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Third-Party Interest, Resource Value, and the Likelihood of Conflict

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Third-Party Interest, Resource Value, and the Likelihood of Conflict

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Abstract
Resource wealth induces predation incentives but also conflict-deterring third-party involvement. As a result, the relation between resource value and conflict probability is a priori unclear. This paper studies such relation with a flexible theoretical framework involving a resource holder, a predator, and a powerful third party. First, we show that, if third-party incentives to intervene are sufficiently strong, conflict probability is hump-shaped in the resource value. Second, we theoretically establish that resource value increases the third party's incentive to side with the resource-rich defendant in case of intervention, providing another mechanism for stabilization when the resource value is high. Third, exploiting widely-used measures of resource value and geologic predictors of oil presence, we provide evidence for our theoretical results. Using data on military bases and arms' trade, we show suggestive evidence that US military inuence drives a non-monotonicity of conflict probability in oil value.

JEL classification: D74, Q38, P48

Keywords: conflict, resource curse, third party, oil, intervention.

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Introduction

Armed conflict often revolves around the ownership of a resource, such as an oil field, a stretch of land, or access to the sea. Incentives to engage in war depend on participants' ability to gain from it. On the one hand, high resource value invites conflict by increasing incentives to predate. On the other hand, resource wealth induces stabilizing efforts by powerful third parties interested in safeguarding access to extraction or consumption. Since an increase in resource value induces higher predation but also higher deterrence by third parties, its effect on conflict occurrence is unclear a priori. This paper sheds light on the issue, formulating and testing a theory of resource war in the presence of third parties.

Our work contributes to the understanding of the resource curse and of economically-motivated third-party interventions. First, by setting up a simple and flexible model of resource war involving a resource holder, a predator, and a powerful third party, we characterize the relation between conflict probability and resource value. Such relation is *hump-shaped* when incentives for the third party to intervene are sufficiently strong–e.g., if the third party can use the intervention to improve its bargaining position, or if resource holder's wealth does not fully translate into military capacity against aggression. Second, we show that resource value increases third parties' incentives to form an alliance with the defendant in resource conflict, providing an additional stabilization mechanism when resource value is high. Specializing our model, we show that our main results hold in relevant real-world settings, such as superpowers importing resources from other countries and using them in production.

Our theoretical insights provide a compelling explanation for the seminal empirical findings in Collier and Hoeffler (1998; 2004) showing a non-monotonic relation between a country's resource abundance–proxied by primary commodities exports over GDP–and probability of civil war.[1] Exploiting established measures of resource value across countries, geologically-determined variation of oil presence, and measures of conflict that include interstate conflict and civil wars we confirm previous non-monotonicity results. In addition, we make an empirical contribution by showing that such non-monotonicity is driven by countries exposed to US military influence.

We develop a model of resource war as a sequential game. A country or government controls a scarce resource; a predator state or opposition group decides whether to attack and try to seize it. In the simplest version of our model, the resource holder grants resource access to a powerful third party, which decides to intervene and back the defendant in case of conflict, securing its control over the resource. Heterogeneity in the cost of war induces a probability of conflict, which depends on resource value. Under general conditions, we show that such probability is hump-shaped. Namely, it increases in resource value if the value is low enough and decreases in value if the value is high enough.

In the general version of our model, (i) we let resource wealth affect military strength, and (ii) we allow the third party to choose her ally–the resource holder or the predator.[2,3] In case of war,

[1] Collier and Hoeffler (1998) argue that such non-monotonic relation could relate to the increased ability of the resource-holding state to provide security with an increased taxable base. As we explain below, we model this channel in our general framework and show it reinforces third parties' stabilizing role.

[2] For example, Collier and Hoeffler (2004) discuss the resource wealth channel as an explanation of Saudi Arabia's internal stability.

[3] There are examples of third parties intervening in favor of challengers and not incumbents. See, for example,

the third party can ex-ante commit to side with either of the two opponents; if the ally loses the war, the third party loses access to the resource. This modeling structure captures settings in which alliances are not easily broken and renegotiated, e.g., because of reputation costs. Such situations arise naturally when the third party is ideologically or culturally close to one of the opponents, as in the context of the Cold War.[4]

In this framework, two additional incentives emerge compared to the simplified model. First, since resource value makes the resource holder comparably stronger, it increases the third party's willingness to side with it. Second, higher military strength by the resource holder reduces the need for third-party intervention. Because the third party has an incentive to side with the stronger player and the resource holder becomes stronger as resource value grows, the third party chooses to ally with the resource holder when the value is high enough. As a result, the probability of conflict is still hump-shaped in resource value, provided the payoff earned from the third party increases fast enough with the value of the resource compared to the resource holder's military strength. In this case, the increase in the economic appeal of the resource dominates the disincentive to intervention given by the increased strength of the ally, triggering more intervention and less conflict as the value grows. Such condition for non-monotonicity naturally arises in the realistic case that the third party uses the intervention to extract better conditions on the exploitation of the resource exploitation.[5] Intuitively, the improvement in bargaining terms resulting from the intervention is a sufficient incentive to support the resource holder, when the resource is valuable. In addition, the condition holds true in other real-world scenarios: e.g., if royalty payments are the main revenue source for the resource holder, or if resource-holder's military expenses grow less than proportionally with GDP.[6,7]

A non-monotonicity in conflict probability can still emerge when marginal returns from the resource decrease quickly for the third party (or the third party is not present). If the resource value is very effective in improving the military strength of the resource holder, and marginal returns of resource value decrease fast enough for the predator, war incentives for predator are decreasing for high resource value. Then, our model nests an alternative explanation for hump-shaped conflict probability discussed in the literature, e.g., proposed by Collier and Hoeffler (2004). Intuitively, if resources increase the ability to fund the military, attacking resource holders is harder for predators, ultimately reducing their incentives to predate. Still, our empirical results showing that countries exposed to the US influence drive the non-monotonicity suggest that the third-party channel drives the results. [8]

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the discussion of the case of the Angola civil war in Bove et al. (2016), or the literature on *booty futures*, e.g., Ross (2012).

[4]Also, Chyzh and Labzina (2018) show how the incentive to keep an unprofitable alliance might arise from dynamic incentives.

[5]For example, Berger et al. (2013a) and Berger et al. (2013b) document that CIA interventions during the Cold War created a larger market for US products.

[6]Van der Ploeg (2011) reviews the literature on the detrimental effects of resource wealth on institutions.

[7]Using data on military expenditure by country by SIPRI we find that the correlation between GDP and military expenses as a fraction of GDP is negative.

[8]In Appendix Section A.4, we show that the predictions of our model apply also in a context that are more similar to civil war. In particular, we show that results hold assuming that (i) resources are not controlled by one opponent only or (ii) bargaining can occur between the parties. We explain the intuition for both cases in Section 1.

In our full model, we rationalize the third party's benefit from intervening with the ability to commit ex-ante to an alliance granting the third-party resource access. The central intuition of the model remains unchanged in a setting where the third party does not commit ex-ante to an alliance and intervenes to avoid a long or particularly destructive war. The latter captures well situations in which alliances are mainly based on resource exploitation and war directly affects third party's rent, e.g., for conflicts affecting oil prices, changes in ownership structure, or causing widespread destruction of capital.[9]

In spite of its simplicity, our theory applies to empirically-relevant contexts. Indeed, we show that our model's assumptions hold in the context of a third party that buys the resource and to use it in production and suffers disruptions from changes in resource ownership. Such application is relevant for understanding the effects of the recent expansion in Chinese presence in mineral-exporting African countries. Further, this setting provides an accurate description of activities connected to oil extraction, which we use to test our model. We test our main predictions using established measures of conflict and resource value, together with the plausibly exogenous measurement of oil presence introduced by Hunziker and Cederman (2017), and controlling for several geographical characteristics potentially correlated to geological determinants of oil presence and conflict (e.g., elevation average and dispersion, temperature, and precipitation). We show that resource value has a non-monotonic effect on conflict probability.[10]

Importantly, we find that the hump-shaped relation between resource value and conflict is particularly strong in countries exposed to US military involvement, measured in the earliest part of our sample years. We focus on the US as the relevant third party because our sample period (1950-1999) mostly overlaps with the Cold War, suggesting to focus on the US, the USSR, or both, as superpowers.[11] While the US was a net oil importer in almost all sample years (EIA, 2021), the USSR was mostly a net oil exporter (Block, 1977; Kotkin, 2008). We conclude that USSR does not fit well our theoretical framework, which requires the third party to have a clear interest in the exploitation of the resource.[12]

We use two innovative ways to measure US involvement, relying on measures of personnel of the US Department of Defense abroad and arms imports from the US.[13] As robustness checks, we show that the same results apply if we use as a measure of involvement a measure of affinity calculated from UN voting patterns, or simply geographical distance.

As we clarified above and discuss in what follows, third-party involvement is not the only potential explanation for a non-monotonicity of conflict probability in value. However, our analysis shows that an empirical non-monotonicity is more robust and pronounced in the presence of

[9] As an example, Kilian (2009) shows how political events in the Middle East sensibly affect oil prices.

[10] We formally test for an inverse-U shaped relation using the methodology suggested by Lind and Mehlum (2010).

[11] In a renown book published in the 1940s (Fox, 1944), William T. R. Fox coined the word 'superpower' to describe the role that the US, the USSR, and the UK would take up in a world transformed by WWII. A few years later, a broad consensus had emerged that the US and the USSR were the only global players able to command a similar role, leading Fox himself to comment on the inclusion of the UK in his book as 'what [...] appears to have been an elementary mistake' (Fox, 1980).

[12] We also show that the evidence of a hump-shaped relation driven by USSR involvement is much weaker, as expected.

[13] Bove et al. (2018) provide evidence that arms trade is an effective foreign policy tool in maintaining access to natural resources.

third parties.

In sum, our work improves our understanding of the geographical determinants of conflict; further, it improves our comprehension of the challenges raised by today's rapid technological change. Technological progress can rapidly affect the importance of a resource as input for production. For instance, the surge in the use of battery-powered devices quickly raised the strategic importance of cobalt for our economies (USGS and USDI, 2012). Similarly, pollution and the threat of climate change prompted investments in the development of alternatives to fossil fuels, in turn affecting conflict incentives in oil-rich areas for local countries and third parties.

Related literature

This paper contributes to two branches of the conflict literature: the study of the resource curse in conflict and the analysis of interventions by third parties.

Seminal empirical work by Collier and Hoeffler (1998; 2004) established a non-monotonic relation between resource abundance–proxied by primary exports over GDP–and the probability of conflict. More generally, Collier and Hoeffler (2004) pioneered the quantitative analysis of the determinants of civil war, showing that economic opportunities, such as resource abundance, are a key determinant of conflict occurrence.[14] Fearon and Laitin (2003) conduct a similar analysis, concluding that malfunctioning institutions and low state strength–rather than resource dependence–are the main drivers of conflict.[15] Brunnschweiler and Bulte (2009) approach the same issue exploiting World Bank natural capital measures to partially solve endogeneity concerns related to resource dependence. They find little association between resource presence and conflict and no compelling evidence of a non-monotonicity in their setting; however they do not test for differential non-monotonic effects across resource types.[16,17] After their work, the potential non-monotonicity of the resource curse was not fully considered in the literature. In some cases, scholars have focused on the impact of different types of resources and moderating factors. For instance, Caselli et al. (2014) study the case of oil, using the Militarized Interstate Disputes (MID) dataset to measure conflict; they highlight the role of resource distance from the border. Other studies have tried to exploit exogenous variation to obtain identification. Berman et al. (2017) show a positive impact of the price of minerals on conflict in Africa using conflict microdata from the Armed Conflict Location & Event Data Project (ACLED). Sonno (2020) finds a causal association between multinationals operations in Africa and conflict. Hunziker

[14]For a general review of the correlation between resource presence and adverse outcomes in economics, politics, and international relations see Van der Ploeg (2011).

[15]See Blattman and Miguel (2010) for a sharp comparison of the relation between Collier and Hoeffler (2004) and Fearon and Laitin (2003) and comprehensive review on the literature on civil war in political science.

[16]Differently from their work, we investigate the presence of non-monotonic effects differential across resources and exploiting geographical determinants of resource presence.

[17]Fearon and Laitin (2003) and Fearon (2005), too, find little evidence of non-monotonicity using the resource dependence measure in Collier and Hoeffler (2004). Despite accepting the non-monotonicity argument, they suggest that a better test of the hypothesis should look at the effect of different types of resources in separation. Instead, later work by Collier et al. (2009), exploiting a more complete dataset of conflicts than Collier and Hoeffler (2004) and extending the time period of the analysis, has provided new evidence on the non-monotonic relation between primary commodity exports and the probability of conflict.

and Cederman (2017) show a positive association between resource presence and civil conflict in the case of oil resources, leveraging on pre-determined geographical variation in sedimentary basins presence in a given area, and using the UCDP/PRIO Armed Conflict Dataset, including civil wars and interstate disputes.[18,19] We make a theoretical contribution to this literature by showing that the involvement of powerful third parties can explain the non-monotonicity of the resource curse. In our full model, we also consider the state capacity channel suggested by Collier and Hoeffler (1998; 2004), showing that it interacts and reinforces our mechanism of interest–third-party intervention.[20] In addition, we make an empirical contribution by (i) showing more evidence on the non-monotonicity of the oil resource curse and, especially, (ii) showing that such non-monotonicity is explained by US military involvement.

Third parties' role in conflict has received large interest starting from the extended deterrence literature in political science, studying how third parties can deter attacks against another actor—see Huth (1989) for a classic reference. A line of works in this literature analyzed 'neutral' interventions with humanitarian or welfare motivations, such as (Meirowitz et al., 2019; Kydd and Straus, 2013). Our analysis, instead, studies the incentives of 'biased' interventions, where the third parties maximize their own profits.[21] As shown by previous literature, interventions can benefit superpowers. Third parties can intervene in conflict to avoid another player's hegemony in a region (Levine and Modica, 2018). By intervening, they can enlarge markets for their products, as shown by Berger et al. (2013a) and Berger et al. (2013b) in the case of CIA interventions during the Cold War. Given such incentives, involvement by external powers can induce regime or area stabilization. Di Lonardo et al. (2019) uses a theoretical model to establish a stabilizing role of foreign threats for autocracies. Chyzh and Labzina (2018) argue that, for deterrence concerns, third parties may support incumbent leaders even when they are likely to fail. In other cases, third parties can benefit from destabilizing an area. Rosenberg (2020) shows that external powers can use war between the resource holder and the defendant in resource-rich areas to extract rents.[22] We contribute to this literature by analyzing third parties' incentives to side with the defendant or the predator in resource war and how this ultimately affects conflict occurrence.[23]

Assuming the presence of a powerful third party, we rely on the geopolitical notion of superpowers' 'Spheres of Influence,' recently conceptualized by Hast (2016) and Etzioni (2015). Latin

[18] Paine et al. (2022) and Paine (2019) theorize how economic activities such as oil extraction can lead to civil war incentives.

[19] Like many other works in the literature, authors use a linear model; if however, strategic considerations lead to a hump-shaped relation, this may impair inference (Signorino and Yilmaz, 2003).

[20] Acemoglu et al. (2012) analyze the interaction between the natural resources' market structure and the incentives of predatory countries to start a war; we include the role of deterrence in this context, abstracting from dynamic strategic incentives.

[21] The distinction between neutral and biased interventions is empirically relevant. For instance, Regan (2002) documents that external intervention in civil wars often increases conflict length; however, biased interventions, backing one opponent, result in lower duration compared to neutral interventions.

[22] Chang et al. (2007) study interventions of third parties siding with an ally, focusing on the relation between the timing of intervention and the equilibrium outcome.

[23] Work by de Soysa et al. (2009) also studies the moral hazard problem induced by the third-party intervention on the incentives for the resource holder to declare war. In this paper, we are always going to assume that the value from war derives from the natural resources so that there would be no reason for the resource holder to attack the other country.

America during the US Monroe Doctrine and NATO-affiliated countries during the Cold War are examples of areas in the US sphere of influence. Instead, Eastern Bloc countries in Europe are examples of countries in the Soviet sphere of influence. In these settings, the relevant third party in an area is unambiguously identified. Below, we argue that our framework extends to situations where more than one third party is present, but only one third party is unsure which player to side with.

We organize the rest of the paper as follows. In the next section, we illustrate a simplified version of the model to clarify the main mechanisms. In Section 2, we illustrate the full-fledged model. In Section 3, we describe how China involvement in the Democratic Republic of Congo can be seen as an illustration of our mechanism. In Section 4, we present an empirical test of our theory exploiting US involvement and hydrocarbons.[24] Finally, we conclude.

1 Simplified model and baseline result

We model the interaction among three countries, R, P, and T. Country R–the resource holder–holds a scarce resource of value v; country P–the predator–can attack and try to seize control of the resource. Country T is a powerful third party interested in exploiting the natural resource.

Countries P and T engage in a sequential game. Country P can attack R and obtain control of the resource if it wins the confrontation. In this case, R loses control of the resource. If P decides to attack R, T can intervene and back its ally R.[25] If P attacks and there is no third-party intervention, P wins with probability p_w. If there is a third-party intervention, R wins for sure. In the general model presented in the next section, we relax the assumption that T always sides with R, and we let p_w vary with the resource value v.

We define $\Pi_P(v)$ and $\Pi_T(v)$ as the payoffs from having access to a resource of value v for P and T, respectively. We think of $\Pi_P(v)$ and $\Pi_T(v)$ as capturing all the economic or political benefits arising from resource access, e.g., profits from selling the resource or the benefit of using it in the production of another good. The latter specification is discussed in Section 3, while the former in the Appendix. Here we aim to remain agnostic on the specific origin of these payoffs or the value index v, and only impose the following two general assumptions:

Aligned Interests - AI Π_T and Π_P are both increasing in v, and they can become high enough to offset any cost of war, namely

$$\lim_{v\to\infty} \Pi_P = \lim_{v\to\infty} \Pi_T = +\infty$$

Furthermore, we use the normalization $\Pi_T(0) = \Pi_P(0)$.[26]

[24] Appendix A.2 contains empirical robustness checks, Appendix A.3 contains two generalizations of the baseline model. All proofs are in Appendix A.5.

[25] T cannot be attacked and cannot attack first, for example, because of institutional and international constraints.

[26] This is without loss of generality: the payoffs are meant to capture the payoffs obtained *from the exploitation of the resource*, hence without the resource they are zero.

Economic efficiency of the third party - EE the rents extracted by the predator are not too large with respect to the rents extracted by the third party: there is a constant $C > 0$ such that $\Pi_P \leq C\Pi_T$.

AI simply captures the fact that the resource is valuable for both players, and the value keeps increasing fast enough as v grows. *EE* captures the fact that the economy of the third party is more developed, and so can more efficiently convert the resource in wealth (or at least not less efficiently). This comes from our focus on third parties that are powerful countries, at least regional powers, and hence have larger (or not smaller) endowments of capital, know-how, and technology.

