot) short of insurgency.

Although the model informs general fighting incentives, three reasons motivate modeling the fighting choice specifically as a separatist war, as opposed to a center-seeking civil war to capture the capital. First, explaining the oil-separatist relationship provides the primary empirical application. Second, although economic grievance arguments also apply to some extent to center-seeking civil wars, rebels can solve the core grievance posited here—central governments exploiting local production—without mobilizing to capture the capital. Rebel groups enjoy information and recruitment advantages when fighting in their home territory and can use guerrilla tactics to strategically avoid government advances rather than to capture new military targets. Therefore, groups harboring local grievances can more feasibly fight to create an autonomous region or fully independent state (Jenne, Saideman and Lowe 2007). Third, assuming that the government cannot commit a priori to future concessions for the challenger corresponds with regions whose residents lack political power at the center (Cederman, Gleditsch and Buhaug 2013). Empirically, politically excluded ethnic groups are usually numerically

[8] The setup also departs from Boix (2003, 2008) by modeling dynamics, which is particularly important for examining incentives for governments to deviate from regional autonomy deals.

[9] For tractability purposes and to focus mainly on C's fighting and production choices, the model assumes p is exogenous. However, later sections discuss substantive factors related to regional oil production that may affect p and present an extension in which p can change depending on the war outcome. Paine (2018) shows that endogenizing the probability of winning does not alter the core logic for explaining the relationship between oil and separatist civil war onset.

[10] Assuming wars last any finite length $n \in \mathbb{Z}_{++}$ produces qualitatively identical results.

small in size, which limits their ability to fight for the center (Paine 2018). Therefore, the low-commitment scope conditions apply most closely to groups that usually prefer separatist over center-seeking fighting.

Labor Supply Stage

G faces a second constraint to taxing production because, in all periods, C can divert effort to produce in an informal market. This possibility incorporates the key theoretical idea that citizens can exit the formal economy by producing outside the state's reach or by physically migrating (de Soto 2000; Scott 2010), and therefore the government must provide incentives for residents to generate taxable output (Olson 2000). Bates (1981, 85–86) discusses farmers in postcolonial Africa often choosing to produce subsistence crops rather than taxable cash crops and to smuggle cash crops across international borders. Activities such as stealing oil output or striking to disrupt production also affect the value of the informal sector.

Formally, in each period, C chooses labor $L_t \geq 0$ to supply for formal-sector production, and output equals $\theta(L_t)$. Assuming $\theta(L_t) = L_t^{\eta}$ and $\eta \in (0, 1)$ implies that the production function exhibits strictly positive and strictly diminishing marginal returns to labor input, and η equals output elasticity.[11] Larger η implies that changes in labor input more strongly affect the amount produced. In other words, formal-sector output exhibits higher labor elasticity.[12] I normalize the price of selling the good in the formal sector to 1, and extensions below parameterize this price.

Devoting labor to the formal economy entails an opportunity cost equaling $\kappa(L_t) = \frac{\omega}{1+\omega} \cdot L_t^{\frac{1+\omega}{\omega}}$ for C from forgone production in the informal sector, for $\omega \in (0, 1)$. Higher ω corresponds to a higher-valued option to exit into the informal economic sector. Many scholars use this functional form, which engenders a strictly positive and strictly increasing labor opportunity cost, in models with an endogenous labor supply because labor supply elasticity equals ω in the linear production technology case (Acemoglu, Verdier and Robinson 2004; Besley and Persson 2011, 80).[13]

Two final assumptions require attention. First, assuming that a unitary actor makes regional production decisions simplifies the analysis without qualitatively altering the findings. Appendix Lemma A.1 demonstrates an identical unique optimal symmetric labor allocation if $N \in \mathbb{Z}_{++}$ citizens in the region independently choose labor amounts if the rebel leader chooses not to fight. Second, separately modeling η and ω facilitates analyzing comparative statics on different production attributes. Below, Figure 3 provides substantive examples with varying η and ω values to clarify these differences. Related, the comparative statics predictions for η do not change if $\omega = 1$, and vice versa for ω if $\eta = 1$. Therefore, modeling different parameters for output elasticity to labor input and for the value of the informal economy highlights different substantive factors that affect the value of producers' economic exit options, but the main grievance results do not require incorporating *both* parameters.

Payoffs

If C accepts G's period t tax proposal, then C consumes formal-sector output not taxed by G minus the informal sector-induced labor opportunity cost, $(1 - \tau_t) \cdot \theta(L_t) - \kappa(L_t)$. G consumes revenues extracted from C, yielding $\tau_t \cdot \theta(L_t)$. A strategically equivalent subgame begins in period $t + 1$, and $V^G_{\text{s.q.}}$ and $V^C_{\text{s.q.}}$ denote future continuation values for G and C, respectively, under the status quo regime.

If instead C initiates a separatist civil war in period t, then neither player consumes in that period. If the separatist attempt fails, then period $t+1$ begins a subgame strategically equivalent to the period t subgame. By contrast, successful separation drops the tax rate to 0 in every future period, and C's labor allocation choice is the only strategic action. In the subgame following successful secession, C's future continuation value equals V^C_{sec}, and G's equals 0 because it lacks a revenue source. Figures 1 and 2 present trees for the stage games and Appendix Table A.1 summarizes the parameters and choice variables.

Equilibrium Analysis

The analysis begins by characterizing the game's Markov Perfect Equilibria (MPE).[14] This isolates why the challenger may attempt to coercively end its interaction with a weakly institutionalized state that cannot credibly promise to limit taxation in weak periods. Markovian strategies disable the challenger from punishing the government for actions taken in previous periods, and the next section evaluates a non-Markovian strategy profile. Applying the single-deviation principle characterizes optimal actions in a peaceful MPE[15]—which is unique when one exists—and in conflictual equilibria and the parameter values under which a peaceful MPE exists. The analysis solves backward on the stage game, and Appendix A proves the formal statements.

Labor Supply Stage

C faces a labor trade-off. Supplying more labor increases formal-sector output, but also raises the opportunity cost from forgone production in the informal sector. Increasing L_t raises C's marginal consumption by the percentage of formal-sector production it retains, $1 - \tau_t$, multiplied by the effect of higher labor supply on increasing formal-sector output, $\frac{\partial \theta(L^*(\tau_t))}{\partial L_t}$. The marginal opportunity cost of supplying labor to the formal sector equals $\frac{\partial \kappa(L^*(\tau_t))}{\partial L_t}$. C chooses the unique labor supply that equates these terms, which

[11] This follows because $\theta(\cdot)$ is a Cobb-Douglas production function with a single input: $\frac{\partial \theta(L_t)}{\partial L_t} \cdot \frac{L_t}{\theta(L_t)} = \eta \cdot L_t^{\eta-1} \cdot \frac{L_t}{L_t^{\eta}} = \eta$.

[12] Implicitly, capital also appears in the economic production function, but I normalize it to 1 in peace periods and to 0 in war periods. An extension presented below models positive consumption during war periods to facilitate additional comparative statics predictions. Abstracting away from capital accumulation over time, which many economic growth models analyze, enables focusing attention on output elasticity (η) rather than on how countries attract and grow capital investment. Especially in the oil context, international actors contribute much of this investment, and the present theory does not address how countries attract international investment.

[13] A less abstract model of the economy would assume that C possesses one labor unit that it can sell either on the formal market at L_t^{η} or on the informal market at $\frac{\omega}{1+\omega} \cdot (1 - L_t^{\frac{1+\omega}{\omega}})$. Here, if C devotes all its labor to the informal sector, then the yield from the informal sector reaches its maximum value $\frac{\omega}{1+\omega}$. Conversely, C reaps 0 from the informal sector by setting $L_t = 1$. This alternative setup yields an identical optimal labor allocation as the present setup, which I prefer because it does not impose the unnecessary upper bound of 1 on C's labor choice.

