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Natural resources and conflict: The crucial role of power mismatch and geographic asymmetries*

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Abstract

Abstract. This handbook chapter studies how natural resource wealth can in many contexts fuel armed conflict. Starting from a simple theoretical model, we stress the role of geography and power mismatch in the so-called "natural resource curse". Drawing on recent empirical evidence, the importance of resource abundance, asymmetry and capital-intensiveness is highlighted, alongside local grievances and international interventions. We propose a series of evidence-driven policy conclusions, ranging from "smart green transition" and democratic institution building over labor-market intervention to a series of specific policies requiring international coordination.

JEL classification: D74, Q34.

Keywords: Natural Resources, Mining, Conflict, commitment problems, power mismatch.

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1 Introduction

Natural resource rents are often equated with political turmoil and fighting. While one can easily find examples where there has been such a link (see e.g. the Democratic Republic of Congo, South Sudan, Chad, Nigeria or Iraq), one can as easily pick examples of both democracies (e.g. Norway) or non-democracies (e.g. Saudi Arabia) where resource wealth has not been associated with political instability. As argued below, whether the spoils of nature give birth to the horror of war depends on a series of geographical and political factors, namely asymmetries and mismatches that are not compensated by appropriate policies. While most of the focus of the current contribution lies on civil conflict (especially, when discussing the empirical evidence), mismatch and asymmetry also play crucial roles in interstate conflict, and hence we shall also at times refer to this.

The plight of the Kurdish population is emblematic of the dangers of natural resource abundance accompanied by a mismatch between relative strength and relative economic rent sharing. While the Kurdish culture dates back by over a thousand years and there have been a string of Kurdish states since the 8th century AD (such as e.g. the Shaddadids dynasty), since the surge of oil as major geopolitical commodity, Kurds have been dispersed into several countries in all of which they are currently an ethnic minority. The Kurdish homelands being particularly oil-rich, Kurdish separatism and quest for an independent state may come with a dear price tag for the states currently dividing up the Kurdish homelands among themselves. The current status of the Kurdish population as ethnic minority that is (in most cases) only dismally represented in government contrasts with the resource abundance of the homelands and the non-negligible force of battle-experienced Kurdish Peshmerga fighters. Such a mismatch between force/potential and political representation fuels the risk of armed fighting in this region.

While there is a large literature on the potential pitfalls of resource abundance and the so-called "resource curse", the question of how resource geography interacts with the political and military distribution of power and rents has been often overlooked. While there exist some survey articles on conflict or the natural resource curse in general (see e.g. Ross (2015), Cust and Poelhekke (2015), Van Der Ploeg and Poelhekke (2017) or Rohner (2023b)), this handbook chapter is to the best of our knowledge the first survey piece focusing on the role of mismatches linked to natural resources and geography.

We first set up an extremely simple canonical workhorse model. Then we will provide a synthesis of the state of the literature on the natural resource curse and the recent advances, taking into account the salience of mismatches between force/potential and representation. We will conclude the chapter with a discussion of specific policies that may help to deal with mismatches and turn the resource curse into a blessing.

2 Theory

In this section we shall discuss a simple workhorse model that allows to nest key insights of a series of existing frameworks.[1]

Consider two players, A and B, and any divisible value R. Let the status quo be represented by the share $\alpha \in [0, 1]$ of such a value that accrues to B, so that A enjoys $(1 - \alpha)R$ in the status quo. Taking for now α as given, let us focus on the incentive by B to challenge the status quo with war. We will consider later the Coasian bargaining reasoning.

Accepting the status quo gives B utility αR, whereas choosing the lottery of war implies the following expected payoff:

$$U_B^w = pR + (1 - p - q)\alpha R - c_B$$

where p denotes the probability of complete victory for B, q denotes the probability of complete defeat for B, and with probability $1 - p - q$ the status quo is maintained (connected with stalemate or indecisive war). Finally c_B is the notation for the cost of war. Assume that A is content with the status quo without loss of generality, i.e. $(1-\alpha)R \geq qR+(1-p-q)(1-\alpha)R-c_A$, i.e.

$$\alpha \leq \bar{\alpha} \equiv \frac{p + c_A/R}{p + q}. \tag{1}$$

In contrast, B may potentially want to challenge the status quo. Clearly the lottery of war is chosen by B iff

$$c_B < R[p - (p + q)\alpha] = R(p + q)(\pi - \alpha) \tag{2}$$

where $\pi \equiv \frac{p}{p+q}$ is the *relative strength* of B and hence $(\pi - \alpha)$ is the *mismatch* between the relative strength and the relative status quo economic share of B. If there is no mismatch there can never be an incentive to go to war for any realization of costs of war. If costs or R are subject to random shocks, the above inequalities simply lead to the conclusion that

Proposition 1 *If in the status quo (1) holds, the probability of war is increasing in the mismatch $(\pi - \alpha)$, in the value of distributable resources R, and in the decisiveness of war technology $p + q$.*

If for instance c_B is drawn from a uniform distribution from $-v$ to $\bar{c}$, where $v > 0$ is some potentially ideological benefit of conflict for non economic reasons and $\bar{c} > 0$ is the maximum possible cost of war, and assuming $c_A > 0$, we have: the ex ante probability of war equal to $\min\left\{1, \frac{R(p+q)(\pi-\alpha)}{v+\bar{c}}\right\}$, for any fixed α satisfying (1). Interestingly, when the value of resources R goes up there is a direct increase in the ex ante probability of war for any given α, but (1) also tells us that $\bar{\alpha}$ shrinks, and hence if anything A becomes less willing to concede upward revisions of α even when allowing some forms of bargaining. Thus it should be intuitive that even

[1] Our setting draws on Herrera et al. (2022), yet adjusting their framework for accommodating to display the role of the absolute value and distribution of natural resources.

allowing for a stage of the game where one player offers a revision of α in order to avoid the war incentives, such a revision becomes less likely to exist when R goes up. This simple observation goes against any claim that having more resources available should facilitate bargaining.