We introduce a stochastic additive cost of war, ε_i for $i \in \{P, T\}$, with distribution F_i, paid by contestants if conflict occurs. These costs are common knowledge in the baseline model, but we show that results are robust to assuming they are players' private information in Appendix Section A.2.[27] The purpose of modeling this component is twofold. First, we aim to model war costs, including physical, financial, and political costs. Second, random war cost can represent a 'measurement error' faced by the econometrician or external observers perceiving war as a stochastic outcome. We adopt the perspective of this external observer; so, our object of study will be the probability of conflict and how it varies with parameter v.

We assume that, for every i, F_i has a density f_i, and $supp f_i \subseteq [m, M]$, where m is finite and smaller or equal to 0, while $M > 0$ can also be infinite. We allow $m < 0$ to accommodate cases where a player might have a 'preference for war.' We assume that the errors are independent, $\varepsilon_P \perp \varepsilon_T$.

In addition, we are going to assume the following regularity conditions on the relation between costs of war and payoffs:

Regularity conditions - RC Assume that payoffs Π_T and Π_P are differentiable. Moreover, assume that the densities are positive in the interior of the support, that is $f_i(x) > 0$ for any $x \in (m, M)$. Assume also that the following holds:

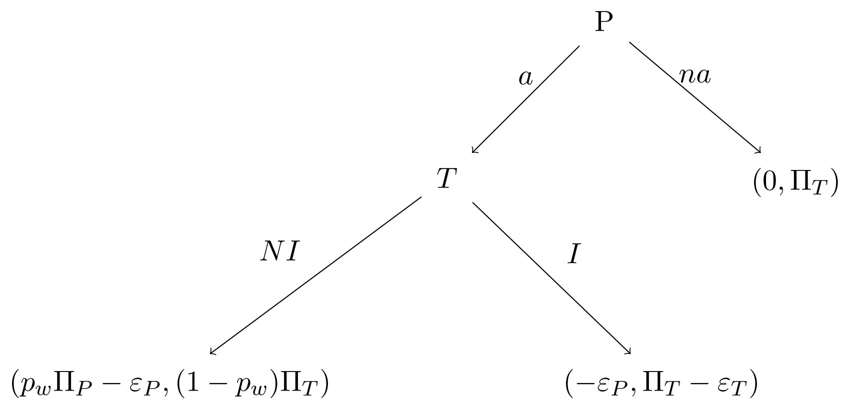
1. if $\lim_{x \to M} f_T(x) = 0$ (as has to be if, e.g., $M = \infty$), there is a left neighborhood of M such that $x^2 f_T(x)$ is strictly decreasing and $\lim_{x \to M} x f_P = 0$
2. if $m = 0$ and $\lim_{x \to m} f_P(x) = 0$, there is a right neighborhood of m such that f_P is strictly increasing and $\lim_{x \to m} x f_T = 0$

Condition *RC* is general enough to be satisfied by many commonly used probability distributions on the positive reals, such as the gamma, the chi-squared, the lognormal, and any standard distribution on the whole real line restricted to $[m, M)$. We are going to maintain conditions *RC*, *EE* and *AI* throughout the paper.

Finally, we normalize $\Pi_i(0) = 0$. This is without loss of generality because we allow the errors ε_i to be negative and have different distributions; the threshold 0 retains no special interpretation. To put it differently, $\Pi_i(v)$ is the difference in the payoff of i in the case where i has access to the resource compared to the case where she has no access.

[27] This extension also provides a setting in which deterrence is imperfect and intervention can occur on the

Figure 1: Game tree of the simplified model



Note: At the terminal nodes are the payoffs respectively of P and T.

1.1 Equilibrium

If P attacks and the third-party does not intervene, P wins with probability p_w. Then, if there is an attack, and given that $\Pi_T(0) = 0$, the payoffs for the third party, in this case, are:

a) $(1 - p_w)\Pi_T(v)$ if there is no third-party intervention;

b) $\Pi_T(v) - \varepsilon_T$ if there is intervention.

So, the third party wants to attack if $p_w\Pi_T(v) > \varepsilon_T$. There are four possible equilibria, depending on the parameters:

1. if $p_w\Pi_P(v) < \varepsilon_P$, P never wants to attack and there is no war;
2. if $p_w\Pi_T(v) > \varepsilon_T$ then T would intervene in case of conflict, hence P does not attack;
3. if $p_w\Pi_P(v) > \varepsilon_P$ and $p_w\Pi_T(v) < \varepsilon_T$ then there is no intervention and P attacks;
4. if $\varepsilon_P < 0$, P always attacks.

Given the equilibria listed above, we compute the ex-ante probability that the SPE of the game involves an attack before the ε_i are drawn. This is:

$$\mathbb{P}(war; v) = F_P(0) + \big(F_P(p_w\Pi_P(v) - F_P(0)\big)\left[1 - F_T\left(p_w\Pi_T(v)\right)\right] \tag{1}$$

The expression is the sum of the terms corresponding to equilibrium (4)–the predator attacks no matter the possibility of intervention–and equilibrium (3)–the predator attacks if the cost of war for the third party is high enough to avoid intervention. Now, we analyze how this probability varies with v, stating the main result of the section, whose proof is in the appendix.

equilibrium path. Given that the predictions on the behavior of the conflict probability are qualitatively similar, we stick to the simplest version in the main text.

Proposition 1.1. *Suppose that AI, EE and RC hold. The probability of conflict is increasing for small v and decreasing for high v.*[28]

Intuitively, an increase in the value results in a higher incentive to go to war for the predator only if the realization of the cost for the third party is sufficiently high to imply no intervention. Then, the predation effect dominates when the value is small, while the deterrence effect dominates when it is high. If the value is small, the third party will almost surely not intervene. An increase in the value will incentivize the predator to attack for many realizations of the errors; so, the predation effect dominates the deterrence. On the contrary, if the value is high, the third party will intervene almost surely; so, if the value of the predator does not grow too fast (assumption EE), an increase in the resource's value will increase the incentives to attack for very few realizations of ε_P, implying that the deterrence effect dominates. In Appendix Section A.3, we further characterize the precise shape of the probability of conflict for all intermediate values and prove that, under some conditions, it has precisely one peak.

In Appendix Section A.4, we show that the main predictions of our model apply not only to interstate conflict but also to civil war. We model civil wars as settings in which either resources are not controlled by one opponent only or bargaining can happen between the parties. In the former case, conflict occurs due to a mismatch between the predator's ability to exploit the resource and its military power, similar to Herrera et al. (2019), and, when it does, the mechanisms of our model apply. As for the latter case, bargaining can avoid conflict in some cases; however, we show that our results carry through when conflict is possible. Further, we show that the incentives induced by bargaining can be sufficient to imply a non-monotonicity of conflict probability even in the absence of third parties, in particular cases. Intuitively, if the resource holder commands more rents for low resource values, and conversely the predatory obtains more rents for high resource value, resource increases induce a non-monotonicity in the resource-holder's ability to 'buy off' the predator.

2 Full model: endogenous alliances and military strength

We now analyze the full-fledged model, relaxing two important assumptions. First, we allow for the possibility that the third party can intervene in favor of both contenders P and R, consistently with our framework, where the third party only serves her economic interests. Resource-dependent countries have incentives to provide military support to resource holders.[29] However, third parties may side with the predator due to its higher chances of victory or honoring a previous alliance. Second, we let the relative military strength of P and R (measured by p_w) depend on the resource value. Past literature has highlighted the role of specific natural resources, such as oil, in increasing military expenditures and arms imports–see, for instance, Ali and Abdellatif (2015) and Vézina (2020). This interacts with the predator's incentives to attack the resource holder and the third party's incentives to intervene.

[28] Here and in the following we say that a property holds 'for small v' to mean that there exist a threshold v_* such that the property holds for all $v < v_*$, and similarly 'for high v' to mean that there exist a threshold v^* such that the property holds for all $v > v^*$.

[29] For instance, Bove et al. (2018) shows how oil producers are more likely to receive support.

The game still has two players, the third party T and the predator P. Player T moves first and chooses to be allied with the resource holder, R, or with the predator, P. In both cases, the predator then chooses whether to attack or not. Finally, the third party decides whether to intervene or stay out. If the third party intervenes, the player it is backing always wins. The payoff functions Π_T and Π_P work exactly as in the previous section, and we are going to maintain assumptions *RC*, *AI*, and *EE*.

Differently from the simplified model, now, p_w is a decreasing function of v, modeling that, as v grows, R has a larger amount of resources to devote to military investment. A common assumption in the literature–see, for instance, Beviá and Corchón (2010) and Jackson and Morelli (2007)–is that the dependence of the probability of victory on relative investments follows a Tullock contest success function (CSF):

$$p_w(v) = \frac{w_P^\gamma}{w_P^\gamma + (w_R + v)^\gamma}$$

where w_P and w_R represent the baseline financial strengths of P and R, to which R can add the funds obtained through the resource. Generalizing this intuition, we are going to assume the following condition:

Tullock-like – TL p_w is decreasing in v, differentiable, p'_w is bounded, and $p_w(0) > 0$.[30]

Naturally, the previous assumption is satisfied by the Tullock CSF above.

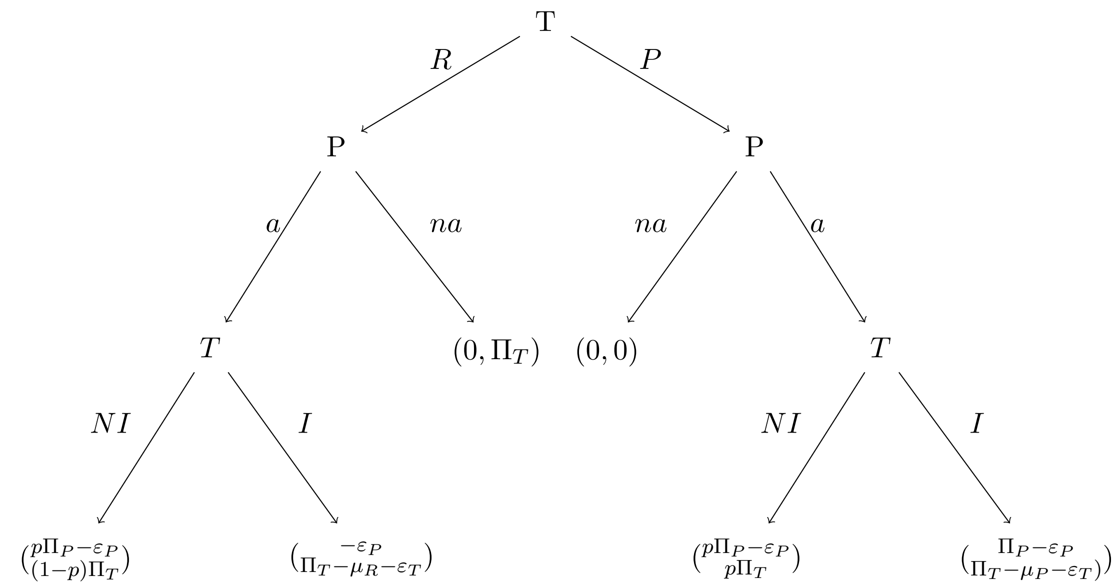
If the third party does not intervene, it can enjoy the payoff from the resource, $\Pi_T(v)$, only if the allied wins. So, if the third party chooses to back R, it has an expected payoff $(1 - p_w)\Pi_T(v)$ from not intervening; if it decides to back P, but it does not intervene in the actual conflict, the payoff is $p_w\Pi_T(v)$.

We maintain the assumption that the costs of war are additive and stochastic ε_T and ε_P, and their distribution satisfies *RC*. We are going to assume that these costs are realized *after* the alliance choice but before any attack decision. This follows the interpretation that the alliance decision is stable over time and potentially occurs well before the actual conflict, while the realization of the war costs may depend on political and military contingencies. We also add a non-stochastic shifter, $\mu_R(p_w)$ if the third party is backing R and $\mu_P(p_w)$ if the third party is backing P. We think of μ_P and μ_R as incorporating, beyond the average military cost of intervention, baseline political preferences, reputation costs of changing alliance, the cost of renegotiating contracts or royalties, and the cost of change of ownership in terms of lost physical, human or organizational capital.[31] Given the variety of possible interpretations, we remain agnostic on their precise shape: we only assume that, whatever the other effects, it is always less costly for T to intervene in favor of a stronger contender. Since the relative military strength is captured by p_w, this means that the cost of backing the resource holder μ_R increases in p_w and that the cost of backing the predator μ_P decreases in p_w. Formally:

[30] A way to think about the bounded derivative assumption is that R has some amount of wealth to devote to war that does not depend on v, and v can increase this wealth. Indeed, this is what happens in the Tullock CSF example in the text.

[31] The interpretation of costs as political preferences is consistent with the framework of Eguia (2019), analyzing military interventions motivated by a noxious policy in the target country.

Figure 2: Game tree of the full model



Note: At the terminal nodes are the payoffs of P and T, respectively.

Costs of war – CW μ_P and μ_R are differentiable, $\mu_P' < 0$, $\mu_R' > 0$.

Our model now features two ways of modeling costs of war, the deterministic cost-shifters μ_i and the random shocks ε_i; both are common knowledge at all stages of the game, driving the alliance choice and the probability of the intervention. The random shocks are realized after the alliance choice by the third party; so, they are stochastic from the perspective of the third party at the first stage. Hence, we can think of ε_i as material and political costs of war that may be difficult to forecast in the long run, such as the cost of military equipment or the popular support for a specific conflict. Cost-shifters μ_R and μ_P, instead, represent long-term institutional and cultural factors affecting the cost of alliances and war, such as institutional, cultural and ideological proximity to the potential ally and relative military strength of players. In light of this, considering these deterministic cost-shifters increases the flexibility of our modeling framework. Our simplified modeling structure, where a single powerful third party plays a strategic role, is well-suited to model an area unambiguously inside the sphere of influence of one superpower. However, the richer framework presented in this section extends to areas where the spheres of influence of two third parties overlap, and one of the two third parties is very likely to back one of the opponents. Political preferences embedded in war cost functions incorporate this geopolitical interaction; the presence of a third party that is sure to intervene increases the relative strength of the two opponents, raising the cost of war for the other third party.

2.1 Equilibrium and main result

The analysis of the game proceeds by backward induction as in the previous section, keeping in mind that now the third party plays twice and so has four strategies, (R, I), (P, I),(R, NI), and (P, NI), representing alliance-intervention choices. In particular, if the third party chooses to be allied with the resource holder, after the realization of ε_T and ε_P, the ensuing subgame is identical to the model of the previous section, augmented with the cost function μ_R. Details on the equilibrium characterization are provided in the Appendix.

In case the third party chooses to be allied with the predator P, the equilibria in the subgame are as follows:

1. if $\varepsilon_P < 0$, P always attacks;
2. if $(1 - p_w)\Pi_T - \mu_P < \varepsilon_T$, then the third party does not intervene in case of conflict, so P attacks if $p_w \Pi_P > \varepsilon_P$;
3. if $(1 - p_w)\Pi_T - \mu_P > \varepsilon_T$, then the third party intervenes in favor of P in case of conflict, so P attacks whenever $\Pi_P > \varepsilon_P$.

The third party at the first stage decides whom to ally with. There are two main forces at play. First, when the third party is allied with the resource holder, the (credible) threat of intervention is sufficient to avoid war and its costs. Second, being allied with the stronger party means that, even without intervention, the likelihood of a favorable outcome of the conflict increases. These incentives imply that when the resource is very valuable and the resource holder is stronger, the third party finds it optimal to side with it. Further, the incentive to intervene is stronger the higher the value. Hence, when v is large, the game is similar to the baseline case where T had to back R.

When v is small, the probability of conflict is increasing: the third party has low incentive to intervene and the predation effect prevails. Instead, when v is large, two incentives for T are now in competition. First, the higher the resource value, the higher the incentive to intervene to secure a favorable outcome, as in the baseline model. Second, the higher the value of the resource, the higher the military capacity of the resource holder, implying that an intervention is *less* necessary. The latter effect directly follows from resource-dependent military capacity and is not present in the baseline model.

The balance of these incentives is represented by the behavior of $p_w \Pi_T$ when v is large. In the simplified model, p_w was constant; hence, this product was growing to infinity (it is sufficient that it grows larger than M, the upper bound of the support of the ε_i). Now, p_w is decreasing to 0. For the intervention effect to prevail, hence the probability of conflict to decrease for large v, the growth in the third party payoff must offset the decrease in the probability of victory of the predator. We formalize this behavior as follows.

Strong Interest of the third party – SI_T for v large enough, $p_w \Pi_T$ must be increasing, and

$$\lim_{v \to \infty} p_w \Pi_T \geq M,$$

where M is the upper bound of the support of ε_i, and can be finite or infinite.

The condition that $p_w \Pi_T$ is increasing can be re-expressed as imposing that the elasticity of Π_T is larger than the elasticity of p_w.[32] In other words, an additional unit of the resource value increases the payoff more than it decreases the probability that the predator wins. Below, we discuss when this condition is likely to be satisfied. First and foremost, this condition holds in the likely situation that the third party can improve its bargaining position by intervening in conflict, extracting more surplus from the resource. In this case, the improvement in bargaining terms make for a sufficient incentive for intervention, even when the ally is very strong.

If SI_T is not satisfied, the probability of conflict may or may not display a hump shape. Non-monotonicity could also arise *without* the third party (a special case of violation of SI_T), depending on the behavior of p_w and Π_P. Specifically, this depends on whether the analog of condition SI_T is true for the predator, namely, if $p_w \Pi_P$ grows to M or not:

Strong Interest of the predator – SI_P for v large enough, $p_w \Pi_P$ is increasing, and

$$\lim_{v \to \infty} p_w \Pi_P \geq M$$

If this is satisfied, then the spoils of war grow in value enough to offset the decreased military force of the predator, and the incentive for war, absent third-party intervention, becomes stronger the larger v. Hence, in this case, absent a third party, the probability of conflict could grow monotonically in v. If instead $p_w \Pi_P$ does not grow but falls for large v, the strength of the predator becomes small enough with respect to the payoff from resource ownership, creating a disincentive to attack. This effect reinforces the hump shape of the conflict probability. In this last case, if the incentive to attack for the predator decreases enough with value, the non-monotonicity could also arise in the absence of intervention (or if the intervention incentive was not strong enough, and $p_w \Pi_T$ were decreasing). One such situation is when the resource holder is very efficient at extracting surplus from its supply of resources and financing an effective army. This type of mechanism is discussed in Collier and Hoeffler (2004) in relation to the case of Saudi Arabia.

Formally, the result is the following.

Theorem 2.1. *Assume RC, EE, AI, TL and CW. The probability of conflict is increasing for small v.*

If SI_T holds, then the probability of conflict is decreasing for large v.

If SI_T does not hold (e.g., if the third party is absent), then the probability of conflict is decreasing for large v only if SI_P is not satisfied.

In other words, our model's empirical prediction is that a non-monotonic relation between conflict probability and resource value can emerge regardless of third-party presence, but third-party presence makes it more likely. In our empirical section, we provide evidence that (i) the

[32] Because:

$$(p_w \Pi_T)' = \frac{p_w \Pi_T}{v} \left(\frac{\Pi_T' v}{\Pi_T} + \frac{p_w' v}{p_w} \right) > 0$$

if and only if $\frac{\Pi_T' v}{\Pi_T} > -\frac{p_w' v}{p_w}$.

relation between resource presence and conflict probability is non-monotonic, and (ii) that it is concentrated in areas exposed to third-party presence. In other words, we provide indirect evidence for the assumption SI_T.