[14] Markov Perfect Equilibrium requires players to choose best responses to each other, with strategies predicated upon the state of the world and on actions within the current period. Appendix A formally defines the equilibrium concept.

[15] In a peaceful MPE, peaceful bargaining occurs in every period along the equilibrium path. This represents the natural baseline in the formal war literature, which focuses on why costly fighting would ever occur in equilibrium given Pareto-improving alternatives.

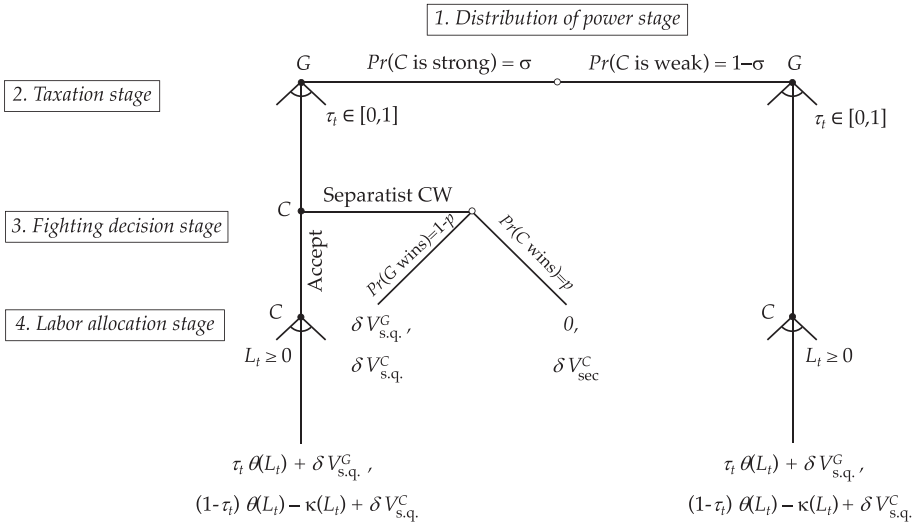

Figure 1. Tree of stage game in status quo regime

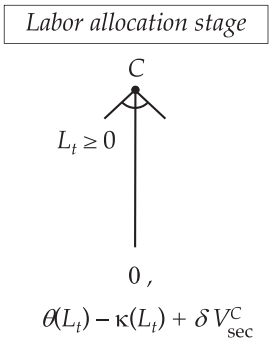

Figure 2. Tree of postsecession stage game

implicitly characterizes $L^*(\tau_t)$:

$$\underbrace{(1-\tau_t)\cdot\frac{\partial\theta(L^*)}{\partial L_t}}_{\text{MB: } C \text{ consumes more from formal sector}} = \underbrace{\frac{\partial\kappa(L^*)}{\partial L_t}}_{\text{MC: Opp. cost from informal sector}}. \quad (1)$$

Substituting in functional forms yields an explicit term:

$$L^*(\tau_t) = [(1-\tau_t)\cdot\eta]^{\frac{\omega}{1+\omega\cdot(1-\eta)}}. \quad (2)$$

Following secession, C's labor choice is the only strategic decision. Lemma 1 states optimal actions, per-period consumption amounts, and continuation values in this subgame.

Lemma 1 (actions/consumption in a period following successful secession): *If C successfully secedes before period t, then C chooses $L_t = L_0^* \equiv \eta^{\frac{\omega}{1+\omega\cdot(1-\eta)}}$, which yields period t consumption $\theta(L_0^*) - \kappa(L_0^*)$ and $V_{sec}^C = \frac{1}{1-\delta}\cdot\left[\theta(L_0^*) - \kappa(L_0^*)\right]$.*

Fighting Decision Stage

If C did not previously secede and G makes an unattractive proposal, then in a strong period C can deviate from a peaceful strategy profile by fighting. C benefits from successful secession because G cannot tax its production. More formally, C will accept a proposal τ_t in a strong period if current- and expected future-period consumption weakly exceeds lifetime expected utility from initiating a civil war:

$$\underbrace{(1-\tau_t)\cdot\theta\left(L^*(\tau_t)\right) - \kappa\left(L^*(\tau_t)\right) + \delta\cdot V_{s.q.}^C}_{E[U_C(\text{accept }\tau_t)]} \geq \underbrace{\delta\cdot\left[p\cdot V_{sec}^C + (1-p)\cdot V_{s.q.}^C\right]}_{E[U_C(\text{fight})]} \quad (3)$$

Taxation Stage: Weak Periods

Although C cannot fight in a weak period, G still faces a trade-off when setting the tax rate. G will consume the share of C's formal-sector output it proposes, $\tau_t\cdot\theta(L^*(\tau_t))$. On the one hand, raising taxes enables G to consume a larger *percentage* of C's formal-sector production. On the other hand, a higher tax rate decreases the *amount* of equilibrium formal-sector production. Higher taxes cause C to substitute away from taxable labor by diminishing C's marginal consumption from working in the formal sector, as Equations (1) and (2) demonstrate. This effect lowers $\theta(L^*(\tau_t))$. G sets τ_t to balance this trade-off, and the following term implicitly defines the unique revenue-maximizing tax rate $\overline{\tau}$:

$$\underbrace{\theta\left(L^*(\overline{\tau})\right)}_{\text{MB: } G \text{ receives higher \% of } C\text{'s formal-sector output}} = \underbrace{\overline{\tau}\cdot\frac{\partial\theta\left(L^*(\overline{\tau})\right)}{\partial L_t}\cdot\left[-\frac{dL^*(\overline{\tau})}{d\tau_t}\right]}_{\text{MC: } C\text{'s formal-sector output decreases}}. \quad (4)$$

This yields the explicit solution:

$$\overline{\tau} = \frac{1+\omega\cdot(1-\eta)}{1+\omega}. \quad (5)$$

Lemma 2 summarizes this discussion.

Lemma 2 (actions/consumption in a weak period): *If C is weak in period t, then G offers $\tau_t = \tau_w^* = \overline{\tau}$, for $\overline{\tau}$ defined in Equations (4) and (5). C chooses $L_t = L^*(\tau_t)$, for $L^*(\tau_t)$ defined in Equations (1) and (2). In equilibrium, $L_t = \overline{L} \equiv \left[(1-\overline{\tau})\cdot\eta\right]^{\frac{\omega}{1+\omega\cdot(1-\eta)}}$. Denoting C's*

equilibrium current-period consumption amount as U_C(weak) and G's as U_G(weak), these terms equal:

- $U_C(\text{weak}) = (1-\overline{\tau})\cdot\theta\left(\overline{L}\right) - \kappa\left(\overline{L}\right)$
- $U_G(\text{weak}) = \overline{\tau}\cdot\theta\left(\overline{L}\right)$

TAXATION STAGE: STRONG PERIODS

In a period with strong rebellion capacity, *C* wins a civil war with positive probability. Consequently, *C* may attempt to secede rather than accept *G*'s most-preferred tax rate detailed in Lemma 2. In equilibrium, if *G* cannot buy off *C* in a strong period by offering $\tau_t = \overline{\tau}$, then if possible it will choose the unique tax rate $\tau_s^* \in [0, \overline{\tau})$ that makes *C* indifferent between accepting or fighting, that is, satisfies Equation (3) with equality. *G* clearly will never set a tax rate lower than needed to induce acceptance. Furthermore, *G* always prefers to buy off *C* if possible in a strong period. *G* does not consume in a fighting period, and there is a p percent chance that *G* can never again tax *C* after the war.