In Appendix A.3 we model endogenous choice of third-party partner in conflict differently. We assume that the third party can form a trade relationship with the country winning the dispute. In this case, intervention is not motivated by the loss of access to the resource. Instead, we assume that war without intervention entails a higher risk of destruction of natural resources (or the extraction infrastructure) unless a third-party intervention resolves conflict quickly; we let the risk of destruction or expected war length depend on the relative military strength of the contestants. The result above carries through also in this alternative setting.

2.2 When is the Strong Interest condition satisfied?

Condition SI_T states that the growth in the third party payoff offsets the decrease in the probability of victory of the predator. In this section, we outline some examples that clarify when we should expect so.

Example 2.1 (**Third party improving its bargaining position after the intervention**). A natural extension of our model is to allow the bargaining position of the third-party to improve if it intervenes. The literature on third-party interventions draws a connection between intervention by third parties and a better ability to extract surplus from the party in conflict they defend, both theoretically (Di Lonardo et al., 2019; Rosenberg, 2020), and empirically (Berger et al., 2013a).[33] We can capture such effect in reduced form by assuming that, if the intervention takes place, the payoff of the third party becomes $(1+\beta_T)\Pi_T$ and the predator's payoff–when the third party backs the predator–becomes $(1-\beta_P)\Pi_P$ with $\beta_T, \beta_P \in (0,1)$.[34]

In this situation, condition SI_T requires that $(\beta_T + p_w)\Pi_T$ grows larger than a constant at the limit, and it is always verified since $\beta_T > 0$. Then, the probability of conflict is decreasing for large v. Intuitively, when the value of resources grows enough, the improvement in bargaining terms is a sufficient incentive for the intervention of the third party even if the ally is strong.

Example 2.2 (**Third party finances military expenses of the resource holder**). We can conjecture that in many real world settings, there is a direct connection between third party resource profits and the resource-holder's military strength, especially when revenues from exporting the resource make a large fraction of the resource-holder's budget. Indeed, Snider (1984) and Bove et al. (2016) provide evidence that arms trade is used to offset the cost of importing the resource.

[33] For instance, the latter shows that after CIA interventions helped USA obtain better trade conditions from targeted countries.

[34] For instance, this situation emerges when the profit from exploitation of the resource is Π, a fraction η goes to the current party controlling the resource as a royalty, and after intervention the third party is able to obtain a better split of surplus $\eta' < \eta$. In this case, if the third party is allied with the predator, after the predator successfully seizes the resource without intervention, the payoffs are $\Pi_T = \eta\Pi$ and $\Pi_P = (1-\eta)\Pi$. If, instead, the third-party intervenes in favor of the predator, the payoffs are $\Pi_T = \eta'\Pi$ and $\Pi_P = (1-\eta')\Pi$, so that $\beta_T = \beta_P = \eta - \eta'$.

Suppose, for instance, that the revenues from the sale of the resource are Π, and the resource holder can obtain a fraction η as a royalty. Third party's payoffs are now given by $\Pi_T = (1-\eta)\Pi$, $\Pi_R = \eta\Pi$. Further, assume that p_w has a functional form as described above, with $\gamma < 1$. Then:

$$p_w \Pi_T = \frac{w_P^\gamma}{w_P^\gamma + (\eta\Pi)^\gamma}(1-\eta)\Pi,$$

which is increasing, verifying SI_T. Intuitively, the military strength of the resource holder is now connected to the benefit the third party has from the resource; then, it cannot grow indefinitely.

Example 2.3 (**Resource-holder military expenses as a decreasing fraction of wealth**). In the general formulation expressed above, resource value can fully translate in military power. In reality, military power returns to resource-holder's resource wealth may be decreasing.[35] For instance, consider the setting of the previous example, where the wealth of the resource holder was a fraction of the profit. Assume that the amount of wealth allocated to military expenses is $f(\eta\Pi)$, with f concave. Condition SI_T is now satisfied more easily, as:

$$(p_w \Pi_T)' = p_w (1-\eta)\Pi' \left(1 - \gamma f' p_w\right),$$

and by concavity if v is large enough $f' < 1$. So depending on f SI_T is satisfied for a larger set of values of γ.

In the next section, we show relevant applications where third-party incentives induces a non-monotonicity. Generally, the conditions are satisfied if the elasticity of military power to wealth is not too large.

3 An illutstration: Cobalt extraction and Chinese involvement in the Democratic Republic of Congo

This section illustrates how the mechanism of our framework connects to an empirically relevant context: a third party buying the resource and using it in production. The geopolitical interest of preserving access to resources used in production, particularly for hydrocarbons, was proposed as a driver of the geopolitical strategies by several high-income economies, e.g., the US involvement in the Middle East, but also the Italian and French presence in Libya and Algeria (Grigas, 2018; Prontera, 2018).[36] In this section, we discuss how similar mechanisms may be at work in the context of mineral extraction in the Democratic Republic of Congo (DRC) and Chinese foreign involvement.

China has been increasingly reliant on African minerals for the production of technological products in recent years. In the last decade, personal electronic devices, such as laptops, smartphones, and tablets, have been widely adopted both in developed and developing economies–see Pew (2016) for the case of smartphones. All these devices require technologically advanced

[35] Using data on military expenditure by country by SIPRI we find that the correlation between GDP and military expenses as a fraction of GDP is negative.

[36] A Politico article covering the recent French geopolitical stance in North Africa can be consulted at https://archive.md/IzOQ5.

batteries. To this moment, lithium-ion batteries are typically employed for these devices, such as Apple and Samsung smartphones. Common smartphones and hand-held devices use lithium cobalt oxide $LiCoO_2$ as cathode for their battery. Lithium cobalt oxide requires cobalt as an input, whose production largely depends on cobalt ore. As of 2015, cobalt ore was mainly extracted and exported by the DRC, which exported a dramatic 89% of the world $752 million trade volume. On the importers' side, China gets 58% of the total, followed by Zambia, where another 31% is transformed into cobalt and sold in a $2.86 billion international market in which, again, the leading importer is China (28% of sales) and the leading exporter is DRC (26% of sales) (Simoes and Hidalgo, 2011).

In recent years, there has been a rapid change in the value of cobalt as an input in production. Though Sony commercialized the first one of this type in 1991 (Sony, 2017), its fortune is mainly due to the mass adoption of electronic devices in our daily life in the last years (Pew, 2016). China heavily invested in the country, especially after the agreement of 2008 between Sicomines (a consortium of Chinese firms) and the DRC government, which granted Chinese access to Congolese minerals in exchange for public infrastructure. In addition, China supported the reform of the armed forces of the DRC (FARDC), supporting the construction of a new FARDC Headquarters, and the acquisition of individual equipment, weapons, and ammunition. Some analysts report that the access to mineral resources may have been facilitated by arms exchange agreements.[37] Then, it is not extremely surprising that cobalt-rich areas, where China is highly involved (Hoslag, 2010), have not suffered extensive conflicts.[38]

Country areas rich of coltan, industrially refined into tantalum, instead, have been extensively affected by armed conflict. As for cobalt, tantalum capacitors are used in electronic devices, particularly in cellphones and videogames platforms. As explained by Usanov et al. (2013), tantalum price suddenly exploded in 2000, with a average price up 647% compared to 1999 price.[39] DRC became a main exporter of coltan and the sudden price increase led to the so-called "coltan fever," during which many local communities and farmers in DRC turned to artisanal mining of the now precious metal. The sudden increase in the price arguably induced an outburst in violence (Usanov et al., 2013), especially at the border with Rwanda, taking place in the larger conflict called the Second Congo War (1998-2003) and sometimes referred to as the Great War of Africa for the number of factions involved (König et al., 2017). While the deep motivations of this conflict are related to ethnic conflict, the different factions fought to obtain control over the mining areas, especially when the price of coltan soared.[40] The recent rise in the economic value of natural resources in the South of DRC could have been followed by an increase of violence in the area in a similar fashion.[41] Instead, China may be acting as the third party of our model, discouraging violence in resource-rich areas and supporting the resource holder in exchange for economic advantage from the valuable input extraction.

Let us turn to a formal characterization of the situation proposed, in order to see the model's mechanisms at play. Think about the usual players in the model as representative agents of the respective economies. For simplicity, we assume that the third party T has no endowment

[37] See, for instance, https://archive.ph/jQTdv.

[38] Indeed, cobalt is not listed among the 'conflict metals' by the EU https://archive.ph/wip/ccum4.

[39] The figure was obtained from USGS data.

[40] See, for instance the reports at https://archive.ph/wip/RYtK0 and https://archive.ph/U1Kwd.

[41] According USGS data, cobalt yearly average price has increased 312% between 2016 and 2018.

of the resource, and its firms need to buy it on the market to produce consumption goods. In particular, the third party behaves as a representative neoclassical firm and it maximizes the following profit function:

$$\pi_T = \Omega_T g_T^{\alpha} - p g_T, \tag{2}$$

where Ω denotes the resource-specific productivity, g is the amount of resource bought, and p is the market price of the resource.

The value of the resource is determined on the competitive international market. Also, we assume that T is the only buyer of the resource to avoid useless algebraic complications. The owner of the resource P or R sells the resource to T. In addition, there is an international supply R_M from the market. The profits coming from the ownership of the resource for players P and R are:

$$\pi_i = p R_i, \tag{3}$$

where R_i is the amount of resource sold by i.

Extraction operations and trade are negatively affected by a war. Then, conflict results in a higher price for the resource: if a war occurs, production drops by a fraction η. Hence, the third party stands to lose from the war in two ways: the quantity available is smaller, and the price will be higher due to the supply-side shock. Through this channel, the third party has a clear interest in maintaining peace since higher prices hurt its economy.

We define a market equilibrium of this model as a price-quantity vector $(p^*, g_T^*, g_R^*, g_M^*)$. Any player is choosing the resource amount g^* optimally given price p^* and such that the market-clearing condition $g_T = g_M + g_R$ is satisfied.

In this context, if we interpret the amount of resource owned by the resource holder as the value parameter, $R_R = v$, the model described here is an instance of the model described in 2.1. In particular, solving for the market equilibrium, the payoff from resource access for the predator and the resource holder are:

$$\begin{aligned} \Pi_P(R_R) &= \frac{\alpha\Omega}{(R_M + \eta R_R)^{1-\alpha}} \eta R_R \\ \Pi_T(R_R) &= (1-\alpha)\Omega\left((R_M + R_R)^{\alpha} - (R_M + \eta R_R)^{\alpha}\right) \end{aligned} \tag{4}$$

So, we can now map this model to the model of the previous sections and state the following Corollary, whose derivation is detailed in the appendix.

Corollary 1. If the payoffs Π_P and Π_T are as in 4, they satisfy AI, EE and RC, so that by Proposition 2 the probability of conflict is hump-shaped under the simplified model.[42]

If, moreover, the probability of victory of the predator is given by a Tullock CSF with parameter $\gamma < \alpha$, then also SI_T is satisfied, and by Theorem 2.1 the probability of conflict is hump-shaped also under the full model.

[42] If $R_M > (1-\alpha)\frac{\eta}{1-\eta} R_R$, they also satisfy DRM, so also Proposition A.3.3 applies, and the probability of conflict has a single peak.

The same framework employed in this section can help investigate the causes and consequences of the US foreign involvement. Hydrocarbon dependence has been discussed as a key determinant of the foreign policy of the US (Jones, 2012; Little, 2008), a global superpower with strong influence across several countries. Historically, the US has been a relevant oil importer, leading to a strong US presence in the Middle East. The Gulf War is a case in point in which the US entered an oil conflict protecting an oil exporter against the predating attacks of a neighboring country (Jones, 2012). If we want to fix this as an example application for our model, the country that owns the resource (e.g., Kuwait) is player R; player P is a rebel group or a neighbor country (e.g., Iraq) wanting to seize the resource. Player T (e.g., the US) is a global superpower interested in the resource because it is a fundamental input in the economy's production chain. With this framework in mind, in the next section we present quantitative evidence for our results, relying on measure of hydrocarbons presence, conflict, and US involvement abroad.

4 Empirical Evidence

In this section, we empirically test whether the probability of conflict is a non-monotonic function of resource value, using conflict data from the Peace Research Institute of Oslo (PRIO) and the Uppsala Conflict Data Program (UCDP) covering the second half of the last century. We then investigate how proxies of third-party influence affect the relation between resource conflict and war.

We produce tests based on measures of oil, gas, and coal value provided by the World Bank. In addition, to partially circumvent endogeneity concerns, we proxy hydrocarbons value with sedimentary basins, controlling for a rich set of geographical controls, similar to Hunziker and Cederman (2017). Our results confirm a non-monotonic relationship between resources value and the probability conflict, providing suggestive evidence of our theoretical mechanism previously outlined.

In addition, we show that the non-monotonicity between conflict probability and resource value is particularly pronounced in countries exposed to US influence, a country (i) with high military and geopolitical power in the sample period, and (ii) highly interested in preserving access to oil.

4.1 Data

World Bank and CRUST data on resources. World Bank Wealth Accounts provide various measures of natural capital for a country in a given year, covering the value of fuel and non-fuel minerals, agricultural land, protected areas, and forests. These measures are calculated as the discounted value of resources present in a country.[43] Our analysis also employs data on the distribution of thick layers of sedimentary rock, a determinant of oil presence. We employ a country dataset constructed by Hunziker and Cederman (2017), based on the CRUST 1.0 dataset by Laske et al. (2013). Such measures provide a source of variation in the availability of hydrocarbons that does not depend on exploration, extraction activities, and then conflict.

[43] A full account of the methodology employed is available at WB (2018).

UCDP/PRIO data on conflict. As we briefly sketched above, we measure conflict occurrence using UCDP/PRIO Armed Conflict Dataset. Armed conflicts are defined as internal or external disputes involving (i) the use of armed force, (ii) at least one state or government contestant, and (iii) at least 25 battle-related deaths. The data also includes an intensity variable reporting whether there the conflict caused at least 1,000 battle-related deaths, the threshold used in the dataset to define the occurrence of a war. We use such variables to construct a 'War' indicator, which we use as an alternative measure to assess robustness.

US bases and arms' trade. We measure US military influence based on two sources. First, we collect the number of US Department of Defense (DoD) personnel deployed by country in 1950, obtained from the Defense Manpower Data Center (DMDC). Coupling these data with the GeoDist database, we define our first measure of US involvement by creating a country dummy taking value one if the nation had a US military base in 1950 or if its closest border is less than 1000 km from one such country. This dummy variable indicates countries where US involvement could be possible in case of a sudden escalation of a local conflict. The 1000-km threshold aims to capture sufficient proximity to US bases, allowing for rapid deployment of US troops within their borders. According to O'Mahony et al. (2018), US troops are generally able to cover 200 miles per day, meaning that 1000 km can be covered in 3 days. Countries within this radius could have been reached rapidly by US forces in case of local conflict.[44] Second, we use the Stockholm International Peace Research Institute (SIPRI) Arms Trade Database to obtain information about US arms importers. We use this dataset to build another US involvement dummy, taking value one if a country imported arms from the US in 1950. Both bases and arms' trade are measured at the start of our dataset to reduce endogeneity concerns.

UNGA voting affinity and distance from the US. To evaluate the robustness of our findings, we also employ two additional proxies for US involvement: (i) voting similarities in the UN General Assembly between a country and the USA and (ii) high geographical distance between the country and the USA. For the first measure, we use an index of the affinity between US votes and other countries' votes for every year from 1946, described in Gartzke and Jo (2006). The index range spans from one, which indicates perfect coincidence, to minus one, which indicates complete disagreement.[45,46] For each country, we compute the index average between 1946 and 1965 and construct a dummy for US affinity reporting when the index is larger than zero.[47] As for the second measure, we construct a dummy variable that takes the value one only for countries below the 75^{th} percentile in terms of distance from the US; zeros in this variable here proxy the inability of the US to conduct a swift intervention in the country.

[44] We also perform robustness checks with higher distances until 1500 km, and results do not change qualitatively.

[45] This is a S score as described in Signorino and Ritter (1999); see Gartzke and Jo (2006) for a more detailed description.

[46] Countries have three possible choices when voting on proposals at the UNGA: approve, not approve, abstain. For this reason, two different indexes can be built depending on whether abstentions are considered. The index we use does not consider them; results remain similar using the alternative index.

[47] Ideally, we would have computed the average between 1946 and 1959, but the sample of countries would have been extremely restricted. The decolonization wave that happened in those years allows us to estimate the model on a reasonable number of countries.

4.2 Sample and descriptive statistics

Our sample consists of countries included in the World Bank dataset, in Hunziker and Cederman (2017) dataset, and in the complementary data used to extract geographic controls.[48] To preserve consistency, we focus on countries that are not powerful enough to intervene in conflicts as powerful third parties on. Hence, we exclude from our sample important regional players: other G8 countries and China.[49] We are left with a panel of 115 countries, and we set our sample years from 1946 to 1999 included.

In Appendix Table A.1, we report the main summary statistics about the variables we have just described. Natural resources such as oil, coal, and gas are not evenly distributed across countries but rather concentrated among a few, leading to a large divergence between the average and the median value of resources across countries. On average, among the countries considered, the share of years in which at least one armed conflict was reported is 14.1%. In contrast, the share decreases for 'War' is 4.5%.

Figure A.1a and A.1b, respectively, show the distribution of the World Bank wealth measure of oil and the volume of sedimentary basins by CRUST 1.0. The two measures are strongly correlated and considerably spread across continents. Oil is more concentrated than sedimentary basins. In our sample, 42.6% of countries has no oil value according to WB data; instead, the volume of sedimentary basins is zero only in 18.2% of the cases.

Figure A.3, instead, depicts the distribution of conflict years occurrences in the sample period. There is variation in the number of conflicts within and across continents. In Figure A.2a, we report the countries hosting US bases in 1950 or sufficiently close to them. It can be noted that US bases and US arms trade are both very high in the Middle East region, Europe, and South America.

4.3 Methodology

We estimate the following equation:

$$W_i = \alpha_0 + \alpha_1 v_i + \alpha_2 v_i^2 + \alpha_X' X_i + \varepsilon_i \tag{5}$$

Where W_i is the share of years with the chosen conflict outcome–'Armed Conflict' and 'War'–in country i, v_i is a vector containing resource values, and X_i is a vector of geographical controls including the continent fixed effects and other variables common in literature: area, population in logs, average elevation, dispersion in elevation, latitude, temperature, and precipitation.[50]

We measure value v using World Bank Wealth Accounts and sedimentary basins. World Bank data consists of per capita oil, gas. and coal values in 2014. We limit our analysis to the role

[48] We run a robustness check including the additional 4 countries that have some missing observations in controls and results remain unchanged.

[49] In the Appendix, we run a robustness check exercise excluding also Australia from the sample as the country represents an outlier in terms of natural resources and has a low level of conflict, showing that the results remain similar.

[50] We take the population in 2014 from control from World Bank data, country area from Hunziker and Cederman (2017), and all of the remaining controls from Ashraf and Galor (2013).

of oil, gas, and coal, coherently with the body of literature analyzing the relevance of different resources in causing conflict.[51] Hydrocarbons are mostly linked to the probability of conflict; other minerals seem to influence the duration of conflicts rather than their onset (Lujala et al., 2005). Further, the value of hydrocarbons, and oil in particular, constitutes most of the natural wealth of countries in WB data. Other types of assets (such as forestry or agricultural land) are not robustly associated with conflict onset, as described in Koubi et al. (2014). Most importantly, the value of these resources is probably related to countries' ability to exploit them, rather than their exogenous initial endowment: they are produced rather than extracted, as pointed out in Ross (2015). Finally, the presence of conflict in a country would highly impact the value of these resources leading to a reverse causality problem in our analysis.

Given the absence of time variation in our wealth measure, we employ as dependent variable the share of years with conflict in our sample as dependent variable.[52] Introducing a time dimension in both conflicts and resource measures would exacerbate endogeneity concerns in our analysis raised by our wealth accounts measure because war likely reduces resource wealth in a country by making extraction more difficult. Nonetheless, as a robustness check, we run a regression exploiting the time-variation of international commodities prices, obtaining similar results.

To tame endogeneity concerns, we employ an alternative measure introduced by Hunziker and Cederman (2017). In their work, they instrument oil extraction with geographical variation in the presence of thick layers of sedimentary rock, a determinant of oil presence. They identify such regions using the CRUST 1.0 dataset by Laske et al. (2013), containing thickness information on a 1-decimal-degree-cell grid for the whole planet; they show thickness to be associated with oil and gas presence. In our estimation, we use their thickness information as an alternative measure of resource value.[53]

As a test of our model, we first check that $\alpha_1 > 0$ and $\alpha_2 < 0$, and then we show that non-monotonicity is more robust in the proximity of US partners, as defined in two ways: (i) by the number of employees American Department of Defense, and (ii) by whether they are US arms' importers. To do so, we introduce interaction terms as in the following model:

$$W_c = \beta_0 + \beta_1 v_i + \beta_2 v_i \times T_i + \beta_3 v_i^2 + \beta_4 v_i^2 \times T_i + \beta_5 T_i + \beta_X' X_i + \nu_i \tag{6}$$

Although the latter analysis is correlational, it can recover a causal relation even if third-party influence depends on resource presence. In particular, the necessary identifying assumption is that third-party influence in a country does not depend *on the relation between resource presence and conflict* after controlling for observable country characteristics. To make this assumption more credible, we use measures of bases and arms' trade from the earliest years available (the starting years of our sample). Further, we investigate the determinants of third-party presence in

[51] A review can be found in Ross (2015) and Koubi et al. (2014).

[52] The results would not change by using a dummy variable indicating the presence of conflict in a specific country-year pair as outcome and adding time fixed-effects as controls.

[53] Given that the results of an OLS regression can be strongly affected by the presence of a few resource-wealthy outliers, we winsorize the data for the resource value before moving to the model estimation. The left part of the distribution is naturally limited by the hard zero threshold; so, we only winsorize the right end of the distribution at the 97.5 percentile.

Appendix Table A.2. US influence is predicted by country characteristics, bases and arms' trade are predicted by different country features (with the exception of population). Nonetheless, our results remain very similar across measures.

The dummy variable T_i represents our measure of third-party presence. The presence of the third party should deter conflicts more in areas where an intervention is easier. A sufficient–though not necessary–condition for a test of our theory is that conflict probability is non-monotonic in resource value only in areas with third-party influence. Therefore, we expect a significant negative squared coefficient only when considering the sum of the two coefficients, not interacted and interacted with our proxy for US proximity. In other words, we expect a negative and significant estimated $\beta_3 + \beta_4$ and a non-significant estimate for β_3. In addition, we formally test for an inverse-U shaped relation using the methodology suggested by Lind and Mehlum (2010), for countries with and without US involvement.

We will compare our main results to employing the USSR as an alternative third party. The USSR was a significant producer of oil, coal, and gas (Block, 1977), implying lower incentives to intervene to preserve access to oil. In this case, we can expect to find less evidence of non-monotonicity.

4.4 Main results and discussion

Results for the analysis on UCDP/PRIO data are shown in Table 1. Outcomes in (1), (2), (5), and (6) are the share of years in the sample with at least 25 battle-related deaths in the country. Other columns have the share of war years as an outcome, recording whether there were at least 1,000 battle-related deaths in the year. The first four columns have per-capita oil and its squared value as the main independent variables. We focus on oil since it represents the vast majority of resource value for countries–its average value is one order of magnitude larger than gas and coal elements of the analysis. Hence, we present only the coefficient for oil in this table, but a complete presentation of the results, including the coefficients for coal and gas, can be found in the Appendix Table A.3. In the last four columns, instead, we use sedimentary basins as a measure of resource value. All columns include year and continent controls. Odd columns include geographical controls. Errors are clustered at the country level.

In the first four columns, the estimated signs across value type and conflict measures agree with the non-monotonicity prediction for oil, displaying a positive sign on the linear term and a negative term on the square. Coefficients are significantly different from zero when controlling for all observables and when the dependent variable includes all conflicts, but they are not significant when we restrict to 'War.' In the last four columns, we report results using sedimentary basins, whose variation is more plausibly exogenous, as a measure of value. As with oil value, signs agree with the predictions of our model. In this case, the coefficient for the squared term is significant in all specifications except the one with controls and 'War' as a dependent variable. In addition, the exact test of an inverse-U shaped relation, reported in the last rows of the table, rejects the null of a monotonic or U-shaped relation at the 10% level in most specifications.

To provide an easier interpretation of our results, we provide the estimated peak of the hump-shaped relation in Table 1. For the WB oil measure, peaks range between 0.11 and 0.12 million dollars per person, well into the 0-0.243 winsorized range, even if only a few MENA countries

Table 1: Impact of Resources on Conflict

	Resource Value: Oil pc				Resource Value: Sedimentary basins			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Conf.	Conf.	War	War	Conf.	Conf.	War	War
Res. Value	3.216	3.334*	1.576	1.631	0.0986***	0.0575	0.0239	0.0114
	(2.406)	(1.811)	(1.252)	(1.170)	(0.0334)	(0.0387)	(0.0150)	(0.0206)
Res. Value^2	-13.71	-15.37**	-6.472	-6.971	-0.0150***	-0.0104**	-0.00376*	-0.00255
	(9.087)	(6.894)	(4.874)	(4.574)	(0.00446)	(0.00462)	(0.00198)	(0.00240)
H0: No inv.-U shape								
p-value	0.092*	0.034**	0.105	0.083*	0.002***	0.070*	0.057*	0.291
Gas, Gas^2	Yes	Yes	Yes	Yes	No	No	No	No
Coal, Coal^2	Yes	Yes	Yes	Yes	No	No	No	No
Continent FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geo Controls	No	Yes	No	Yes	No	Yes	No	Yes
Peak	0.12	0.11	0.12	0.12	3.28	2.78	3.17	2.23
N	115	115	115	115	115	115	115	115

Note: The outcome variable in (1), (2), (5), and (6) is the share of armed conflict years, defined as years with at least 25 battle-related deaths. Other columns have the share of war years as the outcome, defined as years with at least 1,000 battle-related deaths. In the first four columns, the main independent variables (resource value and squared resource value) are per capita oil and per capita oil squared in millions of constant dollars, measured by the World Bank; in the last four columns, the main independent variables are a measure of sedimentary basins' volume and the same variable squared, measured in tens of cubic kilometers. Errors are clustered at the country level. P-values are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

lie above the peak. As for sedimentary basins' volume, peaks are between 2.23 and 3.28 tens of cubic KM, compared to a 0-9.32 winsorized range and many countries are above this threshold. The countries closest to this threshold are Iraq, Norway, and Oman for oil and Mali, Pakistan, and Bolivia for sedimentary basins–considering 2.78 tens of cubic KM as the threshold.

We now turn to the analysis of how third-party presence influences the effect of resources. In Table 2 and Table 3 we focus on how US involvement mediates the effect of oil value or sedimentary basins on conflict by interacting the linear and squared coefficients with dummies for US influence. Dummies for US influence in these tables take value one, respectively, for countries less than 1000 km away from such a US base, and for countries that traded arms with the US. In both tables, in the first four columns, we define resource value as the amount of oil in a country; in the last four columns, instead, we define resource value based on the volume of sedimentary basins. We also report the linear combinations between base coefficients and interactions with relative p-values and run the exact test for non-monotonicity presented above.

As shown in Table 2, the non-monotonicity of conflict probability in oil value or sedimentary basins volume is driven by countries with or close to a US military base in 1950. Base oil coefficients for squared value, representing effects for countries with low US military involvement, are almost never significant, and their sign changes across specifications. Similarly, base coefficients are only significant at the 10% level in column 5, with no geographical controls. Instead, linear combinations, representing effects for countries with high US involvement, are always significant,

Table 2: Impact of Resources on Conflict by Third-Party Presence, by Contiguity to US Bases

	Resource Value: Oil pc				Resource Value: Sedimentary basins			
	Conf.	Conf.	War	War	Conf.	Conf.	War	War
Res. Value	-1.820	-1.485	0.428	-0.0877	0.0699*	0.0224	0.00552	-0.00709
	(3.494)	(3.157)	(1.425)	(1.450)	(0.0358)	(0.0392)	(0.0137)	(0.0193)
Res. Value^2	39.35	36.14	-5.670	1.253	-0.0119**	-0.00478	-0.00148	0.000274
	(48.82)	(44.23)	(20.30)	(20.32)	(0.00530)	(0.00512)	(0.00212)	(0.00242)
Linear Combination:								
Base + Inter. Coeff.								
Oil	8.4195***	7.2756***	4.2473***	4.1253***	0.2234***	0.1896***	0.0966***	0.0862**
p-value	0.000	0.000	0.000	0.000	0.000	0.003	0.005	0.020
Oil^2	-34.9491***	-31.3677***	-17.5416***	-17.3096***	-0.0302***	-0.0283***	-0.0129***	-0.0126***
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.005
H0: No inv.-U shape								
Base Coeff. p-value	.	.	0.393	.	0.027**	0.285	0.344	.
Base + Inter. Coeff. p-value	0.000***	0.000***	0.000***	0.000***	0.000***	0.002***	0.003***	0.011**
Gas, Gas^2	Yes	Yes	Yes	Yes	No	No	No	No
Coal, Coal^2	Yes	Yes	Yes	Yes	No	No	No	No
Continent FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geo Controls	No	Yes	No	Yes	No	Yes	No	Yes
Third Party	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	115	115	115	115	115	115	115	115

Note: The outcome variable in (1), (2), (5), and (6) is the share of armed conflict years, defined as years with at least 25 battle-related deaths. Other columns have the share of war years as the outcome, defined as years with at least 1,000 battle-related deaths. In the first four columns, resource value is measured by oil value per capita. In the last four, it is proxied by sedimentary basins in the country measured in tens of cubic kilometers. The resource value and its squared term are both interacted with a dummy which takes value one if the country had a US base in 1950 or was less than 1000km from a country having one. This table is referenced in Section 4.4. Errors are clustered at the country level. P-values are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

and their signs agree with our theory. The same pattern holds for the significance of the exact test for an inverse-U shape. For countries with no US presence, even signs do not agree with a hump-shaped effect in many cases, implying that the test statistic of Lind and Mehlum (2010) is not even defined.

In Table 3, we show similar results changing the definitions of US military involvement, using arms trade instead of the presence of a US base. The results for linear combinations are similar to the previous table. In all specifications, the coefficient is negative and significant at least at the 10% level. Also in this table, the resource value base coefficients are non-significant in most specifications, and the exact test for an inverse-U shape confirms these results.

To conclude our main analysis, we repeat the test in Table 3 using the USSR as an alternative third party. As we briefly explained above, we can argue that the USSR had less incentives to intervene in oil conflict because it was itself a major producer of hydrocarbons. Appendix Table A.6 backs the idea, showing the results of a regression where resource value is interacted with a dummy for arms' trade with the USSR.[54] The exact tests only support an inverse-U shape for countries exposed to USSR influence in three of the eight specifications. In addition, the test rejects the null in one case also for countries with low USSR influence. These results lend support to the argument that the interest of the third party in the resource is key in driving the relation between conflict probability and resource value.

[54]For the USSR, we were not able to assemble data on the presence of military bases. So, we limit our analysis to arms trade.

Table 3: Impact of Resources on Conflict by Third-Party Presence, by Arms Trade Relation with the US

	Resource Value: Oil pc				Resource Value: Sedimentary basins			
	Conf.	Conf.	War	War	Conf.	Conf.	War	War
Res. Value	1.947	2.473	0.432	0.505	0.0189	-0.00340	-0.00943	-0.0128
	(2.002)	(1.635)	(0.653)	(0.727)	(0.0369)	(0.0417)	(0.0177)	(0.0246)
Res. Value^2	-6.665	-10.62*	-1.100	-1.891	-0.00438	-0.0000605	0.00116	0.00177
	(7.617)	(6.231)	(2.470)	(2.837)	(0.00580)	(0.00535)	(0.00271)	(0.00307)
Linear Combination:								
Base + Inter. Coeff.								
Oil	4.8844*	4.2517	2.9307**	2.7690*	0.1443***	0.1146**	0.0428**	0.0325
p-value	0.086	0.114	0.048	0.071	0.001	0.011	0.027	0.181
Oil^2	-22.7968**	-20.5022*	-13.1134**	-12.4061**	-0.0219***	-0.0191***	-0.0068***	-0.0059**
p-value	0.050	0.062	0.030	0.046	0.000	0.001	0.008	0.044
H0: No inv.-U shape								
Base Coeff. p-value	0.229	0.067*	0.428	0.271	0.305	.	.	.
Base + Inter. Coeff. p-value	0.044**	0.059*	0.025**	0.037**	0.000***	0.006***	0.015**	0.092*
Gas, Gas^2	Yes	Yes	Yes	Yes	No	No	No	No
Coal, Coal^2	Yes	Yes	Yes	Yes	No	No	No	No
Continent FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geo Controls	No	Yes	No	Yes	No	Yes	No	Yes
Third Party	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	115	115	115	115	115	115	115	115

Note: The outcome variable in (1), (2), (5), and (6) is the share of armed conflict years, defined as years with at least 25 battle-related deaths. Other columns have the share of war as the outcome, defined as years with at least 1,000 battle-related deaths. The main independent variables are a measure of sedimentary basins' volume measured in tens of cubic kilometers, and its square, both interacted with a dummy taking value one if a third party is present in the country. In the first four columns, resource value is measured by oil value per capita. In the last four, it is measured by the volume of sedimentary basins in the country. Third-party presence is measured by the presence of arms' trade relation with the US in the 1950s. This table is referenced in Section 4.4. Errors are clustered at the country level. P-values are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4.5 Robustness checks

Overall, our results provide suggestive evidence that the relationship between resource value and conflict is non-monotonic and that third parties' presence drives such non-monotonicity. In the appendix, we assess the robustness of our findings to changes in the sample, estimated model, the measure of third-party presence or resource value employed. In Table A.7, Table A.8, and Table A.9, we run the same analysis excluding a resource outlier with low conflict, Australia, and the results remain similar. In Table A.10, we estimate a logit model instead of a linear probability model, obtaining results in line with our main specification.

In Appendix Table A.4 and Appendix Table A.5, we perform a robustness check using different measures for US involvement: affinity of the country's votes at UN General Assembly with the US and a dummy for high geographical distance from the USA. In both cases, results confirm our findings; countries with higher US influence drive the hump-shaped relationship between conflict probability and resource value.

Finally, in Table A.11, we show that our results are robust to using time variation in oil prices as a shock to resource value. In particular, we interact oil price and squared oil price in a given year with sedimentary basins volume and its square, respectively. The outcome variable in these specifications is a dummy variable recording whether there was a conflict in the specific year-country pair. Results are consistent with Table 1.

4.6 Limitations of our empirical strategy

Some limitations of our empirical strategy are worth mentioning here. First, the value of oil, gas, and coal could be influenced by conflict in an area. Using the data from 2014, we try to limit this effect, but it is still possible that conflicts that happened decades before affect the ability of a country to find and extract natural resources. However, the results of the analysis performed on the sedimentary basins are in line with the effects found for oil. In light of this, the reverse causality problem does not seem to threaten our empirical strategy.

Second, third parties other than the US could be present in some countries, e.g., the USSR. Since the latter countries are likely different from countries with US troops or US arms importers, this would likely produce a source of non-monotonicity in the 'control' group, going against our main hypothesis. In addition, as we discussed in Section 1, different main powers tend to build their own area of influence. Further, our model can be applied within each separate area of spheres of influence, as long as the different main countries are not interfering. If this is the case, the overall effect across the world is similar to the case of having just one powerful third party.

Conclusions

An extensive literature in economics and international relations has analyzed the resource curse of conflict, studying whether and how resource presence in an area induces conflict incentives. Resources controlled by a state actor or group can represent a honey pot, potentially prompting predation by other countries or parties. However, predation incentives are not enough to make for an increasing relation between resource abundance and conflict. In fact, this relation can be decreasing if we introduce conflict-stabilizing third parties in the analysis.

In this work, we develop a simple sequential game that considers third-party involvement in describing the relationship between conflicts and resource value, showing that third-party involvement creates a non-monotonic relationship between resource value and the probability of war. Our model also allows us to analyze the effects of resource value on alliance formation between profit-maximizing powerful third parties and resource-rich countries. We find that the ability of third parties to select their ally reinforces the stabilizing role of superpowers, strengthening our main result. Resource presence increases resource holders' military strength and the third party's incentive to side with them in conflict, further discouraging predator intervention.

We conduct an econometric analysis employing conflict UCDP/PRIO data, a measure of natural resource data from the World Bank, and plausibly exogenous measures of sedimentary basins, proxying for oil presence. We document an empirical hump-shaped relation between resource value and conflict probability, driven by countries exposed to US military involvement.

Our results on the relation among resource value, third-party influence, and conflict are particularly relevant given the fast pace of technological and environmental changes. In the last years, portable devices, such as smartphones, have become widespread globally; demand for lithium-ion batteries' raw materials, such as cobalt ore, has surged as a consequence. Such changes in global demand for minerals have likely shifted the incentives of engaging in conflict to control extraction areas. In addition, they probably induced higher third-party involvement in resource-rich regions by advanced economies producing portable devices or intermediate products. At the same time, in high-income countries, challenges raised by climate change have induced divestment of carbon-emitting technologies and investment in renewable energy. While the long-run consequences of this process are hard to grasp at the moment, demand for fossil fuels–and their price–will likely decrease in the future. Given the concentration of hydrocarbons extraction in the Middle East, this may impact the area's stability through predation incentives and stabilization incentives for third parties currently interested in oil price stability.

In our framework, third parties decide on alliances and interventions based on resource presence, taking as given their 'Sphere of Influence.' Future research should investigate how third parties decide on their involvement in the first place. On the one hand, geographical proximity, cultural, and ideological ties–e.g., during the Cold War–historically shaped incentives for third-party involvement. On the other hand, reliance on natural resources and their geographical concentration in some areas might make some alliance schemes more stable in the long term. Our model provides a valuable starting point to try and rationalize the formation of spheres of influence of different superpowers.