But for other parameter values, *C* optimally responds to *any* proposal by *G* in a strong period by initiating a civil war. To understand why the actors may fail to bargain peacefully, if the per-period likelihood of strong rebellion capacity, σ, is small, then *C* only rarely experiences periods featuring a tax rate lower than $\overline{\tau}$. If, additionally, *C* wins a civil war with relatively high probability (high p) and exhibits patience (high δ), then *C* will fight when temporarily strong—forgoing short-term consumption to achieve higher expected long-term consumption. By contrast, high enough σ yields peaceful bargaining because *G* can credibly offer tax concessions frequently enough in future periods that *C*'s fighting opportunity cost in a strong period outweighs expected fighting benefits.

Formally, Equation (6) substitutes $\tau_t = 0$, as well as equilibrium consumption amounts and continuation values from Lemmas 1 and 2, into Equation (3) solved with equality to define a threshold $\overline{\sigma} < 1$ that determines equilibrium behavior in a strong period. For any $\sigma > \overline{\sigma}$, there exists a continuum of tax proposals that *C* will accept. If $\sigma < \overline{\sigma}$, then *C* will reject any tax offer, even $\tau_t = 0$. To see that large enough σ suffices for peace, the second term in Equation (6) cancels out if $\sigma = 1$, leaving a strictly positive expression. Lemma 3 summarizes these considerations.

$$\Phi(\overline{\sigma}) \equiv \underbrace{(1-\delta)\cdot\left[\theta(L_0^*) - \kappa(L_0^*)\right]}_{\text{Accept } \tau_t=0}$$

$$\underbrace{-\delta\cdot p\cdot(1-\overline{\sigma})\cdot\left\{\left[\theta(L_0^*) - \kappa(L_0^*)\right] - \left[(1-\overline{\tau})\cdot\theta(\overline{L}) - \kappa(\overline{L})\right]\right\}}_{C\text{'s long-term opportunity cost from forgoing fighting}} = 0 \quad (6)$$

Lemma 3 (actions/consumption in a strong period) *Define τ_s^* as the equilibrium strong-period tax rate proposal. If C is strong in period t:*

- *If $\sigma > \overline{\sigma}$, then G offers $\tau_t = \tau_s^* = \overline{\tau}$ if this satisfies Equation (3), and otherwise offers the unique $\tau_t = \tau_s^* \in (0, \overline{\tau})$ that satisfies Equation (3) with equality. C accepts with probability 1 any offer that satisfies Equation (3) and chooses $L_t = L^*(\tau_t)$, for $L^*(\tau_t)$ defined in Equations (1) and (2). C fights with probability 1 in response to any offer that does not satisfy Equation (3). In equilibrium, $L_s^* \equiv \left[(1-\tau_s^*)\cdot\eta\right]^{\frac{\omega}{1+\omega\cdot(1-\eta)}}$. Denoting C's equilibrium current-period consumption amount as U_C(strong) and G's as U_G(strong), these terms and the status quo future continuation values equal:*
  - $U_C(strong) = (1-\tau_s^*)\cdot\theta(L_s^*) - \kappa(L_s^*)$
  - $V_{s.q.}^C = \frac{1}{1-\delta}\cdot\left[\sigma\cdot U_C(strong) + (1-\sigma)\cdot U_C(weak)\right]$. *Lemma 2 defines U_C(weak).*
  - $U_G(strong) = \tau_s^*\cdot\theta(L_s^*)$
  - $V_{s.q.}^G = \frac{1}{1-\delta}\cdot\left[\sigma\cdot U_G(strong) + (1-\sigma)\cdot U_G(weak)\right]$. *Lemma 2 defines U_G(weak).*
- *If $\sigma < \overline{\sigma}$, then $\tau_t \in [0, 1]$. C fights with probability 1 in response to any tax offer. Denoting C's continuation value following a strong period in the status quo regime as V_{strong}^C and G's as V_{strong}^G, the following equilibrium current-period consumption and future continuation terms differ if $\sigma < \overline{\sigma}$ as opposed to $\sigma > \overline{\sigma}$:*
  - $V_{strong}^C = \delta\cdot\left[p\cdot V_{sec}^C + (1-p)\cdot V_{s.q.}^C\right]$. *Lemma 1 defines V_{sec}^C.*
  - $V_{strong}^G = \delta\cdot(1-p)\cdot V_{s.q.}^G$

Proposition 1 states the equilibria. If $\sigma > \overline{\sigma}$, then the unique MPE features peaceful bargaining in every period. If $\sigma < \overline{\sigma}$, then a continuum of payoff-equivalent MPE strategy profiles exist that, along the equilibrium path, feature a separatist civil war in every strong period.

Proposition 1 (equilibria): *The three lemmas summarize MPE actions and consumption amounts in the game's three states:*

- *C seceded before period t: see Lemma 1.*
- *Weak C in period t: see Lemma 2.*
- *Strong C in period t: see Lemma 3.*

Economic Exit, Redistributive Grievances, and Civil War

The model yields a general redistributive grievances mechanism: *G*'s inability to commit to low taxes only causes war for economic activities that undermine the credibility of *C*'s threat to exit the formal economy, captured by low ω and η. An ineffective economic exit option raises *G*'s revenue-maximizing tax rate—the equilibrium tax rate in weak periods—which naturally corresponds with economic grievances, or redistributive grievances. Higher taxes cause *C* to substitute away from supplying formal-sector labor (see Equations [1] and [2]), which decreases taxable production. However, the *extent* to which higher taxes increase *G*'s marginal cost of taxation (expressed in Equation [4]) depends on the economic exit parameters: formal-sector output elasticity (η) and labor supply elasticity (ω). Low formal-sector output elasticity implies that decreasing *C*'s labor supply only minimally diminishes formal-sector output. Low labor supply elasticity implies that higher taxes only minimally diminish equilibrium labor supply because *C* experiences low returns to producing in the informal sector.[16] Lemma 4 formally links *C*'s economic exit option parameters to *G*'s optimal tax rate, and Appendix Section A.2 illustrates the elasticity logic by more generally parameterizing *G*'s tax problem.

Lemma 4 (redistributive grievances mechanism): *A decrease in formal-sector output elasticity (η) and a decrease in the labor supply opportunity cost (ω) each increase the revenue-maximizing tax rate $\overline{\tau}$ that G levies in weak periods. Formally:*

Part A. $-\frac{d\overline{\tau}}{d\eta} > 0$.

Part B. $-\frac{d\overline{\tau}}{d\omega} > 0$.

[16] A low η value also exerts a reinforcing indirect effect that decreases the elasticity of *C*'s optimal labor supply function.

Table 1. When does the government exploit the challenger?

		C's contemporaneous fighting ability	
		Weak	*Strong*
C's economy	*More effective economic exit threat*	*C* not exploited	*C* not exploited
	Less effective economic exit threat	*C* exploited	*C* not exploited

A decrease in the value of *C*'s economic exit option (proxied by low η or ω) increases the range of parameters for which civil wars occur in equilibrium because of the redistributive grievance mechanism. *C* possesses two tools to prevent high taxes: threatening to fight and threatening to exit the formal sector. Strong contemporaneous coercive power suffices to prevent exploitation because *G* prefers buying off *C* in a strong period to triggering fighting. Furthermore, an effective economic exit threat, captured by high η or ω, prevents high taxes even in weak periods because *G* does not want to undermine its tax base. In other words, *G*'s inability to *commit* to low taxes does not trigger war when coupled with economic incentives for low taxes. By contrast, groups with a low-valued economic exit option face a high equilibrium tax rate in weak periods. This redistributive grievance effect creates a large gap between how much *C* consumes in weak periods in the status quo regime and how much it would consume by successfully seceding. An economically aggrieved challenger therefore faces higher incentives to initiate a separatist civil war in a period with strong capacity for rebellion because gaining its own state would eliminate future government exploitation—hence alleviating redistributive grievances. Table 1 summarizes this logic and Proposition 2 formally states the result.

> **Proposition 2** (redistributive grievances generate secession incentives): *An increase in redistributive grievances raises the equilibrium likelihood of separatist civil war, that is, increases the range of σ values small enough that C will reject any offer in a strong period. Formally, for $\overline{\sigma}$ defined in Equation (6), $-\frac{\partial\overline{\sigma}}{\partial\overline{\tau}}\cdot\frac{d\overline{\tau}}{d\eta}>0$ and $-\frac{\partial\overline{\sigma}}{\partial\overline{\tau}}\cdot\frac{d\overline{\tau}}{d\omega}>0$.*

Reneging on Regional Autonomy Deals

A relevant real-world possibility is that a government can limit redistributive grievances by granting regional autonomy with low permanent taxes. Does this resolve the theoretical linkage between redistributive grievances and civil war? This section analyzes a non-Markovian strategy profile in which *G* offers the same tax rate to *C* in every period, backed by *C*'s threat to fight in the first strong period following any deviation by *G* to a higher tax rate. The government can always offer a permanent tax rate low enough to prevent *C* from seceding in a strong period. However, taxing at a rate lower than the revenue-maximizing amount creates an opportunity cost because *G* would benefit in the short-term by raising taxes. *G* will deviate from the regional autonomy deal—despite eventually facing a separatist attempt—if *C* engages in economic activities that diminish its threat to exit the formal economy because this raises the revenue-maximizing tax rate (as Lemma 4 shows). Therefore, even when a government can, in principle, enact low permanent taxes, a similar mechanism as demonstrated in Proposition 2 undermines regional autonomy deals. Appendix B provides additional formal details, and Appendix Section B.3 addresses a puzzle generated by comparing the distinct equilibria in this and the previous section by explaining the countervailing effects that a higher discount factor exerts on equilibrium war prospects.

Formally, suppose *G* offers $\tau_t=\hat{\tau}$ to *C* in every period *t*. Although *C*'s postsecession continuation value, $\hat{V}^C_{sec}=\frac{1}{1-\delta}\cdot\left[\theta\left(L^*_0\right)-\kappa\left(L^*_0\right)\right]$, does not change from above, its continuation value in the status quo regime now equals $\hat{V}^C_{s.q.}=\frac{1}{1-\delta}\cdot\left[(1-\hat{\tau})\cdot\theta\left(L^*(\hat{\tau})\right)-\kappa\left(L^*(\hat{\tau})\right)\right]$ because *C* receives the same offer in every period, strong or weak. *C* will accept $\hat{\tau}$ rather than initiate a separatist civil war in a period with strong rebellion capacity if and only if:

$$(1-\hat{\tau})\cdot\theta\left(L^*(\hat{\tau})\right)-\kappa\left(L^*(\hat{\tau})\right)+\delta\cdot\hat{V}^C_{s.q.}\geq\delta\cdot\left[p\cdot\hat{V}^C_{sec}+(1-p)\cdot\hat{V}^C_{s.q.}\right]. \quad (7)$$

I assume a punishment strategy in which if *G* ever reneges by proposing some $\tau_t>\hat{\tau}$, then *C* initiates a separatist civil war in the next strong period. Relaxing the Markov assumption bites because *C* conditions its actions on *G*'s choices in previous periods. Appendix B discusses in more detail that, after a failed war, *G* and *C* return to the original actions with *G* offering $\hat{\tau}$ in every period and *C* accepting any tax rate no greater than that. The analysis focuses on the best possible peaceful payoff for *G*: the highest $\hat{\tau}$ that enables buying off *C* in a strong period. Define $\underline{\hat{\tau}}$ such that $\hat{\tau}=\underline{\hat{\tau}}$ solves Equation (7) with equality (see Appendix Equation B.1). Importantly, a unique $\underline{\hat{\tau}}>0$ always exists. Therefore, in this strategy profile—but not for Markovian strategies—*G* can always set $\hat{\tau}$ low enough to satisfy *C*'s no-fighting constraint. *C* cannot profitably deviate to fight if the status quo regime features low-enough taxes in every period, for example, if *G* proposes a tax rate close to 0 in every period.

Crucially, however, the *government* may be able to profitably deviate in a weak period by making an exploitative tax proposal—despite triggering costly fighting in the next strong period. *G*'s optimal deviation entails taxing at the revenue-maximizing rate $\overline{\tau}$ in all periods until the civil war occurs. High-enough expected time until the secession attempt, captured by low σ, enables *G* to profitably deviate from a strategy profile that would induce peace along the equilibrium path. Formally, *G* will propose the compromise tax rate $\underline{\hat{\tau}}$ in every period if and only if:

$$\underbrace{\delta\cdot\sigma\cdot\left[1-\delta\cdot(1-p)\right]\cdot\underline{\hat{\tau}}\cdot\theta\left(L^*(\underline{\hat{\tau}})\right)}_{G\text{'s expected losses from deviating starting in first strong period}}\geq\underbrace{(1-\delta)\cdot\left[\overline{\tau}\cdot\theta\left(\overline{L}\right)-\underline{\hat{\tau}}\cdot\theta\left(L^*(\underline{\hat{\tau}})\right)\right]}_{G\text{'s gains from deviating in every prewar period}} \quad (8)$$

The left-hand side of Equation (8) states *G*'s net expected loss in all periods including and after the first strong period that follows *G* deviating to the revenue-maximizing tax rate. *G* does not consume in a war period. Furthermore, if *G* wins the war, it simply recovers its future consumption stream under the original regional autonomy deal (that is, had it not deviated). This occurs with probability $1-p$. However, with probability p, *G* loses the war and can never again tax *C*'s production, which creates a long-term expected cost.

The right-hand side of Equation (8) states *G*'s net expected utility gain in every period before the first strong period if it chooses the optimal deviation. *G* strictly benefits in the short-term from taxing at the revenue-maximizing rate $\overline{\tau}$ rather than at the compromise rate $\underline{\hat{\tau}}$, which is strictly less than $\overline{\tau}$ in the substantively interesting parameter range

in which C can credibly threaten to fight if G proposes the revenue-maximizing tax rate.

The logic for why ineffective economic exit undermines regional autonomy deals and causes civil war resembles the redistributive grievances mechanism in the baseline analysis. Because lower ω and η raise the revenue-maximizing tax rate $\overline{\tau}$, if C cannot effectively threaten to exit the formal economy in response to high taxes, then G faces high short-term gains to deviating from the regional autonomy deal. Proposition 3 formalizes this logic.

> **Proposition 3** (redistributive grievances in constant-tax equilibrium): *An increase in redistributive grievances raises the equilibrium likelihood of separatist civil war, that is, increases the range of σ values small enough that G will deviate to high taxation. Formally, for $\hat{\sigma}$ defined in Appendix Equation B.6, $-\frac{\partial \hat{\sigma}}{\partial \overline{\tau}} \cdot \frac{d\overline{\tau}}{d\eta} > 0$ and $-\frac{\partial \hat{\sigma}}{\partial \overline{\tau}} \cdot \frac{d\overline{\tau}}{d\omega} > 0$.*

Application to the Conflict Resource Curse

Applying the model logic generates new insights into the conflict resource curse, specifically, by helping to explain the strong positive statistical relationship between regional oil production and separatist civil war established in the literature. It first summarizes evidence for this pattern and explains its importance to the broader conflict resource curse literature. Insights from the model explain why capital-intense, geographically concentrated, and immobile oil production facilitates easy government taxation by undermining a region's economic exit option, therefore making civil war more likely. Easy-revenue properties of oil production also increase a government's incentives to renege on regional autonomy deals, which Sudan's second civil war exemplifies.