Despite leaving many relevant questions open for future research, our work shows that powerful third parties' incentives to intervene in war are a determinant of the resource curse of conflict.

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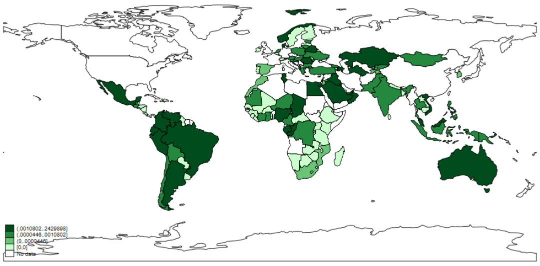
Appendices

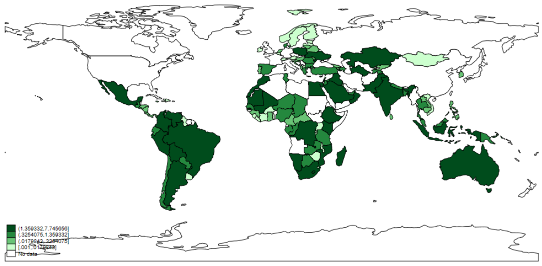
A.1 Figures

Figure A.1: Resource value by country

(a) Oil value



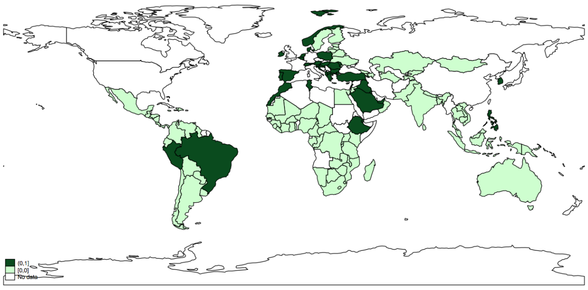
(b) Sedimentary basins volume



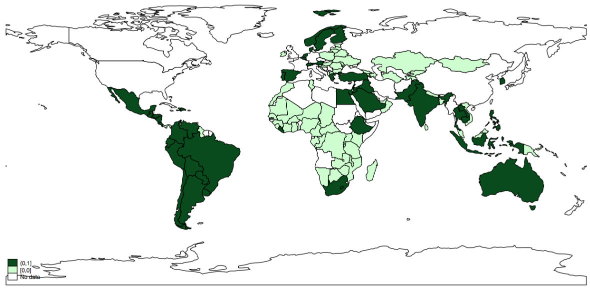
Note: This map reports measure of resource value by country. Panel A.1a reports the value of oil natural capital per capita in the country in 2014, in million dollars, according to the Wold Bank. Panel A.1b reports the volume of sedimentary basins in the country according to the CRUST dataset.

Figure A.2: third-party presence by country

(a) Contiguity to US bases in 1950

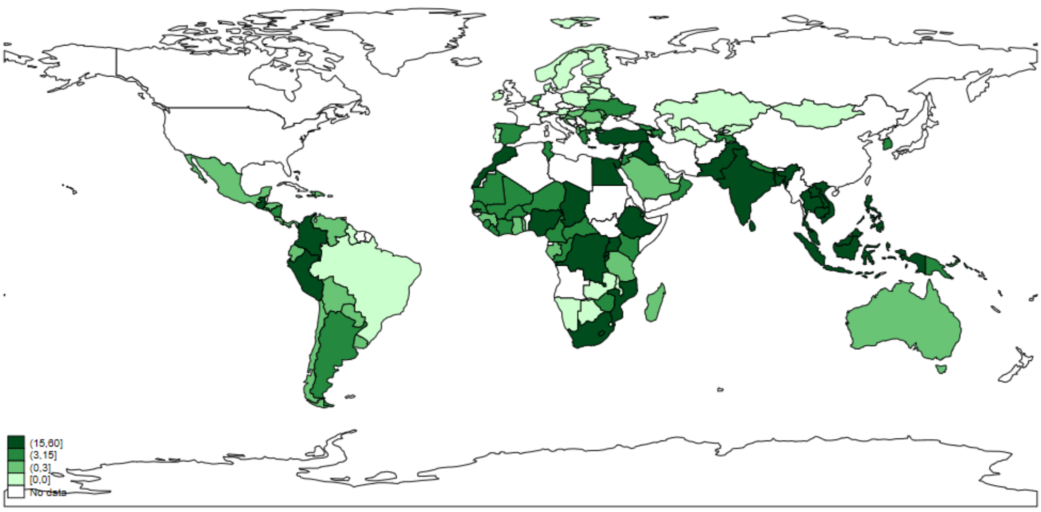


(b) US arms importers in the 1950s



Note: This map reports measure of third-party presence by country. In panel A.2a, third-party presence is measured by the presence of a US base with in the country or in a country less than 1000km away, in 1950. In panel A.2b, third-party presence is measured by whether the country is among US arms' importers in the 1950s.

Figure A.3: Conflict by Country



This map reports the total number of conflict years by country from 1950 till 2000, collected in UCDP/PRIO. Conflict is defined as at least 25 battle-related deaths. Referenced in Section 4.1.

A.2 Tables

Table A.1: Summary statistics

	Mean	sd	Min	Median	Max	N
(a): Resource presence						
Sedimentary basins volume	1.12	1.84	.001	.324	7.7	115
Oil value pc	.0103	.0404	0	.0000461	0.2	115
Gas value pc	.000757	.00229	0	2.93e-06	0.01	115
Coal value pc	.000227	.000722	0	0	0.004	115
(b): Geographic characteristics						
Area, (log Km^2)	7.67	1.57	1.85	7.79	11.3	115
Absolute latitude	25.4	17.2	1	22	64	115
Average altitude (Km)	.553	.486	.0242	.395	2.7	115
Dispersion in altitude	.367	.348	0	.265	1.9	115
Average temperature (C)	18.9	8.02	-.344	22	28.6	115
Average precipitation (mm)	90.8	61.3	2.91	82.9	260.0	115
Population, logs	16.4	1.34	13.5	16.2	21.0	115
(c): Conflict						
Conflict, at l. 25 deaths	.141	.204	0	.0556	0.7	115
Conflict, at l. 1000 deaths	.0449	.0847	0	0	0.4	115
(d): Third-party presence						
Close to US base	.287	.454	0	0	1	115
Traded arms with US	.409	.494	0	0	1	115
UNGA voting affinity	.711	.456	0	1	1	90
Distance from the US (Km)	8757	3214	2476	8336	16180.3	115

Note: summary statistics for the variables used in the analysis. Panel reports the mean, standard deviation, minimum, median, maximum values and number of observations for the measures of resource value: sedimentary basins volume, and oil, gas, and coal per capita. Panel (b) reports the same statistics for the geographical controls employed in the analysis, country areas, latitude, altitude mean and standard deviation, temperature in Celsius degrees, precipitation, and number of inhabitants in logs. Panel (c) reports summary statistics on the occurrence of conflict. Panel (d) reports third-party presence measures: a dummy for being close to a US base, having traded arms with the US or voting similarly (affinity larger than 0) on roll-call votes in the UN General Assembly (UNGA), and the distance from the US.

Table A.2: Determinants of third-party presence

	Bases	Arms' Trade
Area, (log Km^2)	-0.112***	0.0124
	(0.0308)	(0.0341)
Absolute latitude	0.00938	0.0190**
	(0.00793)	(0.00877)
Average altitude (Km)	-0.160	-0.158
	(0.155)	(0.172)
Dispersion in altitude	0.104	0.498***
	(0.167)	(0.184)
Average temperature (C)	0.00206	0.0242
	(0.0155)	(0.0172)
Average precipitation (mm)	-0.00117	0.00232**
	(0.000901)	(0.000998)
Population, logs	0.0950***	0.0900**
	(0.0358)	(0.0397)
Constant	-0.527	-2.406***
	(0.749)	(0.829)
Observations	115	115

Note: The outcome variable in the first column is a dummy taking value 1 if the country hosted a US military base in 1950 or was less than 1,000km away from a country hosting one. The outcome variable in the second column is a dummy taking value 1 if the country was a US arms' importer in the 1950s. Independent variables include country area, absolute latitude, average and dispersion in altitude, average temperature, average precipitation, and population in logs. This table is referenced in Section 4.4. Errors are clustered at the country level. P-values are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3: Impact of Resources on Conflict (extended)

	(1) Conf.	(2) Conf.	(3) War	(4) War	(5) Conf.	(6) Conf.	(7) War	(8) War
Oil	3.216	3.334^{*}	1.576	1.631				
	(2.406)	(1.811)	(1.252)	(1.170)				
Oil^2	-13.71	-15.37^{**}	-6.472	-6.971				
	(9.087)	(6.894)	(4.874)	(4.574)				
Gas	-27.55	-49.95^{**}	-19.93	-26.73^{**}				
	(26.71)	(21.52)	(13.41)	(12.44)				
Gas^2	582.8	3371.3^{**}	887.9	1756.9^{*}				
	(2110.5)	(1686.3)	(992.7)	(930.3)				
Coal	273.9^{***}	145.7	81.18^{***}	37.96				
	(105.7)	(92.99)	(29.75)	(30.01)				
Coal^2	-87114.0^{***}	-38496.3	-26198.7^{***}	-10660.1				
	(29626.7)	(25940.1)	(9117.6)	(9213.2)				
Sed. Vol.					0.0986^{***}	0.0575	0.0239	0.0114
					(0.0334)	(0.0387)	(0.0150)	(0.0206)
Sed. Vol.^2					-0.0150^{***}	-0.0104^{**}	-0.00376^{*}	-0.00255
					(0.00446)	(0.00462)	(0.00198)	(0.00240)
H0: No inv.-U shape								
p-value	0.092^{*}	0.034^{**}	0.105	0.083^{*}	0.002^{***}	0.070^{*}	0.057^{*}	0.291
Continent FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geo Controls	No	Yes	No	Yes	No	Yes	No	Yes
Peak	0.12	0.11	0.12	0.12	3.28	2.78	3.17	2.23
N	115	115	115	115	115	115	115	115

Note: The outcome variable in (1), (2), (5), and (6) is the share of armed conflict years, defined as years with at least 25 battle-related deaths. Other columns have the share of war years as the outcome, defined as years with at least 1,000 battle-related deaths. In the first four columns, the main independent variables are resource value and squared resource value per capita for oil, gas, and coal in millions of constant dollars, measured by the World Bank; in the last four columns, the main independent variable is a measure of sedimentary basins' volume, measured in tens of cubic kilometers. Errors are clustered at the country level. P-values are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.4: Impact of Resources on Conflict by Third-Party Presence, by UNGA Voting Similarity with the US

	Resource Value: Oil pc				Resource Value: Sedimentary basins			
	Conf.	Conf.	War	War	Conf.	Conf.	War	War
Res. Value	11.56	-6.253	15.19**	9.298	0.00203	-0.111	-0.0224	-0.0638
	(9.803)	(14.08)	(7.543)	(8.783)	(0.105)	(0.119)	(0.0372)	(0.0461)
Res. Value^2	-47.85	27.17	-61.95**	-37.16	0.00301	0.0429	0.00473	0.0208
	(39.58)	(57.58)	(30.94)	(36.22)	(0.0298)	(0.0361)	(0.0104)	(0.0128)
Linear Combination:								
Base + Inter. Coeff.								
Oil	2.1636	4.0502*	1.5131	2.1264	0.1375***	0.1086***	0.0384**	0.0290
p-value	0.527	0.089	0.359	0.129	0.000	0.009	0.027	0.206
Oil^2	-10.8685	-18.5592**	-6.9143	-9.2928*	-0.0204***	-0.0179***	-0.0059**	-0.0053*
p-value	0.421	0.048	0.289	0.092	0.000	0.001	0.014	0.061
H0: No inv.-U shape								
Base Coeff. p-value	0.121	.	0.025**	0.162	.	.	.	.
Base + Inter. Coeff. p-value	0.264	0.046**	0.181	0.066*	0.000***	0.005***	0.015**	0.105
Gas, Gas^2	Yes	Yes	Yes	Yes	No	No	No	No
Coal, Coal^2	Yes	Yes	Yes	Yes	No	No	No	No
Continent FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geo Controls	No	Yes	No	Yes	No	Yes	No	Yes
Third Party	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	90	90	90	90	90	90	90	90

Note: The outcome variable in (1), (2), (5), and (6) is the share of armed conflict years, defined as years with at least 25 battle-related deaths. Other columns have the share of war years as the outcome, defined as years with at least 1,000 battle-related deaths. The main independent variables are a measure of sedimentary basins' volume measured in tens of cubic kilometers, and its square, both interacted with a dummy taking value one if a third party is present in the country. In the first four columns, resource value is measured by oil value per capita. In the last four, it is measured by the volume of sedimentary basins in the country. Third-party presence by a dummy taking value 1 if the country has average measure of voting similarity to the US in the UN General Assembly roll-call votes larger than 0 between 1946 and 1965. This table is referenced in Section 4.4. Errors are clustered at the country level. P-values are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.5: Impact of Resources on Conflict by Third-Party Presence, by Being Close to the US

	Resource Value: Oil pc				Resource Value: Sedimentary basins			
	Conf.	Conf.	War	War	Conf.	Conf.	War	War
Res. Value	-0.466	-9.005	0.508	-2.909	0.0573	-0.00425	-0.00709	-0.0274
	(21.17)	(27.94)	(13.14)	(14.59)	(0.0764)	(0.0643)	(0.0343)	(0.0342)
Res. Value^2	5.762	116.5	-17.29	26.80	-0.00994	-0.00182	-0.000189	0.00242
	(257.3)	(340.8)	(160.4)	(177.3)	(0.00979)	(0.00792)	(0.00429)	(0.00406)
Linear Combination:								
Base + Inter. Coeff.								
Oil	3.9096	3.7402*	2.2053*	2.1398*	0.1104***	0.0855**	0.0337**	0.0286
p-value	0.126	0.054	0.077	0.066	0.002	0.048	0.044	0.183
Oil^2	-16.8671*	-17.3515**	-9.4182*	-9.4399**	-0.0162***	-0.0139**	-0.0048**	-0.0047*
p-value	0.092	0.024	0.055	0.039	0.001	0.011	0.037	0.082
H0: No inv.-U shape								
Base Coeff. p-value	.	.	0.485	.	0.227	.	.	.
Base + Inter. Coeff. p-value	0.064*	0.028**	0.040**	0.034**	0.001***	0.025**	0.023**	0.093*
Gas, Gas^2	Yes	Yes	Yes	Yes	No	No	No	No
Coal, Coal^2	Yes	Yes	Yes	Yes	No	No	No	No
Continent FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geo Controls	No	Yes	No	Yes	No	Yes	No	Yes
Third Party	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	115	115	115	115	115	115	115	115

Note: The outcome variable in (1), (2), (5), and (6) is the share of armed conflict years, defined as years with at least 25 battle-related deaths. Other columns have the share of war years as the outcome, defined as years with at least 1,000 battle-related deaths. The main independent variables are a measure of sedimentary basins' volume measured in tens of cubic kilometers, and its square, both interacted with a dummy taking value one if a third party is present in the country. In the first four columns, resource value is measured by oil value per capita. In the last four, it is measured by the volume of sedimentary basins in the country. Third-party presence is measured by a dummy taking value 1 if the country is less far from the US than the 75th percentile in the distribution of distances. This table is referenced in Section 4.4. Errors are clustered at the country level. P-values are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.6: Impact of Oil on Conflict by Third-Party Presence, USSR Arms trade

	Resource Value: Oil pc				Resource Value: Sedimentary basins			
	Conf.	Conf.	War	War	Conf.	Conf.	War	War
Res. Value	0.298	0.659	-0.110	-0.209	0.0559*	0.0161	0.00841	-0.00142
	(1.592)	(1.278)	(0.529)	(0.573)	(0.0321)	(0.0379)	(0.0137)	(0.0180)
Res. Value^2	-2.216	-4.836	0.162	0.254	-0.00992**	-0.00571	-0.00187	-0.00101
	(5.837)	(4.796)	(1.996)	(2.166)	(0.00426)	(0.00448)	(0.00180)	(0.00208)
Linear Combination:								
Base + Inter. Coeff.								
Oil	71.8904**	74.7069***	40.8644	42.9412	0.1734	0.0786	0.0626	0.0329
p-value	0.031	0.007	0.146	0.111	0.180	0.516	0.399	0.691
Oil^2	-9.3e+02*	-9.8e+02**	-5.3e+02	-5.6e+02	-0.0170	-0.0048	-0.0091	-0.0055
p-value	0.051	0.013	0.195	0.152	0.541	0.848	0.535	0.736
H0: No inv.-U shape								
Base Coeff. p-value	0.426	0.303	.	.	0.042**	0.336	0.270	.
Base + Inter. Coeff. p-value	0.029**	0.008***	0.103	0.081*	0.384	.	0.307	0.381
Gas, Gas^2	Yes	Yes	Yes	Yes	No	No	No	No
Coal, Coal^2	Yes	Yes	Yes	Yes	No	No	No	No
Continent FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geo Controls	No	Yes	No	Yes	No	Yes	No	Yes
Third Party	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	115	115	115	115	115	115	115	115

Note: The outcome variable in (1), (2), (5), and (6) is the share of armed conflict years, defined as years with at least 25 battle-related deaths. Other columns have the share of war years as the outcome, defined as years with at least 1,000 battle-related deaths. The main independent variables are a measure of sedimentary basins' volume measured in tens of cubic kilometers, and its square, both interacted with a dummy taking value one if a third party is present in the country. In the first four columns, resource value is measured by oil value per capita. In the last four, it is measured by the volume of sedimentary basins in the country. Third-party presence is measured by a dummy taking value 1 if the country has a arms' trade relation with the USSR in the 1950s. This table is referenced in Section 4.4. Errors are clustered at the country level. P-values are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.7: Impact of Resources on Conflict, Excluding Australia

	Resource Value: Oil pc				Resource Value: Sedimentary basins			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Conf.	Conf.	War	War	Conf.	Conf.	War	War
Res. Value	3.059	2.869	1.543	1.529	0.0941***	0.0546	0.0220	0.0103
	(2.489)	(1.914)	(1.285)	(1.212)	(0.0339)	(0.0405)	(0.0154)	(0.0217)
Res. Value^2	-13.19	-13.98*	-6.360	-6.664	-0.0138***	-0.00976*	-0.00330	-0.00234
	(9.389)	(7.302)	(4.988)	(4.717)	(0.00464)	(0.00505)	(0.00212)	(0.00264)
H0: No inv.-U shape								
p-value	0.111	0.068*	0.116	0.105	0.003***	0.090*	0.078*	0.318
Gas, Gas^2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Coal, Coal^2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Continent FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geo Controls	No	Yes	No	Yes	No	Yes	No	Yes
Peak	0.12	0.10	0.12	0.11	3.40	2.80	3.34	2.21
N	114	114	114	114	114	114	114	114