Statistical Relationship Between Regional Oil Production and Separatist Civil War

Many articles document statistical evidence that separatist civil wars occur more frequently in oil-rich than in oil-poor regions, using various samples, civil war measures, oil measures, and research designs (Sorens, 2011; Morelli and Rohner 2015; Hunziker and Cederman 2017; Paine 2018). Exemplifying patterns found in existing research, within a broad sample of ethnic minority groups in non-Organisation for Economic Co-operation and Development (OECD) countries between 1945 and 2013, groups with at least one giant oil field in their territory initiated a separatist civil war 2.8 times more frequently than oil-poor groups, 1.02 percent of years compared to 0.37 percent.[17] Table 2 (see below) shows that oil-separatist civil wars range across geographical regions from Africa (Angola, Nigeria, Sudan) to the Middle East (Iran, Iraq) to South Asia (India, Pakistan) to Southeast Asia (Indonesia) to Eastern Europe (Russia).

Explaining the empirical oil-separatism pattern is particularly important because widespread proclamations that natural resources "curse" prospects for civil peace hinge in large part on this specific relationship. Other natural resources do not robustly associate with civil war onset. Correlations for alluvial diamonds, for example, are statistically fragile (Ross 2015, 250). Therefore, scholars should examine oil not only because it composes overwhelmingly the most valuable natural resource among internationally traded commodities—ten to one hundred times the next-most traded commodity (Colgan 2013, 12)—but also because oil appears distinctive in its systematic conflict-inducing properties. Furthermore, oil production and *aggregate* civil war onset do not systematically correlate at the country level (Cotet and Tsui 2013; Bazzi and Blattman 2014; Ross 2015, 251). Oil does not "curse" prospects for the other major type of civil war, center-seeking civil wars in which rebels fight to capture the capital, a discrepancy that Paine (2016, 2018) examines.

Why Oil Production Facilitates Government Revenues

Producing oil—as opposed to other natural resources or economic activities—undermines regional actors' threat to exit the formal economy, which the formal model links to high government taxation. Figure 3 plots different economic activities by how they affect producers' economic exit threat in two dimensions: formal-sector output elasticity to local labor input (η) and informal economic production value (ω). Values closer to the origin indicate a higher revenue-maximizing tax rate for the government, $\overline{\tau}$.

High capital intensity and the ease with which producers can import foreign labor makes oil output largely inelastic to local labor input. This corresponds to a low value on the vertical axis of Figure 3, or low η. Producing oil requires large capital investments, which foreign actors often fund. Ross (2012, 46) shows the capital-to-labor ratio in the oil and gas industry exceeds that in any other major industry for US businesses operating overseas. Menaldo (2016, 131–75) describes the intimate relationship between oil production in developing countries and foreign capital, technology, and technical production expertise.[18] Companies can also easily import labor needed for production because lower-level oil company employees require scant knowledge of local circumstances. For example, Arabian oil companies rely overwhelmingly on migrant workers (Johnston 2017). Angola's oil industry also exemplifies these characteristics. "International oil companies, and oil service companies, kept their staff and installations in Angola to a minimum, preferring wherever possible to run their Angolan operations from overseas" (Le Billon 2007, 108). Although oil production accounts for the majority of economic output and government revenues in Angola, the industry "employs less than 0.2 percent of the active population and is barely physically present in the country" (109). Ross (2012, 44–49) provides additional examples.

Oil production also undermines opportunities for societal actors to hide production from the government and to reap gains from informal activities outside the government's reach because oil is capital-intensive, concentrated in production, and immobile. This corresponds to a low value on the horizontal axis of Figure 3, or low ω. Oil is a point-source resource because it is "exploited in small areas by a small number of capital-intensive operators" (Le Billon 2005, 34). Because governments can relatively easily enforce military control over oil fields—relative to output produced in a non-concentrated area—extracting this point-source resource requires minimal bureaucratic capacity (Dunning 2008, 40).[19] Furthermore, even a rebel group that gains military control over oil fields faces great difficulties to

[17] Figures calculated by author by merging ethnic group and civil war data from the Ethnic Power Relations dataset (Vogt et al. 2015) with giant oil field location (Horn 2015).

[18] Menaldo (2016) also discusses how information asymmetries between international oil companies and governments in developing countries limit the host government's take from oil profits. However, this concerns the distribution of rents between domestic governments and international actors and does not contradict the present assertion that governments easily redistribute oil rents away from producing regions.

[19] However, this trend may change in the future as unconventional oil sources, including oil shales and oil sands, gain prevalence in global production.

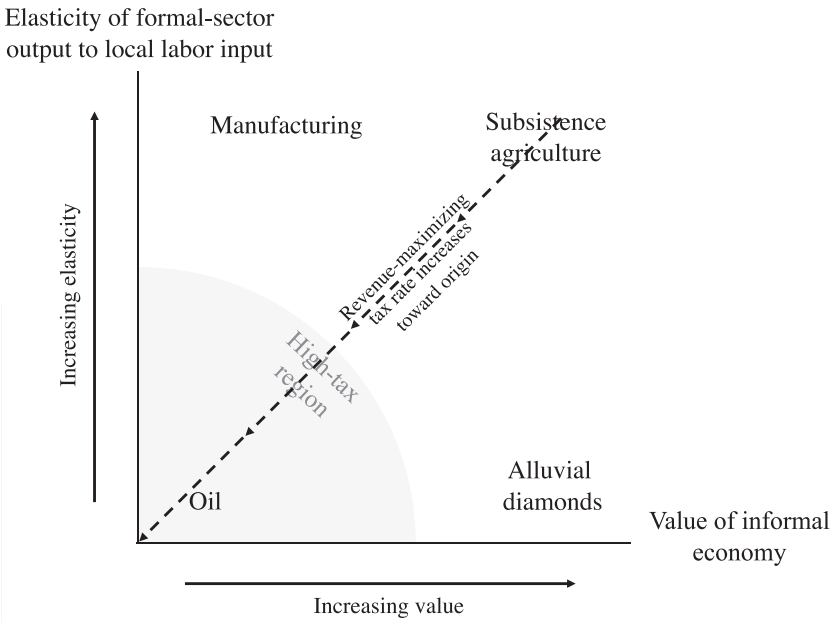

Figure 3. Taxability of different economic activities
Notes: The two dimensions in Figure 3 correspond to the following: formal-sector output elasticity to local labor input (η) and the value of the informal economy (ω). Factors such as highly capital intensive formal-sector production and the ability to replace local with foreign workers decrease values on the vertical axis. Higher capital-intensity of formal-sector production, concentrated production areas, and immobility each decrease values on the horizontal axis.

extracting oil and constructing a national distribution system to reap profits (Fearon 2005, 500)—which relates to high capital costs, required technical know-how, and foreign assistance needs. Finally, immobile oil fields imply that local producers cannot threaten to move their oil reserves outside the government's reach if taxed at unfavorable rates (Boix 2003, 42–43).

These attributes distinguish oil from many other economic activities, which Figure 3 depicts.[20] Although alluvial diamond mining resembles oil because neither require local labor for extraction and both have a fixed location, alluvial diamonds necessitate higher bureaucratic capacity to monitor and entail lower capital costs. This corresponds with a higher value on the horizontal axis of Figure 3. Alluvial diamonds are a diffuse resource because they are "exploited over wide areas through a large number of small-scale operators" (Le Billon 2005, 32). Therefore, societal actors can more easily steal these "blood diamonds" and prevent the government from accruing revenues. Operating a modern manufacturing plant resembles oil production because, after sinking factory-building costs, the plant is concentrated in location and immobile. However, most industry does not resemble oil production's high capital-intensity. Therefore, most manufacturing requires more labor—often, local and somewhat skilled labor—yielding a higher value on the vertical axis. And some manufacturing activities locate further to the right in Figure 3. Large multinational corporations enjoy sufficient liquidity even after sinking costs in a fixed asset to leave the country and to produce elsewhere in reaction to high taxes, whereas companies cannot move oil fields. Subsistence agriculture differs from oil production on both dimensions because it relies heavily on local labor and is diffuse, which corresponds with higher values on both the horizontal and vertical axes of Figure 3. Harvesting illicit drugs exhibits similar traits because producers can relatively easily conceal them from governments, especially by selling on international markets. This discussion substantively supports Assumption 1.

> **Assumption 1:** *Oil-rich territories exhibit lower formal-sector output elasticity η (lower value on vertical axis of Figure 3) and lower opportunity costs to supplying formal-sector labor ω (lower value on horizontal axis of Figure 3) than oil-poor territories.*

Applying the Theory: Oil, Redistributive Grievances, and Civil War

Combining these empirical considerations with implications from Lemma 4 and Propositions 2 and 3 explains the redistributive grievances linkage between regional oil production and separatist civil war onset. By undermining a region's economic exit option and facilitating high government taxes, regional oil production creates incentives to secede to prevent future government exploitation. Evidence from various oil-rich regions with separatist civil wars supports this argument. In Iraq, Kurds historically claim that the oil-rich Kirkuk area "is Kurdish and therefore must be part of any Kurdish autonomous area. They further claim they should receive a percentage of oil revenues from the area" (Zanger 2002, 41), contrary to Saddam Hussein's strategy to siphon oil revenues from the north. In Angola, Cabinda (which produces most of the country's oil) is "one of the poorest provinces in Angola. An agreement in 1996 between the national and provincial governments stipulated that 10 percent of Cabinda's taxes on oil revenues should be given back to the province, but Cabindans often feel that these revenues are not benefiting the population as a whole" (Porto 2003, 3).

[20] Other economic activities besides oil also belong in the bottom-left quadrant of Figure 3. Kimberlite diamonds and deep-shaft minerals such as copper possess similar attributes (Le Billon 2005, 30). Unlike for oil, however, scholars demonstrate mixed existing empirical evidence linking non-oil natural resources and separatist civil war (Ross 2015, 250).

Table 2. Oil-separatist cases: evidence for redistributive grievances, 1946–2006

Country	*Region*	*First conflict year*	*Evidence for redistributive grievances from R&B (2012)?*
Angola	Cabinda	1975	YES
Bangladesh	Chittagong Hills	1974	YES
India	Assam	1990	YES
Indonesia	Aceh	1975	YES
Iran	Kurdistan	1966	NO
Iran	Arabistan	1979	YES
Iraq	Kurdistan	1961	YES
Nigeria	Biafra	1967	YES
Nigeria	Niger Delta	2004	YES
Pakistan	Baluchistan	1974	YES
Russia	Chechnya	1999	YES
Sudan	South	1983	n.a.
Yemen	South	1994	NO

Note: Table 2 includes every case in Ross's (2012) list of separatist conflicts in oil-producing regions that Rustad and Binningsbø (2012) also code as a natural resource war (plus South Sudan, where production did not begin until after the war started), using Ross's (2012) conflict onset year. Following Rustad and Binningsbø's (2012) temporal sample, the data run from 1946 to 2006. Table 3 also contains every ethnic group with at least one giant oil field within their territorial location that fought a separatist civil war, using spatial ethnic group data and conflict data from the Ethnic Power Relations dataset (Vogt et al. 2015) and giant oil field data from Horn (2015). Table 3 excludes the following cases listed by Ross (2012, 165) because the region/ethnic group does not contain a giant oil field, nor do Rustad and Binningsbø (2012) code a natural resource war: Xinjiang (China), Bangladesh (independence war from Pakistan), or Kurdistan (Turkey).

Documenting this pattern more systematically, Table 2 lists every oil-rich region that initiated a separatist civil war, and the table notes describe the sample. For most conflicts, Rustad and Binningsbø (2012) code an indicator variable for whether the distribution of natural resource revenues influenced the conflict. Their codebook states that they consider two types of distributional issues: "distribution of the natural resource itself such as land, water, or agricultural products, and conflicts over the distribution of natural resource revenues." Ten of the twelve oil-separatist cases in their dataset exhibit evidence for redistributive grievances.

Regarding regional autonomy deals, Sudan exemplifies a government actively undermining existing agreements to control oil revenues. The northern-dominated Sudanese government granted an autonomous region in the south after a civil war that ended in 1972. Less than a decade later, oil discoveries in the south coincided with aggressive moves by the Khartoum government that effectively abrogated the 1972 settlement. In 1980, Sudan's president "announced plans to redraw the borders between southern and northern provinces. When this proposal was blocked by the regional government in the south, he conveniently created a new province and removed the oil-fields altogether from southern jurisdiction" (Ali and Matthews 1999, 209). Khartoum followed this action by splitting the south into three regions, organizing and arming tribal militias in the south, and declaring Sharia law for the entire country in 1983. In reaction to the negated autonomy deal, the rebel group Sudan People's Liberation Army (SPLA) initiated a second major separatist civil war in 1983.

Alternative Explanation: Greedy Oil Rebellions

The model analysis provides further insight into the resource curse by evaluating and highlighting shortcomings of alternative greed-based explanations for the oil-separatism relationship. Strikingly, most arguments assume that *rebels* routinely access or can influence the distribution of oil revenues—contrasting with the core grievance premise (Assumption 1) that *governments* easily control oil revenues. Combining the logic of greed mechanisms with empirical considerations about oil production shows that, contrary to existing arguments, greed mechanisms logically *diminish* separatist incentives or raise equilibrium-separatist civil war prospects only under unlikely empirical conditions.

Wartime Rebel Looting?

Some scholars argue that rebel groups operating in oil-rich territories frequently can *loot* oil production to increase consumption during civil war (Collier and Hoeffler 2005a, 44; Ross 2012, 145–87). However, the attributes of oil production summarized in Assumption 1 imply that rebel groups should face difficulties to looting oil production during ongoing civil wars. Combining empirical observations with logic from the model highlights that this greed argument is unlikely to explain the oil-separatist relationship.

Empirically, considerable scholarship examines rebel looting during civil war and reveals very few separatist cases with oil-generated rebel finance. Ross (2012, 170–3) documents oil theft by rebels in Nigeria's Niger Delta region in the 2000s during a low-intensity civil war, although even in this "exceptional case ...the government's oil revenue is larger than the rebels"' (Colgan 2015, 6). Collier and Hoeffler (2005a, 44) state that one of the "two major reasons why natural resources might be a powerful risk factor" is "the opportunity that they provide to rebel groups to finance their activities during conflict." However, their qualitative discussions of oil-secession cases in Nigeria's Biafra conflict, Indonesia, and Sudan do not mention rebel looting (Collier and Hoeffler 2005a, 47–49).

To more systematically demonstrate evidence against rebel financing, Table 3 presents the same cases as in Table 2. Rustad and Binningsbø (2012) provide an indicator variable for evidence of resources funding the insurgency. They identify thirty-one natural resource civil wars that involved rebel looting, but *none* of these wars occurred in oil-rich territories. The financing conflicts instead involved natural resources such as cashew nuts, charcoal extraction, cocoa, copper, diamonds, drugs, gems, and timber. This list additionally motivates distinguishing natural resources by production attributes because all except copper (present in one case) are diffuse resources that impede government control, indicating a high value on the horizontal axis of Figure 3.