Note: The outcome variable in (1), (2), (5), and (6) is the share of armed conflict years, defined as years with at least 25 battle-related deaths. Other columns have the share of war years as the outcome, defined as years with at least 1,000 battle-related deaths. In the first four columns, the main independent variables are resource value and squared resource value per capita for oil, gas, and coal in millions of constant dollars, measured by the World Bank; in the last four columns, the main independent variable is a measure of sedimentary basins' volume, measured in tens of cubic kilometers. This table is referenced in Section 4.4. In this Table, the sample excludes Australia. Errors are clustered at the country level. P-values are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.8: Impact of Resources on Conflict by Third-Party Presence, by Contiguity to US Bases (excl. Australia)

	Resource Value: Oil pc				Resource Value: Sedimentary basins			
	Conf.	Conf.	War	War	Conf.	Conf.	War	War
Res. Value	-2.333	-2.397	0.278	-0.362	0.0605	0.00125	0.000695	-0.0162
	(3.579)	(3.100)	(1.453)	(1.436)	(0.0388)	(0.0434)	(0.0154)	(0.0221)
Res. Value^2	43.36	39.15	-4.501	2.158	-0.00956	-0.000475	-0.000267	0.00214
	(49.63)	(43.49)	(20.51)	(20.06)	(0.00653)	(0.00590)	(0.00269)	(0.00294)
Linear Combination:								
Base + Inter. Coeff.								
Oil	8.4297***	7.2236***	4.2503***	4.1097***	0.2238***	0.1857***	0.0967***	0.0846**
p-value	0.000	0.000	0.000	0.000	0.000	0.003	0.005	0.022
Oil^2	-35.1336***	-31.7828***	-17.5954***	-17.4345***	-0.0302***	-0.0282***	-0.0129***	-0.0125***
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.005
H0: No inv.-U shape								
Base Coeff. p-value	.	.	0.424	.	0.095*	0.489	0.482	.
Base + Inter. Coeff. p-value	0.000***	0.000***	0.000***	0.000***	0.000***	0.002***	0.003***	0.012**
Gas, Gas^2	Yes	Yes	Yes	Yes	No	No	No	No
Coal, Coal^2	Yes	Yes	Yes	Yes	No	No	No	No
Continent FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geo Controls	No	Yes	No	Yes	No	Yes	No	Yes
Third Party	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	114	114	114	114	114	114	114	114

Note: The outcome variable in (1), (2), (5), and (6) is the share of armed conflict years, defined as years with at least 25 battle-related deaths. Other columns have the share of war years as the outcome, defined as years with at least 1,000 battle-related deaths. The main independent variables are a measure of sedimentary basins' volume measured in tens of cubic kilometers, and its square, both interacted with a dummy taking value one if a third party is present in the country. In the first four columns, resource value is measured by oil value per capita. In the last four, it is measured by the volume of sedimentary basins in the country. Third-party presence is measured by a dummy taking value 1 if the country had a US base in 1950 or was less than 1000km from a country having one. This table is referenced in Section 4.4. In this Table, the sample excludes Australia. Errors are clustered at the country level. P-values are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.9: Impact of Resources on Conflict by Third-Party Presence, by Arms Trade Relation with the US (excl. Australia)

	Resource Value: Oil pc				Resource Value: Sedimentary basins			
	Conf.	Conf.	War	War	Conf.	Conf.	War	War
Res. Value	1.243	1.107	0.194	0.0670	0.0186	-0.00384	-0.00953	-0.0129
	(1.897)	(1.366)	(0.590)	(0.664)	(0.0371)	(0.0419)	(0.0178)	(0.0247)
Res. Value^2	-3.940	-5.526	-0.179	-0.259	-0.00441	-0.0000432	0.00115	0.00178
	(7.322)	(5.237)	(2.233)	(2.605)	(0.00585)	(0.00538)	(0.00273)	(0.00308)
Linear Combination:								
Base + Inter. Coeff.								
Oil	4.9420*	4.2612	2.9502**	2.7721*	0.1354***	0.1121**	0.0401**	0.0319
p-value	0.083	0.113	0.047	0.070	0.001	0.015	0.047	0.202
Oil^2	-23.5364**	-21.8388**	-13.3635**	-12.8348**	-0.0197***	-0.0184***	-0.0061**	-0.0058*
p-value	0.043	0.047	0.027	0.038	0.000	0.002	0.025	0.064
H0: No inv.-U shape								
Base Coeff. p-value	0.348	0.210	.	0.463	0.309	.	.	.
Base + Inter. Coeff. p-value	0.043**	0.058*	0.025**	0.036**	0.001***	0.008***	0.025**	0.102
Gas, Gas^2	Yes	Yes	Yes	Yes	No	No	No	No
Coal, Coal^2	Yes	Yes	Yes	Yes	No	No	No	No
Continent FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geo Controls	No	Yes	No	Yes	No	Yes	No	Yes
Third Party	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	114	114	114	114	114	114	114	114

Note: The outcome variable in (1), (2), (5), and (6) is the share of armed conflict years, defined as years with at least 25 battle-related deaths. Other columns have the share of war years as the outcome, defined as years with at least 1,000 battle-related deaths. The main independent variables are a measure of sedimentary basins' volume measured in tens of cubic kilometers, and its square, both interacted with a dummy taking value one if a third party is present in the country. In the first four columns, resource value is measured by oil value per capita. In the last four, it is measured by the volume of sedimentary basins in the country. Third-party presence is measured by the presence of arms' trade relation with the US in the 1950s. This table is referenced in Section 4.4. In this Table, the sample excludes Australia. Errors are clustered at the country level. P-values are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.10: Impact of Resources on Conflict, Logit

	(1) Conf.	(2) Conf.	(3) War	(4) War	(5) Conf.	(6) Conf.	(7) War	(8) War
main								
Oil	51.65	119.2***	-11.11	-2.501				
	(39.06)	(44.58)	(24.58)	(26.81)				
Oil^2	-87.91	-253.3	32.21	5.567				
	(128.5)	(180.6)	(113.5)	(117.1)				
Gas	994.7	624.7	897.8	636.4				
	(774.8)	(1162.9)	(771.5)	(692.9)				
Gas^2	-193877.4	-232673.7	-163924.3	-126987.6				
	(118551.1)	(158030.9)	(102167.0)	(95774.5)				
Coal	-395.3	-1915.3	1887.5**	1310.4				
	(1027.0)	(1393.4)	(940.4)	(966.6)				
Coal^2	-236486.1	347751.2	-653723.7**	-374768.7				
	(369413.8)	(431305.2)	(290682.8)	(292058.5)				
Sed. Vol.					0.999**	0.982	0.714**	0.675
					(0.490)	(0.694)	(0.332)	(0.524)
Sed. Vol.^{2}					-0.163**	-0.163*	-0.121**	-0.116*
					(0.0681)	(0.0878)	(0.0523)	(0.0651)
Continent FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geo Controls	No	Yes	No	Yes	No	Yes	No	Yes
Peak	0.29	0.24	0.17	0.22	3.07	3.01	2.95	2.91
N	115	115	115	115	115	115	115	115

Note: The outcome variable in (1), (2), (5), and (6) is the share of armed conflict years, defined as years with at least 25 battle-related deaths. Other columns have the share of war years as the outcome, defined as years with at least 1,000 battle-related deaths. In the first four columns, the main independent variables are resource value and squared resource value per capita for oil, gas, and coal in millions of constant dollars, measured by the World Bank; in the last four columns, the main independent variable is a measure of sedimentary basins' volume, measured in tens of cubic kilometers. This table is referenced in Section 4.4. Errors are clustered at the country level. P-values are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.11: Impact of Sedimentary Basins and Prices on Conflict

	(1) Conf.	(2) Conf.	(3) War	(4) War
Sed. Vol. $\times$ Oil Price	0.114*	0.114*	0.0869	0.0869
	(0.0643)	(0.0643)	(0.0547)	(0.0547)
Sed. Vol.^{2} $\times$ Oil Price^2	-0.0193**	-0.0193**	-0.0134*	-0.0134*
	(0.00933)	(0.00933)	(0.00783)	(0.00783)
Year FEs	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes
Geo Controls	No	Yes	No	Yes
Peak	2.96	2.96	3.24	3.24
N	6095	6095	6095	6095

Note: The outcome variable in (1) and (3) is a conflict dummy, defined as episodes with at least 25 battle-related deaths. Other columns have war episodes as the outcome, defined as episodes with at least 1,000 battle-related deaths. The main independent variables are a measure of sedimentary basins' volume, measured in tens of cubic kilometers, interacted with yearly oil prices in 2012 dollars and this value squared. This table is referenced in Section 4.4. Errors are clustered at the country level. P-values are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

A.3 Additional theoretical results

A.1 Intervention motivated by avoiding production disruptions

In this section, we explore a variant of the model in which the third party does not form a stable alliance with one of the contenders, but can costlessly form a trade relationship with whichever among the predator and the resource owner is the winner of the war. Hence, intervention cannot be motivated by the loss of access to the resource. Instead, we are going to assume that war without intervention entails a higher risk of destruction of natural resource (or capital and infrastructure needed for extraction), unless the third party intervenes, quickly resolving conflict. The goal of the section is to show that the result above carries through also in this alternative setting.

Formally, we are going assume that, if there is no intervention, the payoff of the third party is $\alpha(p_w)\Pi_T$, where $\alpha \in (0, 1]$ represents the fraction of resource lost in conflict. The simplest case is in which this fraction is constant but, consistently with allowing variation in military strength, we allow α to depend on p_w, to reflect the fact that the balance of forces may affect the amount of destruction due to war.[A.1] In case we expect asymmetry of forces to be the most destructive cases, we have the more general result. In case we expect instead symmetry of forces to be the most destructive case, because for example that is the case in which we can expect fighting to be last longer and cause more destruction,[A.2] then our result carries through, provided condition SI_T holds. We are going to assume that α is differentiable and its derivative is bounded.

The timing of the game is as follows:

1. the predator decides if to attack or not;
2. the third party decides if to intervene in favor of the predator (I_P), intervene in favor of the resource holder (I_R), or not intervene.

Moreover, we are going to add some structure to the costs of war:

Costs of war 1 – CW1 μ_P and μ_R are differentiable, bounded, $\mu'_P \leq 0$, $\mu'_R \geq 0$. Moreover:

1. if P wins for sure intervention in favor of P is less costly: $\mu_P(1) < \mu_R(1)$;
2. if R wins for sure intervention in favor of R is less costly: $\mu_P(0) > \mu_R(0)$.

The assumption above has the consequence that $\mu_P - \mu_R$ is monotonic, so there are no multiple regions with changes of alliance; the increase of p has the unambiguous effect of making more convenient to support P. Note that the case in which both are constant (or even zero, as in the simplified model) is a special case of the above assumption.

If P does not attack, the intervention choice is immaterial. Instead, if P attacks, different equilibria emerge based on the value of v. Under the assumptions above, if v is high enough, so

[A.1] We can of course expect some fraction of resource to be lost in conflict even with intervention. If we define this baseline rate of loss ζ and the fraction of resource lost without intervention as $\zeta\alpha$, all the results follow through. We set $\zeta = 1$ in the main text for simplicity.

[A.2] In this case α could for example be u-shaped: there exist a p^* such that η is decreasing for $p < p^*$ and is increasing for $p > p^*$.

that p_w is close enough to 0, T intervenes in favor of the resource holder R. This is because if p is small enough, by the assumption above, $\mu_P > \mu_R$. The behavior when v is close to 0 instead depends on the relative military investments of R and P absent the natural resource, that is $p_w(0)$. If $p_w(0)$ is sufficiently close to 1, we have that $\mu_R(p_w(0)) > \mu_P(p_w(0))$; so, for small v, the intervention might be in favor of P, otherwise it is always in favor of R.

All the other assumptions on payoffs and error terms are as in the previous section.

The key mechanism is that the preferred ally of the third party in case of intervention is still given by the relative size of μ_P and μ_R, that means that it is still the case that intervention is in favor of P for v small, and in favor of R for v large. If v is small, there is no intervention regardless of the shape of α. If v is large, the shape of α matters: if asymmetry is destructive then as the resource holder grows powerful this might trigger more intervention, and less conflict via deterrence. If asymmetry is not destructive, as the resource holder grows powerful the incentive to intervene decreases and it has to be balanced with the increase in value, in a way very similar to what discussed in the previous section. The proof follows directly below.

Proposition A.3.1. *Assume RC, AI and $CW1$. The probability of conflict is increasing for small v.*

If $\alpha(0) < 1$ (asymmetry of forces is destructive) then the probability of conflict is decreasing for large v. If $\alpha(0) = 1$ (asymmetry of forces is not destructive), then the probability of conflict is decreasing for large v if SI_T is satisfied.

Proof. T prefers to intervene in favor of R if:

$$\mu_R < \mu_P$$

$$\Pi_T - \mu_R - \varepsilon_T > \alpha \Pi_T$$

It prefers to intervene in favor of R if:

$$\mu_R > \mu_P$$

$$\Pi_T - \mu_P - \varepsilon_T > \alpha \Pi_T$$

It prefers to stay out otherwise. In the first stage P chooses to attack depending on the intervention choice and the values of ε_P, similarly as in the proof of Theorem 2.1.

So the intervention choice depends uniquely on the μs, and by CW it follows that intervention is in favor of R if sufficiently high.

Hence, if v is sufficiently small, and intervention is in favor of P the probability of conflict is:

$$F_P(p_w \Pi_P(v)) + F_T((1-\alpha)\Pi_T - \mu_P)(F_P(\Pi_P(v)) - F_P(p_w \Pi_P(v)) + F_P(0)$$

The derivative is:

$$f_P(p'_w \Pi_P + p_w \Pi'_P) + f_T(-\eta' p' \Pi_T + (1-\eta)\Pi'_T - \mu'_P p'_w)\Delta F_P + F_T(f_P \Pi'_P - f_P(p'_w \Pi_P + p_w \Pi'_P))$$

now proceeding as in the proof of 2.1 we see that if $v \to 0$ the only surviving term is $p_w \Pi'_P > 0$, so the derivative is positive.

If for v small intervention is in favor of R, the the calculations are analogous to Proposition 2 and we again obtain that the probability is increasing.

If v is sufficiently large the intervention is in favor of R. The probability of conflict is:

$$F_P(p_w\Pi_P)(1 - F_T((1-\alpha)\Pi_T - \mu_R)$$

The derivative is:

$$f_P(p'Pi_P + pPi'_P)(1 - F_T) - f_T(-\alpha' p'\Pi_T + (1-\alpha)\Pi'_T - \mu'_R p')F_P$$

Proceeding as in the previous proof, we have to study the sign of:

$$(1-\eta)\Pi'_T - \eta' p'\Pi_T - \mu'_R p'$$

a sufficient condition for this to be positive is:

$$\frac{\Pi'_T}{\Pi_T} > \frac{\alpha' p'}{1-\alpha}$$

If $\alpha' \leq 0$ for v large this is true. If $\alpha' > 0$ then for v large we have that $\frac{\alpha' p'}{1-\alpha} \sim \frac{p'}{p}\alpha' \frac{p}{1-\alpha}$. Now $\frac{p}{1-\alpha}$ converges to 0 if $1 - \alpha(0) > 0$. Otherwise, it converges to an indeterminate form $\frac{0}{0}$, so that by De l'Hôpital Theorem it is asymptotically equivalent to: $\frac{p'}{-\alpha' p'} = -\frac{1}{\alpha'}$. Hence the whole expression is asymptotically equivalent to:

$$\frac{\alpha' p'}{1-\alpha} \sim -\frac{p'}{p}\alpha' \frac{1}{\alpha'} = -\frac{p'}{p}$$

so that the condition is equivalent to:

$$\frac{\Pi'_T}{\Pi_T} > -\frac{p'}{p}$$

□

A.2 Private information on war costs

In this section, we explore the robustness of our baseline result if the costs ε_i are players' private information. This captures the idea that the different parties may not be able to perfectly observe each other's military capacity, internal consensus, and other factors that might contribute to the war cost. This different assumption also provides a context in which there is intervention on the equilibrium path, that might be useful in applications.

For simplicity, now assume $\varepsilon_P > 0$, and $M < \infty$. The game formally becomes a dynamic bayesian game. We look for the Perfect Bayesian Equilibrium; this is a simple task in this context because the cost of P does not affect the payoffs of T directly. Hence, the decision of T will depend only on the attack choice. Therefore, we can neglect beliefs of T about the cost–players do not need to do bayesian updating.

Now, we can closely mimic the analysis done for the baseline, and the results go through. The intuition is a close analog to the baseline, the difference being that now P takes into account the expected probability of an intervention rather than the intervention itself. As in the baseline, if the value is small, the third party almost surely will not intervene. Hence, an increase in the value will incentivize the predator to attack for many realizations of ε_P, so that the predation effect dominates the deterrence. If the value is high, the third party will almost surely intervene, so an increase in the value of the resource will increase the incentives to attack for very few realizations of ε_P, so the deterrence effect dominates.

Formally, we can state the following proposition.

Proposition A.3.2. *In the model with asymmetric information, if we assume AI, EE and RC, the probability of conflict is increasing for small v and decreasing for high v.*

Proof. The expected gain from a war for P is $p_w\Pi_P(1 - F_T(p_w\Pi_T)) - \varepsilon_P$. Then there are also here three types of equilibria:

- If $p_w\Pi_P(1 - F_T((p_w)\Pi_T)) < \varepsilon_P$, P never wants to attack and there is no war;
- If $p_w\Pi_P(1-F_T((p_w)\Pi_T)) > \varepsilon_P$ then P attacks and there is war. If in addition $(p_w)\Pi_T(v) > \varepsilon_T$ then there is intervention, otherwise there is no intervention.

The analysis of the alliances proceeds in a very similar way: for v small enough T is allied to P, for v large enough is allied to R. If v is small the analysis is identical to the theorem in the text.

If v is large the probability of conflict is:

$$F_P((p_w\Pi_P - \mu_P)(1 - F_T(p_w\Pi_T - \mu_R)))$$

derivative of probability of conflict when T allied with R (high v) is:

$$P' = f_P^R\left(-f_T^R((\beta_T + p_w)\Pi'_T + p'_w\Pi_T - \mu'_R p'_w)\Pi_P p_w + (1 - F_T^R)(\Pi'_P p_w + \Pi_P p'_w)\right)$$

Now $\mu'_R \to 0$, so this is the same as:

$$f_P^R\left(-f_T^R((\beta_T + p_w)\Pi'_T + p'_w\Pi_T)\Pi_P p_w + (1 - F_T^R)(\Pi'_P p_w + \Pi_P p'_w)\right) < 0$$

Now if $M < \infty$ everything remains finite apart from $1 - F_T^R$ and possibly f_T^R. IF $f_T^R(M) > 0$ we are done. If not, using the approximation $1 - F_T^R \sim f_T^R(M - (\beta + p_w)\Pi_T + \mu_R)$ (for $M > (\beta + p_w)\Pi_T - \mu_R$, zero otherwise), we find that the above is positive if and only if

$$-f_T^R((\beta_T + p_w)\Pi'_T + p'_w\Pi_T)\Pi_P p_w + f_T^R(M - (\beta + p_w)\Pi_T + \mu_R)(\Pi'_P p_w + \Pi_P p'_w) < 0$$

$$-((\beta_T + p_w)\Pi'_T + p'_w\Pi_T)\Pi_P p_w + (M - (\beta + p_w)\Pi_T + \mu_R)(\Pi'_P p_w + \Pi_P p'_w) < 0$$

and the second term goes to zero. Moreover, the first term is negative if either $\beta_T > 0$, or SI_T holds.