Several cases suggest that coding *no* looting cases overstates how rarely this phenomenon occurs in separatist civil wars over oil-rich regions, although the cases do not alter the main point that massive looting very rarely occurs. In addition to the Niger Delta case mentioned above, southern Sudanese rebels provide another possible example because they blew up pipelines and disrupted oil production during Sudan's second civil war, although this evidence more closely resembles the disruption mechanism (see below) than the looting mechanism. Finally, rebels earned huge profits from oil sales during the post-2011 Islamic State (ISIS) conflict in Iraq and Syria (Dilanian 2014), which began after the final year in Rustad and Binningsbø's (2012)

Table 3. Oil-separatist cases: evidence for looting, 1946–2006

Country	*Region*	*First conflict year*	*Evidence for looting from R&B (2012)?*
Angola	Cabinda	1975	NO
Bangladesh	Chittagong Hills	1974	NO
India	Assam	1990	NO
Indonesia	Aceh	1975	NO
Iran	Kurdistan	1966	NO
Iran	Arabistan	1979	NO
Iraq	Kurdistan	1961	NO
Nigeria	Biafra	1967	NO
Nigeria	Niger Delta	2004	NO
Pakistan	Baluchistan	1974	NO
Russia	Chechnya	1999	NO
Sudan	South	1983	n.a.
Yemen	South	1994	NO

Note: See the note for Table 2.

dataset. However, scholars disagree on how to correctly code ISIS' civil war aims, who proclaimed to establish an Islamic Caliphate in territory captured from Iraq and Syria. Either way, the overall rarity of massive oil looting during separatist conflicts implies that this mechanism provides an unconvincing explanation for the empirical oil-separatist relationship.[21]

Extending the model to incorporate wartime consumption formalizes the linkage among the attributes of oil production summarized in Assumption 1, the rarity of oil looting, and incentives for civil war. Assume that actors consume a positive amount in a war period and that G and C exogenously divide C's formal-sector production. G receives $(1-\phi)\cdot x(\eta)$ percent and C receives $(1-\phi)\cdot[1-x(\eta)]$ percent, and $\phi \in (0,1)$ captures war destructiveness. The less that C's formal-sector production depends on local labor, the more easily G can expropriate C's resources even during a war. Formally, the evidence that motivated Assumption 1 also supports assuming that $x \in (0,1)$ strictly decreases in η, which implies that oil production lowers C's percentage of wartime spoils. Because higher x decreases C's expected utility to fighting, this logic yields Proposition 4.

> **Proposition 4** (oil depresses looting possibilities): *An increase in C's oil production through its effect on decreasing its percentage share of formal-sector production during a war (less looting) diminishes the equilibrium likelihood of separatist civil war, that is, decreases the range of σ values small enough that C will reject any offer in a strong period. Formally, for $\overline{\sigma}_g$ defined in Appendix Equation C.1, $\frac{\partial \overline{\sigma}_g}{\partial x}\cdot\frac{dx}{d\eta} < 0$.*

Rebel Arming Advantage?

A corollary to the looting argument posits that oil-rich challengers should enjoy an arming advantage from using oil to finance insurgent activities. Related, rebels may leverage expected future control over oil reserves to borrow from international actors in a "booty futures" market (Ross 2012, 174–78). However, contrary to the seemingly sensible idea that rebel groups in oil-producing territories should enjoy arming advantages, rebels usually face great difficulties to gaining access to oil wealth. By contrast, governments frequently fund their military using oil revenues. Combining empirical observations with logic from the model highlights that this greed argument is also unlikely to explain the oil-separatist relationship.

Empirically, rebel groups almost never access oil revenues to fund start-up costs for challenging a government because, even when otherwise possible, international actors often support incumbent oil-rich regimes to stabilize oil production and prices. Among Ross's (2004, 2012) review of cases, only Congo-Brazzaville in the 1990s exhibits evidence from an oil-rich country in which rebels raised start-up funds via oil in a booty futures market, and these rebels did not seek secession. In this exceptional case, rebel leader and former president Denis Sassou-Nguesso promised to restore French oil company Elf Aquitaine's monopoly over Congo's oil if he regained power, in return for assistance. However, international actors rarely contract on future oil promises by rebel groups because international oil companies and their host governments favor incumbents over challengers to prevent costly oil production disruptions. At least empirically, this argument appears true even beyond oil. Ross (2004, 50) concludes from examining thirteen prominent civil wars involving various natural resources that "nascent rebel groups never gained funding before the war broke out from the extraction or sale of natural resources, or from the extortion of others who extract, transport, or market resources."

Instead, theoretical and empirical considerations suggest that oil production anywhere in a country should *decrease* the challenger's probability of winning a separatist civil war by funding the government. Consistent with Assumption 1, Paine (2016) explains why governments enjoy large advantages over rebel groups for translating oil wealth into military capacity, contrary to common allegations that oil wealth weakens state capacity. Empirically, scholars' evidence shows that oil-rich countries spend large amounts on their militaries (Wright, Frantz and Geddes 2015, 15–17).[22] This corresponds with Colgan's (2015, 8) argument that "[t]he government's oil income is typically so much larger than the rebels' share that the relative balance of power favors the incumbent government" and with his empirical finding that oil-rich countries win civil wars at higher rates than oil-poor countries. Formally, we can express this idea by assuming p increases in both η and ω.

Overall, contrary to the seemingly sensible idea that rebel groups in oil-producing territories should enjoy arming advantages, these empirical observations instead support the opposite assumption. By decreasing C's expected utility to fighting, this logic yields Proposition 5.

> **Proposition 5** (oil hinders insurgent success): *An increase in C's oil production through its effect on decreasing its probability of winning diminishes the equilibrium likelihood of separatist civil war, that is, decreases the range of σ values small enough that C will reject any offer in a strong period. Formally, for $\overline{\sigma}$ defined in Equation (6), $-\frac{\partial \overline{\sigma}}{\partial p}\cdot\frac{dp}{d\eta} < 0$ and $-\frac{\partial \overline{\sigma}}{\partial p}\cdot\frac{dp}{d\omega} < 0$.*

[21] The Armed Conflict Database (Gleditsch et al. 2002) codes ISIS as participating in a center-seeking civil war in Iraq and a separatist civil war in Syria. Correlates of War (Dixon and Sarkees 2015) codes ISIS as participating in a center-seeking civil war in Iraq and an intercommunal conflict in Syria. Other oil-funded insurgencies discussed in the literature—such as Colombia, Iraq after the 2003 US invasion, and Libya in 2011—involved center-seeking civil wars. Although a similar difficulty-of-looting argument also applies to center-seeking civil wars (Paine 2016), disaggregating civil war types highlights that this phenomenon rarely occurs in separatist civil war cases.

[22] Colgan (2015, 7) provides additional citations.

Disrupting Oil Production?

Scholars also argue that societal actors can often *disrupt* oil production. Collier et al. (2009, 13) state that oil production enables activities such as "'bunkering' (tapping of pipelines and theft of oil), kidnapping and ransoming of oil workers, or extortion rackets against oil companies (often disguised as 'community support')." Blair (2014) argues that people living near oil production sites can engage in protests, strikes, sabotage, or theft at these facilities, which improves their bargaining position relative to the government. Although these specific arguments focus on activities during peacetime, ongoing wars often feature even starker disruptions. For example, SPLA's insurgency in South Sudan prevented Chevron from producing oil in the 1980s and 1990s despite earlier major oil discoveries. Combining the logic of the model with empirical observations casts doubt that the peacetime disruption mechanism is empirically relevant, although—highlighting why we need to distinguish between disruption during peacetime and war—the wartime disruption mechanism is more plausible.

Peacetime Disruption

During peacetime, the disruption argument faces two important shortcomings. First, the empirically grounded premises discussed above show that oil production does not improve C's bargaining position. If the disruption mechanism works as scholars propose, then oil production should increase the value of C's economic exit option and decrease equilibrium tax rates, that is, moving up and/or to the right in Figure 3. If withholding local labor in oil-rich regions (perhaps via protests or strikes) more greatly interrupts formal-sector production than if the region produced an alternative commodity, then oil production corresponds with a high value on the vertical axis. Despite cases such as Iran in 1978 and Venezuela in 2002 in which successful strikes temporarily shut down each country's oil production, the key question concerns whether local residents' actions affect oil output more or less than other economic activities. As discussed, highly capital-intense oil production and the usual ease with which firms replace local workers with foreign workers implies low output elasticity (Assumption 1)—contrary to the disruption argument.