□

A.3 Full characterization of the shape of the probability

In this section, we focus on the simplified model of Section 1, and show how one can characterize the full shape of the probability of conflict under additional assumptions.

We are going to need the following stronger assumption on the payoffs:

Decreasing Ratio of Marginals - DRM Assume that $\frac{\Pi'_P(v)}{\Pi'_T(v)}$ is non-increasing.

Another way to express the last condition is that the marginal value grows faster for the third party than the predator - or it decreases more slowly. We can think of a third party better able to exploit the resource across values of v, so that the returns to scale in extraction are less decreasing than for the predators. This idea is consistent with the interpretation that the third party is a powerful, advanced economy. Note that DRM implies EE, so that the conditions of this section are strictly more stringent than the ones studied in the text.

The result is the following.

> **Proposition A.3.3.** *Assume AI, RC, DRM, and that densities f_i are log-concave. The probability of war $\mathbb{P}(war; v)$ has only one maximum.*

A.4 Civil wars: bargaining and non-concentrated resources

So far, we have interpreted our model through the lens of interstate conflict. In this section, we show that our results are robust to a setting of civil war. To do that, we build two extensions of our model that are particularly relevant for this case. First, since shared institutions likely increase the ability to enforce conflict-avoiding contracts, we analyze the case of bargaining. Second, we look to the case of non-concentrated resources, in which resource holder and predator partially share the resource, modeling the case in which different groups control different areas of a country, homogeneous in terms of resource presence. To simplify the analysis and have lighter formulas, from now on, we work under the simplified model of section 1, in which $supp f_i = [0, M]$, $M < \infty$.

A.1 Bargaining

If country R is resource-rich, in principle, it could avoid war by 'buying off' the predator. Under a classical bargaining framework, similar to Fearon and Laitin (2003), conflict can arise. As we show, when it does, the probability of war follows the same non-monotonic pattern of the previous sections.

We assume that, before the game outlined in the previous section starts, the resource holder R has a chance to make a take-it-or-leave-it offer to the predator P, inducing her not to declare war. At the time of the offer, R does not know the war cost of P. If P accepts, there is no war; if it rejects, the game proceeds as before.

The possibility of bargaining allows for a new trade-off. On the one hand, the increase in the resource value v enlarges the total surplus to be split, facilitating successful bargaining; on the other hand, it makes the prize of war more attractive. Assuming, for simplicity, that the distribution of errors is uniform on $[0, 1]$, we find a simple condition that allows us to understand which effect will prevail, detailed in the following proposition:

Proposition A.4.1. *Assume AI, RC, and that F_P is the uniform distribution on $[0, 1]$. Under the bargaining procedure detailed above, conflict can occur in equilibrium if there exists an interval of values of v in which $\Pi_P - \Pi_R$ is increasing.*

If $\Pi_P - \Pi_R$ is increasing in v, then the probability of conflict is hump-shaped in the resource value v.

If $\Pi_P - \Pi_R$ is increasing for small v and decreasing for large v, then the probability of conflict is hump-shaped in v even if there is no third party.

More concretely, in contexts where bargaining is possible, the behavior of the probability of conflict depends on how fast the value of the resource for the predator grows with respect to the value for the resource holder, as measured by $\Pi_P - \Pi_R$. If this quantity is decreasing, then the payoff from v is larger for the resource holder; so, R will always be able to offer an amount high enough to buy off the predator. If it is increasing, instead, the ability of the resource holder to buy off the predator decreases with the resource value, hence, symmetrically, the incentive for predation and the probability of attack increases. As an instance, suppose that payoffs are given by:

$$\Pi_P = \sqrt{v} \quad \Pi_R = \sqrt{v + A}$$

where $A > 0$ represents the higher level of wealth of R. In this case is immediate to verify that $\Pi_P - \Pi_R$ is increasing. This represents a situation in which the predator has access to a similar technology for exploiting the resource but it is poorer than the resource holder; so, a marginal increase in the resource value is more profitable for P than for R.[A.3] In this case, conflict can arise and the usual mechanics of third-party intervention generate an hump shape in conflict probability.

As we clarified in the previous proposition, a non-monotonicity in the conflict probability can arise under bargaining even in the absence of third-party influence. Consider the following modification of the previous example:

$$\Pi_P = B\sqrt{v} \quad \Pi_R = \sqrt{v + A}$$

where $A > 0$ represents the higher level of wealth of R, and $B < 1$ the 'total factor productivity' of P's economy. In this case, $\Pi_P - \Pi_R$ is increasing if and only if $v < AB^2/(1 - B)^2$. Then, an increase resource value reduces R's ability to buy off P for low values of v, and the reverse occurs for high v.

[A.3] Another example in which the difference in payoffs is increasing is the framework described in Section 3, where the resource owner payoff comes from the profit raised from selling the resource to the third party. In this case, this condition is satisfied if, for example, the resource holder R has access to more extraction sites beyond the contested one that can be seized by P. If this is the case, we find that $\Pi_P - \Pi_R$ is increasing because of decreasing marginal returns of the resource; hence conflict can arise.

A.2 Non-concentrated resources

In a civil war, natural resource ownership is hard to enforce perfectly, especially if the resource is spread across an area. For instance, it might be hard or impossible for one of the parties in conflict to control *all* of the extraction sites for a given mineral. Rebels or armed groups can appropriate amounts of the resource with relatively less effort than in the context of interstate wars by exploiting pre-war control of extraction areas. Rebels in a civil war might benefit from the natural resource as much as the central government (or adversary armed group) and use it as a financing channel for conflict, as discussed, e.g., by Collier and Hoeffler (2004). Hence, in this section, we relax the assumption that, absent conflict, the natural resource benefits only player R. Now, the predator has access to a constant fraction η of the profits from the resource.[A.4] In particular, assume there is a function $\pi(v)$ representing such profits, and assume that it is increasing (and satisfies the necessary regularity conditions). Assume that R and P earn fractions of it in the status quo: $\eta\pi(v)$ and $(1-\eta)\pi(v)$. If P wins the conflict, it can secure the full amount of profits: $\pi(v)$. Hence, the payoff of P from the conflict is $\Pi_P = (p_w - \eta)\pi$.

The payoff of the third party, Π_T, may now depend on η. For instance, the third party might earn a royalty τ out of the resource profit earned by the incumbent. Under this assumption $\Pi_T = (1-\eta)\tau\pi(v)$. If the payoff of the third party derives instead from using the natural resource for production, η might enter the payoff in a more complex way. In any case, we assume that $\Pi_T(v)$ is increasing in v; the larger the value, the larger the benefit for the third party deriving from the resource.

Given the specified payoffs, apart from the technical regularity conditions, if the Aligned Interests condition holds, we have the usual non-monotonicity of conflict in resource value. Namely, we need to check whether Π_P is increasing. This is true if and only if $p_w > \eta$. In this case, Proposition 2 holds, and the probability of conflict is still hump-shaped. The difference $p_w - \eta$ has an interesting interpretation as comparing P's 'economic' and 'military' strengths. If the difference is negative, P can secure a high fraction of resources under the status quo, but it would hardly win in a military confrontation; if it is positive, P has access to a very low fraction of resources even if its military strength is high. Then, conflict occurs if P's 'military power' is greater than its 'political power' η. In recent literature, this *mismatch* between political and military power has been proposed as one important driver of conflict–see, for instance, Esteban et al. (2020), Herrera et al. (2019).

A.3 Third party as a seller of the resource: Multinationals extracting resources

In this section, we illustrate how our general framework can accommodate the case of a third party that is not a buyer of the resource, as in 3, but a seller. A leading example of this is a multinational firm extracting a resource and selling it in the market. Assume that such a firm earns a profit and pays royalties that could attract other players' attention, such as neighboring countries or rebel groups in the country.

[A.4] In Appendix Section A.4, we study the case in which the predator has access to a fraction of the resource quantity, delivering very similar results to the ones in this section.

The Colombian context represents a good instance of this process. Oil extraction attracted many multinational corporations: British Petroleum, Occidental Petroleum Corp., and Texas Petroleum Company (Richani, 2005). This contributed to exacerbate civil conflict in the country among the government, left-wing *Guerrillas* and the paramilitary groups–see, for instance, Richani (2005) and Dube and Vargas (2013). Multinational firms do not have an army, but they can command military power in two ways: lobbying activities prompting the intervention of a military power, the US, and subcontracting to security services and the Colombian Army (Richani, 2005).

Let us consider this situation in light of our model. The third party T is a multinational firm, player R is the Colombian municipality where royalties are paid, and P is a rebel group stealing the resource.

The multinational firm takes the international price p as given. This assumption is realistic in the Colombian case since Colombia is a minor oil-producer; according to EIA data, Colombia provided around 1% of world daily barrels in 2000. Also, profits are positive in the model because of entry barriers in the extraction sector. We abstract from the royalties that it is paying to the resource owner since this player is never active, so the results will not depend on them.

In this context, we can think of the value of the resource as being parameterized by the exogenous price p. In the language of our abstract model, let $v = p$. We can write the third party's profit function π as:

$$\pi(p) = \max_{q_1, q_2, \dots, q_n} \left(pF(q_1, q_2, \dots, q_n) - \sum_i w_i q_i \right)$$

where the vector q indicates all the inputs that the firm needs to extract the resource, and w is the vector of input prices. We think of the input prices as fixed parameters.

The predator aims to appropriate part of the profits from the sale of the resource, so its possible gain is:

$$\Pi_P = \pi(p)$$

There are various reasons why the third party might be concerned about conflict. The predator could disrupt the resource's extraction; alternatively, it might impose higher royalties or appropriate the profits altogether. We capture these incentives by assuming that if P wins a fraction $1 - \delta$ of the profit is lost, so that $\Pi_T = \delta\pi(p)$.[A.5]

In this case, we investigate the impact of exogenous changes in the market price of the resource. Price changes arise as a consequence of many different events. For example, a productivity shock of the type analyzed in the previous section might drive the price up, while an increase in competition would have the opposite effect.

Since the third party behaves as a competitive neoclassical firm, it is immediate to compute the marginal impact of a variation in the price of the resource. By Shephard's Lemma, the marginal

[A.5] This is equivalent to assuming that the production is not affected directly by conflict, but input prices are higher in case of war.

impact of a variation in the output price is equal to the output quantity:

$$\frac{\partial \Pi_P}{\partial p} = F(q)$$

$$\frac{\partial \Pi_T}{\partial p} = \delta F(q)$$

so that condition AI and RC are satisfied, and Proposition 2 applies.[A.6]

To check if it is possible to apply Theorem 2.1, we need to check assumption SI_T, that is the behavior of $p_w \Pi_T$. Consider a Tullock CSF as in Section 2.1. Then we want to check:

$$\lim_{p\to\infty} \frac{w_P^\gamma}{w_P^\gamma + (w_P + p)^\gamma} \delta\pi(p)$$

this is a $\frac{\infty}{\infty}$ indeterminate form, so applying De l'Hôpital theorem:

$$\lim_{p\to\infty} \frac{w_P^\gamma \delta\pi'(p)}{\gamma(w_P + p)^{\gamma-1}}$$

and since π is convex π' is increasing; so if $\gamma < 1$ the expression grows to infinity, and the assumptions of Theorem 2.1 are satisfied. Notice that depending on how much π' grows they might be satisfied even for $\gamma > 1$. For example if F is Cobb-Douglas with decreasing returns to scale (because of, e.g., fixed capital), so to be homogeneous of degree β_0, then the profit is proportional to $p^{\frac{1}{1-\beta_0}}$, and repeating the limit reasoning above we find that the expression grows to infinity if $\frac{\beta_0}{1-\beta_0} > \gamma - 1$.

A.4 Non-concentrated resources: predator has access to some quantity of resource

If v represents the quantity of the contested resource, and this is non-concentrated, we can assume that the parties in conflict control a fraction of the quantity each. In particular, say that the predator controls a fraction ηv of the quantity, and the function representing the profits extracted from a quantity of resource is π, as in the previous paragraph. The relevant payoff for P then becomes: $\Pi_P = p_w \pi(v) - \pi(\eta v)$. If this payoff increases in v, the situation is exactly analogous to the baseline, with the non-monotonic relation between v and the probability of conflict because the trade-off between desirability and deterrence realizes again. On the contrary, if the payoff decreases in the resource value, there is no trade-off, and the probability of conflict is decreasing with v.

[A.6]Moreover, taking the ratio of the two:

$$\frac{\Pi'_P}{\Pi'_T} = \frac{1}{\delta}$$

Therefore, if the share of profits lost in conflict is constant, the condition DRM is also satisfied, and Proposition A.3.3 applies.

The payoff Π_P is increasing if:

$$\frac{\pi'(v)}{\pi'(\eta v)} > \frac{\eta}{p_w}$$

that is, if the marginal payoff grows (decreases) at a rate higher (lower) than η/p_w. The ratio η/p_w has a similar interpretation as in the previous paragraph, as the relative value of P's 'economic' and 'military' strengths. This ratio does not immediately translate in war decisions, though, because the payoffs' shape must be factored in. In other terms, if η is very high, meaning that a large fraction of the resource goes to the predator anyway, an increase in the value of the resource makes war less attractive (income effect). Conversely, if the resource value is very low, an increase in the value makes war more attractive.

The payoff of T is the same as in the previous sections, so the fact that Proposition 2 can be applied depends on the fact that Π_P is increasing, which gives us the Aligned Interests condition. If this is the case, we have a non-monotonic probability of conflict. If, instead, the payoff of P is decreasing, we get that the probability of conflict is monotonically decreasing or constantly zero.

We can identify the following clear-cut cases:

1. if π is concave and $\eta > p_w$, then there is no conflict. The interpretation is that the 'rebels' can extract enough rent under the status quo, and the marginal value of owning additional resource is decreasing, so, even as the value grows, P is never willing to attack;

2. if π is convex and $\eta < p_w$, then the rebels can extract small rents in peace, but are militarily strong *and* additional units of the resource are more and more valuable; hence, as the value grows, the resource becomes more attractive. This creates incentives for predation, and so Proposition 2 applies.

Summing up, non-concentrated resources may disincentivize conflict but, if conflict can occur, the mechanisms of the main model apply and the probability is hump-shaped in the value of the resource.

A.5 Proofs

A.1 Proofs of Section 1

We are going to need the following Lemma.

Lemma A.5.1. *Under assumptions AI, and EE,* $\lim \frac{\Pi'_P}{\Pi'_T} \leq C$

Proof. By assumption AI we have $\lim \frac{\Pi_P}{\Pi_T} = \frac{\infty}{\infty}$. By De l'Hopital's theorem, $\lim \frac{\Pi'_P}{\Pi'_T} = \lim \frac{\Pi_P}{\Pi_T}$, and by EE the latter is less that C.

□

A.1.1 Proof of Propositions 2 and A.3.3

The probability that there is war is:

$$\mathbb{P}(war; v) = F_P(p_w\Pi_P(0)) + (p_w F_P \Pi_P(v) - F_P(p_w\Pi_P(0)))\left[1 - F_T\left(p_w\Pi_T(v)\right)\right] \tag{7}$$

The derivative of the probability is:

$$\frac{\partial}{\partial v}\mathbb{P}(war; v) = \left(F\left(p_w\Pi_P(0)\right) - F(p_w\Pi_P(v))\right) f(p_w\Pi_T(v)) p_w \Pi_T'(v) + \tag{8}$$

$$p_w\Pi_P'(v) f\left(p_w\Pi_P(v)\right)\left[1 - F\left(p_w\Pi_T(v)\right)\right] \tag{9}$$

it is bigger than zero if and only if:

$$\left[1 - F\left(p_w\Pi_T(v)\right)\right] p_w\Pi_P'(v) f\left(p_w\Pi_P(v)\right) > \left(F\left(p_w\Pi_P(v)\right) - F(p_w\Pi_P(0))\right) f(p_w\Pi_T(v)) p_w\Pi_T'(v) \tag{10}$$

Rewrite the condition above to get (I omit the arguments of the functions whenever they are clear, for ease of reading):

$$(F_P - F_P(0)) f_T \big(\left[1 - F_T\right] \frac{\Pi_P'}{\Pi_T'} \frac{f_P}{(F_P - F_P(0)) f_T} - 1 \big) > 0$$

The sign of the derivative is driven by the term in brackets. So we have to check when:

$$\left[1 - F_T\right] \frac{\Pi_P'}{\Pi_T'} \frac{f_P}{(F_P - F_P(0)) f_T} > 1$$

By the lemma above, $\Pi_P' \leq \Pi_T'$, hence that term never diverges.
Case $v \to 0$ Using a Taylor expansion of the denominator around 0, so that: $F_P(p_w\Pi_P) - F_P(0) \sim f_P(p_w\Pi_P) p_w \Pi_P$ we can rewrite the LHS as:

$$\left[1 - F_T\right] \frac{\Pi_P'}{\Pi_T'} \frac{1}{\Pi_P f_T} \sim \left[1 - F_T\right] \frac{\Pi_P}{\Pi_T} \frac{1}{\Pi_P f_T} = \left[1 - F_T\right] \frac{1}{\Pi_T f_T}$$

and since by RC $f_T \Pi_T \to 0$ the fraction diverges. So the derivative is positive.
Case $v \to \infty$
If $f_T(M) > 0$ then the thesis follows immediately.
If $f_T(M) = 0$, by RC the function $G(x) := 1 - F_T(1/x)$ has a derivative $G'(x) = f_T(1/x)(1/x^2)$ which is strictly increasing in x. Hence:

$$G(x) - G(0) \leq G'(x) x$$

that is:

$$1 - F_T(1/x) \leq f_T(1/x)(1/x^2) x$$

so

$$1 - F_T \le \Pi_T f_T$$

hence:

$$\lim_{v\to\infty} [1 - F_T] \frac{\Pi'_P}{\Pi'_T} \frac{f_P}{(F_P - F_P(0))f_T} = \lim_{v\to\infty} \Pi_T \frac{\Pi'_P}{\Pi'_T} f_P = \lim_{v\to\infty} \Pi_P f_P = 0$$

which means the derivative is negative.

A.2 Proof of Section 2.1

A.2.1 Proof of Theorems 2.1 and ??

We are going to use the following lemmas.

Lemma A.5.2. *Assumptions AI and EE imply:*

$$\frac{p_w \Pi'_T + p'_w \Pi_T}{p_w \Pi'_P + p'_w \Pi_P} \le C$$

with $0 < C < \infty$.

Proof. By AI:

$$\frac{p_w \Pi'_T + p'_w \Pi_T}{p_w \Pi'_P + p'_w \Pi_P} \le \frac{p_w C \Pi'_P + p'_w C \Pi_P}{p_w \Pi'_P + p'_w \Pi_P} = C$$

We can rewrite the fraction as:

$$\frac{p_w \Pi'_T + p'_w \Pi_T}{p_w \Pi'_P + p'_w \Pi_P} = \frac{\Pi_T}{\Pi_P} \frac{\frac{\Pi'_T}{\Pi_T} + \frac{p'_w}{p_w}}{\frac{\Pi'_P}{\Pi_P} + \frac{p'_w}{p_w}}$$

Now since by De l'Hôpital theorem $\lim_{v\to\infty} \frac{\Pi'_P}{\Pi'_T} = \lim_{v\to\infty} \frac{\Pi_P}{\Pi_T}$, it follows that also the latter is bounded. Dividing the two expressions, we obtain that $\lim_{v\to\infty} \frac{\Pi'_T}{\Pi_T} = \lim_{v\to\infty} \frac{\Pi'_P}{\Pi_P}$, it follows that:

$$\lim_{v\to\infty} \frac{p_w \Pi'_T + p'_w \Pi_T}{p_w \Pi'_P + p'_w \Pi_P} = \lim_{v\to\infty} \frac{\Pi'_T}{\Pi'_P}$$

that is bounded above and away from zero.

□

The equilibrium in the subgame following the alliance with R is:

1. if $\varepsilon_P < 0$, P always attacks;
2. if $p_w \Pi_P(v) < \varepsilon_P$, P never wants to attack and there is no war;
3. if $(p_w + \beta_T)\Pi_T(v) - \mu_R > \varepsilon_T$ then T would intervene in case of conflict, hence P does not attack unless $\varepsilon_P < 0$;

4. if $p_w \Pi_P(v) > \varepsilon_P$ and $(p_w + \beta_T)\Pi_T(v) - \mu_R < \varepsilon_T$ then there is no intervention and P attacks.

In this case, the probability of conflict is:

$$\begin{aligned} P^R(war) =& P(\{\varepsilon_P \leq 0\} \cup \{0 < \varepsilon_P \leq p_w \Pi_P, \, \varepsilon_T < (p_w + \beta_T)\Pi_T - \mu_R\}) = \\ & F_P(0) + (F_P(p_w \Pi_P) - F_P(0))(1 - F_T^R) \end{aligned}$$

where $F_T^R \coloneqq F_T((p_w + \beta_T)\Pi_T - \mu_R)$.

The equilibrium in the subgame following the alliance with P is in the main text, and the probability of conflict is:

$$\begin{aligned} P(war)^P &= P(\{\varepsilon_P < 0\} \cup \{0 \leq \varepsilon_P < p_w \Pi_P, \, \varepsilon_T > (1 + \beta - p_w)\Pi_T - \mu_P\} \cup \{0 \leq \varepsilon_P < \Pi_P, \, \varepsilon_T \leq (1 + \beta - p_w)\Pi \\ &= F_P(0) + (F_P(p_w \Pi_P) - F_P(0))(1 - F_T^P) + F_T^P (F_P((1 - \beta_P)\Pi_P) - F_P(p_w(1 - \beta_P)\Pi_P)) \end{aligned}$$

where $F_T^P \coloneqq F_T((1 + \beta_T - p_w)\Pi_T - \mu_P)$.

The expected payoff of T from choosing to be allied with R is:

$$P^R(war)(1 - p_w)\Pi_T + (1 - P^R(war))\Pi_T = (1 - p_w F_P^P (1 - F_T^R))\Pi_T$$

the expected payoff from choosing to be allied with P is:

$$(1 - F_T^P) F_P^P p_w \Pi_T + (F_P(\Pi_P) - F_P^P) \left(F_T^P((1 + \beta_T) Pi_T - \mu_P) - \int^{(1+\beta_T - p_w)\Pi_T - \mu_P} \varepsilon_T \mathrm{d}F(\varepsilon_T) \right)$$

where $F_P^P \coloneqq F_P(p_w(1 - \beta_P)\Pi_P)$, F_T^P and F_T^R have been defined in the text.

Hence, the third party chooses to be allied with R if and only if:

$$\begin{aligned} & (1 - p_w F_P (1 - F_T^R))\Pi_T > (1 - F_T^P) F_P p_w \Pi_T + \\ & (F_P(\Pi_P) - F_P) \left(F_T^P((1 + \beta_T)\Pi_T - \mu_P) - \int^{(1-p_w)\Pi_T - \mu_P} \varepsilon_T \mathrm{d}F(\varepsilon_T) \right) \end{aligned}$$

Case 1: v large

Define $E^P = \int^{(1+\beta_T - p_w)\Pi_T - \mu_P} \varepsilon_T \mathrm{d}F(\varepsilon_T)$. If $v \to \infty$ the condition above is satisfied if and only if:

$$((1 - pF_P(1 - F_T^R)) - (1 - F_T^P)F_P p - (F_P(\Pi_P) - F_P)F_T^P)\Pi_T + \Delta F_P(\mu_P + E^P) > 0$$

As $v \to \infty$, $p_w \to 0$. Moreover, by our assumption, $E^P \to \mathbb{E}\varepsilon_P > 0$. We have two cases. If $\Delta F_P \to 0$, then the expression above is asymptotically equivalent to $\Pi_T + \Delta F_P(\mu_P + E^P)$, and is positive. If instead $\Delta F_P \to \ell > 0$, then the expression above is asymptotically equivalent to $(1 - \ell)\Pi_T + \ell(\mu_P + E^P)$, still positive. Hence, for v large, the third party supports the resource holder.

Hence, the probability of conflict for v large is:

$$F_P(0) + (F_P - F_P(0))(1 - F_T^P)$$

and the derivative is:

$$f_P(p'_w \Pi_P + p_w \Pi_P)(1 - F_T^R) - f_T(p'_w \Pi_T + (p_w + \beta_T)\Pi'_T - \mu'_R p'_w)(F_P - F_P(0))$$

where as in the previous sections we omitted the argument of the densities f_P and f_T. Using the Lemma A.5.2, if $(p_w + \beta_T)\Pi_T$ goes to ∞, then $F_T^R \to 1$. Now if $f_T(M) > 0$ since $1 - F_T$ goes to 0 as $v \to \infty$, if $\beta_T > 0$ we find that the probability is decreasing for large v. (Remember that μ_R is increasing in p) If $\beta_T = 0$ and $(p_w + \beta_T)\Pi_T$ is increasing, we conclude the same thing.

As in the previous proof, if $f_T(M) \to 0$, then use the approximation $1 - F_T^R \sim f_T((p_w + \beta_T)\Pi_T - \mu_R)$ and $f_P \Pi_P \sim f_P \Pi_T \to 0$ to obtain the same result.

Case 2: v small

If $v \to 0$ instead, if the choice is R, if $f_P(0) > 0$, the only part surviving in the derivative is $f_P p_w \Pi'_P$, and is positive. If instead $f_P(0) \to 0$, use the fact that asymptotically $F_P - F_P(0) \sim f_P p_w \Pi_P$ and obtain that the derivative is asymtptically equivalent to:

$$f_P\left[(p'_w \Pi_P + p_w \Pi_P)(1 - F_T^R) - f_T(p'_w \Pi_T + (p_w + \beta_T)\Pi'_T - \mu'_R p'_w) p_w (1 - \beta_P)\Pi_P\right]$$

and again the only term surviving is $p_w \Pi'_P (1 - F_T^R) > 0$. So the probability is increasing.

If instead the alliance is with P:

$$P(war) = F_P + (F_P(\Pi_P) - F_P)(1 - F_T^P)$$

the derivative is:

$$f_P(1 - \beta_P)(p'_w \Pi_P + p_w \Pi'_P) F_T^P - f_T(p'_w \Pi_T + (p_w + \beta_T)\Pi'_T - \mu'_R p'_w)(F_P(\Pi_P) - F_P) +$$

$$+ f_P(1 - \beta_P)(\Pi_P)\Pi'_P(1 - F_T^P)$$

and if $v \to 0$ $F_P(\Pi_P) - F_P(0) \to 0$. So if $f_P(0) > 0$ the negative term goes to zero and the expression is asymptotically equivalent to $f_P(p_w \Pi'_P) F_T^P + f_P(\Pi_P)\Pi'_P(1 - F_T^P)$, so it is positive. If instead $f_P \to 0$, we can use the fact that $F_P(\Pi_P) \sim f_P \Pi_P$ and $F_P \sim f_P p_w \Pi_P$, and that $f_P(\Pi_P) \sim f_P(p_w \Pi_P)$ to rewrite it as:

$$f_P(1 - \beta_P)\left[-(p'_w \Pi_T + p_w \Pi'_T - \mu'_R p'_w)(1 - p_w)\Pi_P + \Pi'_P(1 - F_T^P) + (p'_w \Pi_P + p\Pi'_P) F_T^P\right]$$

and now the only surviving terms are $\Pi'_P(1 - \beta_P)(1 - F_T^P) + p_w(1 - \beta_P)\Pi'_P F_T^P > 0$, so the probability of conflict is increasing.

□

A.3 Proofs of Section 3

We calculate the equilibrium price, assuming all problems have an interior solution.
If there is no war, the FOC is:

$$\Omega_T \alpha (g_T)^{\alpha-1} = p \tag{11}$$

that is

$$p = \frac{\alpha\Omega}{g_T^{1-\alpha}} = \frac{\alpha\Omega}{(R_M + R_R)^{1-\alpha}} \tag{12}$$

where we already used the market clearing condition $g_T = R_R + R_M$. The equilibrium profits of the third party are as follows:

$$\pi_T = \Omega(R_M + R_R)^\alpha - \frac{\alpha\Omega}{(R_M + R_R)^{1-\alpha}}(R_M + R_R) = (1-\alpha)\Omega(R_M + R_R)^\alpha$$

If there is war instead, the FOC yields:

$$p(war) = \frac{\alpha\Omega}{g_T^{1-\alpha}} = \frac{\alpha\Omega}{(R_M + \eta R_R)^{1-\alpha}} \tag{13}$$

because now market clearing yields $R_M + \eta R_R = g_T$. The profit of the third party in this case is:

$$\pi_T(war) = (1-\alpha)\Omega(R_M + \eta R_R)^\alpha$$

Call Π_P the profit of the predator when it seizes the resource. Since in this case war occurs for sure:

$$\Pi_P = \frac{\alpha\Omega}{(R_M + \eta R_R)^{1-\alpha}} \eta R_R$$

Instead, the payoff of having access to the resource for T is:

$$\Pi_T = (1-\alpha)\Omega(R_M + R_R)^\alpha - (1-\alpha)\Omega(R_M + \eta R_R)^\alpha$$

A.3.1 Proof of Corollary 1

RC is satisfied by the assumptions.
The derivatives are:

$$\Pi'_P = p\alpha\Omega\eta \frac{R_M + \alpha\eta R_R}{(R_M + \eta R_R)^{2-\alpha}}$$

$$\Pi'_T = (1-\alpha)\Omega\alpha \left((R_M + R_R)^{\alpha-1} - \eta(R_M + \eta R_R)^{\alpha-1}\right)$$

The first is obviously positive. To check the second, notice that is positive if and only if:

$$(R_M + R_R)^{\alpha-1} > \eta(R_M + \eta R_R)^{\alpha-1}$$

that is:

$$(R_M + \eta R_R)^{1-\alpha} > \eta(R_M + R_R)^{1-\alpha}$$
$$R_M + \eta R_R > \eta^{\frac{1}{1-\alpha}}(R_M + R_R)$$
$$R_M(1 - \eta^{\frac{1}{1-\alpha}}) + R_R\eta(1 - \eta^{\frac{1}{1-\alpha}-1}) > 0$$

and $\frac{1}{1-\alpha} - 1 > 0$ so $\eta^{\frac{1}{1-\alpha}-1} < 1$ and this inequality is true. This proves AI.
Condition DRM in Appendix A.3 implies EE. To prove that DRM holds, the ratio of marginal payoffs is:

$$\frac{\Pi'_P}{\Pi'_T} = \frac{R_M + (\eta - 1 + \alpha)R_R}{(R_M + \eta R_R)^{2-\alpha}\left((R_M + R_R)^{\alpha-1} - \eta(R_M + \eta R_R)^{\alpha-1}\right)}$$

Taking the derivative, we find that it is decreasing if and only if:

$$(\alpha - 1)R_M\left(R_M + \eta R_R\right)^{\alpha-3}\times$$
$$\left((R_M + R_R)^{\alpha-2}\left((2\eta - 1)R_M + \eta R_R(\alpha(\eta - 1) + 1)\right) - \eta^2\left(R_M + \eta R_R\right)^{\alpha-1}\right) < 0$$

Manipulating this expression, we find that this is true if and only if

$$R_M > (1 - \alpha)\frac{\eta}{1 - \eta}R_R$$

Concerning the hypothesis of Theorem 2.1, we have to check the limit:

$$\lim_{R_R\to\infty} \frac{w_P^\gamma}{w_P^\gamma + (R_R + w_P)^\gamma}(1 - \alpha)\Omega\left((R_M + R_R)^\alpha - (R_M + \eta R_R)^\alpha\right)$$
$$= \lim_{R_R\to\infty} \frac{w_P^\gamma}{w_P^\gamma + (R_R + w_P)^\gamma}(R_M + R_R)^\alpha(1 - \alpha)\Omega\left(1 - \left(\frac{R_M + \eta R_R}{R_M + R_R}\right)^\alpha\right)$$

and this goes to infinity if $\alpha > \gamma$.

A.4 Proofs of Section A.4

A.4.1 Proof of Proposition A.4.1

Since the behavior of the third party does not change, this means that we have 2 cases: if T intervenes, there is no offer and no war. If T does not intervene, there is an offer. The probability of conflict is:

$$\mathbb{P}(war; v) = (1 - F_T(p_w\Pi_T))P(P \text{ does not accept})$$

R offers x in exchange to not enter into the conflict. P does not accept if $x < p_w\Pi_P - \varepsilon$, or $p_w\Pi_P - x > \varepsilon_P$. In this case the optimal trasfer is the solution of:

$$\max_x \int^{p_w\Pi_P - x}(1 - p_w)\Pi_R f_P \mathrm{d}\varepsilon_P + \int_{p_w\Pi_P - x}(\Pi_R - x)f_P \mathrm{d}\varepsilon_P$$
$$= \max \Pi_R - p_w\Pi_R F_P(p_w\Pi_P - x) + (\Pi_R - x)(1 - F_P(p_w\Pi_P - x))$$

taking the FOC we get:

$$x = p_w \Pi_R - \frac{1 - F_P}{f_P}$$

whenever x is positive.

To check if the result on the hump shape holds we need to study $P(war) = P(\varepsilon_T > p_w \Pi_T) P(\varepsilon_P < p_w \Pi_P - x)$, and in particular $p_w \Pi_P - x$. If this is increasing, there is the hump shape, otherwise not. If F_P is uniform:

$$x = \frac{p_w(\Pi_R + \Pi_P) - 1}{2}$$

and

$$p_w \Pi_P - x = \frac{p_w(\Pi_P - \Pi_R) + 1}{2}$$

whenever $p_w \frac{\Pi_R + \Pi_P - 1}{2} > 0$, that is whenever $\Pi_R + \Pi_P$ are high enough. In particular if $v = 0$ then $p_w \Pi_P - x = 0$ and $x = 0$. In particular if $\Pi_P - \Pi_R$ is increasing then there can be conflict, and the hump shape follows from Proposition 2. If $\Pi_P - \Pi_R$ is decreasing then the probability of conflict is 0 if $v = 0$ and decreasing, so it is always zero. If $\Pi_P - \Pi_R$ is first increasing and then decreasing, then the probability is hump shaped also in absence of a third party, because the term $p_w \Pi_P - x$ is already itself hump shaped, similarly to the case discussed in 2.1.

R does not know the type of T In the case P does not know the type of T we obtain a very similar result. The optimal offer is:

$$x = p_w(1 - F_T)\Pi_R - \frac{1 - F_P}{f_P}$$

With uniform distribution:

$$x = (1 - F_T) p_w \frac{\Pi_R + \Pi_P - 1}{2}$$

$P(war) = F_P\left((1 - F_T) p_w \Pi_P - x\right)$ and the threshold is: $(1 - F_T) p_w \frac{\Pi_P - \Pi_R + 1}{2}$ again depends on $\Pi_P - \Pi_R$.

A.6 Dataset

In this appendix we list the data sources we employ in the empirical section and we describe the creation of the working dataset that we use for our analysis.

Resource data and geographical controls

From the 2014 World Bank Wealth dataset, we collect information about oil, gas, and coal value by country.[A.7] We merge this source with information about sedimentary basins thickness organized by Hunziker and Cederman (2017) into a country dataset. Then, we merge our data with climate and geographical controls in Ashraf and Galor (2013).

[A.7] World Bank, https://databank.worldbank.org/reports.aspx?source=wealth-accounts

US military involvement

The Defense Manpower Data Center dataset (DMDC) reports US bases by country along with the number of employees of from Department of Defense (DoD). We organize the data in a country database, which we merge with the CEPII GeoDist dataset, contining information about whether two countries are neighbors. In this way, we construct a country dummy reporting if the nation hosts a US base with more than 1000 DoD employees or it is contiguous to one such a country.

To construct another measure of US military involvement, we use the SIPRI Arms Trade Database containing the data of the US arms export. We fix discrepancies in the country coding in order to merge this database with the other ones described above. Then, we proceed to create a dataset containing the value of US arms exported to each country.

WTI oil prices and GDP deflator

From FRED, we collect a time series of monthly oil prices, and compute the yearly average to merge it with conflict information. To compute real prices, we collect the quarterly time series for the US GDP deflator from the same source and turn it into a yearly time series by computing an yearly average.[A.8]

Conflicts Data

The database UCDP/PRIO Armed Conflict Dataset contains information about all armed conflict from World War II. Each row in the dataset corresponds to a conflict and reports all countries involved. We rearrange such dataset into a year-country dataset fo conflict. Conflict intensity for a given couple is the maximum amount of intensity (in terms of deaths) among all conflicts in which the part was involved. Using such intensity variable, we create a new dummy for conflict taking value one only in the presence of a high number of casualties.

To conclude, we merge all the previous year-country or country databases and drop G8 countries. We winsorize our resource variables at the 97.5 percentile and create a categorical variable distinguishing different regions of the world.

Similarity in UN General Assembly Voting (Affinity)

From the dataset described in Gartzke and Jo (2006), we obtained the Affinity of Nations index. This index provides a metric that compute the similarity of state preferences based on voting positions of pairs of countries in the United Nations General Assembly. The index is calculated using 'S score' as in Signorino and Ritter (1999): it goes from -1 (maximum distance in votes)

[A.8] U.S. Energy Information Administration, Crude Oil Prices: West Texas Intermediate (WTI) - Cushing, Oklahoma [MCOILWTICO], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/MCOILWTICO, August 1, 2021 and U.S. Bureau of Economic Analysis, Gross Domestic Product: Implicit Price Deflator [GDPDEF], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/GDPDEF, August 1, 2021.

to 1 (perfect similarity in votes). We average this index for the years from 1945 to 1960 and we keep the affinity index between all countries and the USA.