Similarly, if residents can steal oil more easily than other economic activities, then this would raise the value of the informal economy and oil production should locate farther to the right on the horizontal axis in Figure 3. However, as noted, governments can relatively easily guard oil fields because actors extract oil in concentrated locations, whereas rebels face great difficulties to gain the technical expertise and international assistance needed to reap large oil profits. Another possibility is for disruptions to affect a government's ability to translate oil revenues into a strong military. But, especially during peacetime, disruptions will likely lack sufficient destruction that more oil production *decreases* the government's probability of winning (higher p), given the funding advantages that governments enjoy over rebels.

Second, even if the disruption mechanism did enhance C's economic exit option, then oil production would *decrease* incentives for fighting by triggering the opposite logic as presented for the redistributive grievances mechanism. For example, Blair (2014) posits that threatening to interrupt oil production increases oil-rich residents' bargaining power relative to the government. Using language from the present model, higher η or ω increases the value of C's economic exit option, which decreases the equilibrium tax rate in weak periods and increases the parameter range in which G can buy off C in a strong period. In other words, reversing Assumption 1 implies that oil production—as opposed to other economic bases—helps to smooth C's consumption across periods and therefore *reduces* C's incentives to launch a separatist bid when temporarily strong, via the logic of Proposition 2.

Alternatively, we could assume that C can also choose a "simple revolt" option—for example, mass strikes or other disruptive events short of conventional war definitions—in any period and consume $R > 0$ rather than accepting the government's offer. If oil production increases R by facilitating disruptions, then this effect weakly increases C's lifetime expected consumption in the status quo regime and—similar to increasing η or ω—decreases C's incentives to initiate a separatist civil war in a strong period.

Wartime Disruption

A more compelling version of the greed argument, implicit in some existing arguments, is that oil can trigger fighting because ongoing fighting can disrupt oil production sufficiently to shift the distribution of power away from G. Extending the model to allow for a third war outcome enables evaluating this argument. Assume at the game's outset that C wins outright and gains independence with probability $p_t = p$, as in the baseline model. However, conditional on not winning, two possible outcomes occur. First, as in the baseline model, C may lose, which occurs with probability $(1 - p) \cdot (1 - s)$, for $s \in (0, 1)$. Second, with probability $(1 - p) \cdot s$, C does not secede but permanently shifts the distribution of power in its favor to some $p_t = p' > p$ in all future periods t.[23] If oil production increases the power-shifting probability s, then this mechanism increases C's incentives to fight—consistent with Lujala's (2010) finding that conflict lasts longer in territories with known hydrocarbon reserves even if no production occurs. Although rebels do not directly profit by disrupting oil production in this setup, reducing the government's access to oil revenues can reap indirect benefits. For example, rebels in southern Sudan in the 1980s prevented the government from extracting oil revenues by initiating fighting shortly after discovery and by blowing up pipelines.

Although the wartime disruption argument highlights a more compelling logic than other greed mechanisms, it cannot explain many empirical oil-separatism cases, either. High wartime disruption in Sudan's second civil war is an outlier. And even in this case, the disruption mechanism does not explain the government's strategic choices (described above) that effectively ended the regional autonomy deal and drove SPLA to fight—as opposed to SPLA blowing up pipelines to exploit a hapless government. Furthermore, this mechanism does not negate the general arming advantages that governments enjoy from greater access to oil revenues both in peacetime and during war (Colgan 2015, 7–8), which decreases p and diminishes C's fighting incentives (Proposition 5), nor does oil production necessarily covary with high s. Civil war disrupts all economic output, not just oil.[24]

[23] The model can easily incorporate this idea if power can only shift once. Specifically, assume that the game begins in state $p_t = p$, and only this state exhibits a positive probability that—if a war occurs—C's future probability of winning increases via the intermediate war outcome. If instead p_t previously shifted to p', then $p_t = p'$ in all future periods and $s = 0$. In words, the subgame in which a power shift previously occurred strategically replicates the baseline game.

[24] Blattman and Miguel (2010, 37–45) summarize evidence for economic disruption during civil wars.

Prize and Price Effects

Appendix Sections C.2 and C.3 evaluate arguments about a large prize (Collier and Hoeffler 2005a; Garfinkel and Skaperdas 2006) and about volatile oil revenues (Karl 1997). Contrary to existing arguments, a large prize does not necessarily raise the likelihood of civil war. Although a large prize increases the challenger's expected utility to fighting, it also raises the opportunity cost to fighting a war. The volatile revenues argument exhibits higher theoretical plausibility. Periods of temporarily low oil prices, and time periods during which a major oil field has been discovered but production has not begun, generate low contemporaneous opportunity costs, but the prize exhibits high *future* value. Focusing on an opportunity cost mechanism also distinguishes the logic from Bell and Wolford (2015), who analyze oil discoveries and shifts in the future distribution of power.

Conclusion

This article posits a strategic linkage between economic grievances and civil war onset, and also provides insights into a specific empirical pattern: oil-rich regions fight separatist civil wars relatively frequently. The findings carry theoretical and empirical implications for various grievances and greed mechanisms in the civil war literature and highlight new considerations for broader international relations research. The article provides a framework for understanding how attributes of economic production that affect a producer's exit option to the informal sector—such as elasticity of output to local labor input and the value of producing in the informal sector—can create redistributive grievances and foster civil war incentives. The model's theoretical implications yield hypotheses that scholars could test empirically for various economic commodities, for example, by combining the model's theoretical logic with commodities in different positions in Figure 3. Furthermore, the regional autonomy analysis informs broader questions about grievances. For example, Cederman, Gleditsch and Buhaug (2013) show that ethnic groups that lack access to political power at the center more frequently fight civil wars. But why would a government exclude ethnic groups if this choice raises the likelihood of civil war? The model provides insight into why a government may strategically choose not to alleviate grievances, which future research could extend.

Additionally, understanding why greed theories cannot explain the oil-separatist relationship may also help to better understand scope conditions for mechanisms such as rebel looting and rebel finance. Natural resources more easily looted than oil—such as alluvial diamonds—provide more viable rebel finance sources. Therefore, if looting often triggers civil wars, then easily lootable resources such as alluvial diamonds should systematically associate with separatism. However, although we require additional research, existing statistical results show a weak relationship between alluvial diamonds and civil war (Ross 2015, 250). Perhaps the nonfinding for alluvial diamonds arises because these minerals are secondary to state weakness for causing civil war onset. Only amid severe state weakness can rebels control territory and mine diamonds. This consideration explains how rebels looted and financed their armies using alluvial diamonds during conflicts in Angola, Liberia, and Sierra Leone—and explains ISIS's control over oil fields—but also why rebels usually cannot loot en masse.

Finally, the dual inside option (economic exit) and outside option (fighting) in the model may also provide insights into international warfare. Considerable international conflict research examines shifts in power over time (Fearon 1995; Powell 2004), but less research analyzes alternatives to fighting to mitigate adverse shifts in the distribution of power. In oil-rich countries, for example, anticipated depletion of oil reserves over time implies an adverse future power shift relative to great powers. In response, many oil-rich countries actively invest in alternative industries (similar to the economic exit option in the model) to minimize expected future exploitation from producing less oil. More perversely, pursuing weapons of mass destruction and exiting international institutions generates a similarly valuable inside option. Based on gross domestic product and industrial production alone, weak countries like North Korea would perhaps face exploitation when bargaining via standard diplomatic options. Developing nuclear weapons serves as a viable exit option to gain favorable outcomes despite weak traditional bargaining leverage. Overall, these considerations suggest the model's mechanisms, perhaps with substantively appropriate extensions, may help to explain various international and domestic conflict outcomes.

Supplementary Information

Supplementary information is available at www.jackpaine.com and at the *International Studies Quarterly* database.

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