If the cost of war increases proportionally with R, e.g. $c_i = d_i R$, $i = A, B$, then the ex ante probability of war does not depend on R. Thus, we can now see a first important difference between a natural resource discovery and other forms of increases in R. Suppose that $R = E + W$, where W comes from activities already in place such as agriculture and industries whereas E is the present discounted value of expected profits from newly discovered resources underground. In this case the cost of war c_i can be reasonably assumed to be equal to $c + d_i W$, since the underground resources are typically not destroyed during war. Thus, when a country or region is characterized by a contestable surplus mostly determined by the E component, then the ex ante probability of war is affected much more than for other countries or regions where instead the W component dominates. Thus periods of new discoveries and countries or regions particularly rich of natural resources and not so rich in destroyable other forms of wealth are the most at risk.

A second important remark leading to emphasize the specificity of natural resources relates to the relative strength of countries or regions: if R increases because of immediately fungible sources of income, the W component, then the economically stronger of the two could invest immediately more than the economically weaker player in arms, hence reducing the mismatch; on the other hand, if the increase in R is coming mostly from the E component, immediate militarization is less likely, since the capital markets for such types of investment are far from perfect, hence even with endogenous militarization to reduce the mismatch the E component of R is the least likely to induce such readjustments.

Third, p and q may depend on the geography of endowments and borders when R depends mostly on oil wells or other pointy resource endowments. As shown theoretically and empirically in Caselli et al. (2015), interstate conflict is ex ante more likely when two adjacent countries have asymmetric oil endowments, either because one has it and the other does not, or because they both have it but only one of them has it close to the borders. Given that in that paper the victory of R depends on moving the border enough as an outcome of war to make the opponent's well fall on the attacker's side of the border, the way in which this can be re-cast in terms of p and q is straightforward: suppose that A has oil wells but far from the border with B. Consider the case in which B has no oil first: here B has $\alpha = 0$, hence a very large mismatch, which implies a high probability of war. Now consider the case in which B is still with no oil but A's fields are close to the borders: in this case the mismatch may remain the same (if p and q change proportionally) but conditional on victory the probability of reaching the opponent's possessions is higher, and proposition 1 tells us that higher probability of decisiveness leads to higher probability of war. Hence both the predictions of Caselli et al. (2015) are captured within the framework proposed in this chapter.

Similarly, the model applies to the civil war onset problem: in a country where group A controls the government and group B is a minority group with region B as homeland (calling region A the rest of the country), group B may develop incentives to secede if resource discoveries of value happen in region B itself, and the current share α of the total country revenues from natural resources is sufficiently low. As in Morelli and Rohner (2015), group B compares the status quo utility αR from staying peaceful in the country controlled by A with the expected payoff from one of the possible war lotteries. In general the probability of a decisive victory by B in a secessionist conflict, p_s, is greater than the probability of a decisive victory by B in a centrist conflict, p_c, whereas the probability of a decisive repression (or victory by A in a centrist conflict), q_c, is typically higher than the probability of a decisive repression of a secessionist attempt, q_s (but it is not obvious whether $p_s + q_s >\!<\!= p_c + q_c$). After a discovery of resources in the homeland of B not reflected in an adequate upward adjustment of α the mismatch increases and war becomes more likely in the absence of bargaining and consequent revision of α. As shown in Morelli and Rohner (2015), a peaceful revision of α has, on top of the standard commitment and asymmetric information frictions, also an upper bound due to the incentive compatibility for A, which depends on the centrist war lottery odds rather than the secessionist war lottery odds. Thus, even allowing for Coasian bargaining possibilities, the prediction remains that an increase in mismatch due to natural resource unequal discoveries leads to higher probability of conflict onset.

Herrera et al. (2022) show how mismatch between relative military power and relative political power of any pair of players (countries or groups) disputing divisible resources can generally determine greater likelihood of war incidence and even duration, regardless of whether bargaining is allowed. One could see this even with a simple extension to two periods of the model above.[2]

Going back to the question of what causes bargaining breakdown, it is possible to show that all the rationalist reasons for war (see Fearon et al. (1995), and Jackson and Morelli (2007)) are exacerbated by asymmetric natural resource discoveries. Commitment problems arise when a surplus value R comes in larger part from the present discounted value of future streams of sales of natural resources, for the reason that the promise of transfers necessary for Coasian bargaining requires commitment to keep the promise of transfer payments in the future.[3] Moreover, another rationalist reason for war, namely agency problems, is easily exacerbated by a significant presence in the economy of natural resources: as shown in Jackson and Morelli (2007), the risk of war increases with the leaders' political bias, and the latter is basically the benefit-cost ratio for

[2] The modification of the above model that allows us to predict longer duration when mismatch is larger, involves replacing the binary outcome obtained with probability $p+q$ with an interior power shift, like in Herrera et al. (2022).

[3] Jackson and Morelli (2007) contains a discussion of the various forms of commitment problems involving transfers even in the absence of political bias.

leaders from the lottery of war; when a target country is rich in natural resources, a stream of future payments can be easily directed in the pockets of the elite of the invading country in proportions higher than happening domestically for other types of income production sources, and hence the presence of attractive natural resources in the target country is itself a cause of higher political bias in the attacking country.

3 Empirical evidence

In what follows, we critically discuss the available empirical evidence related to the main predictions outlined in the theory section above.

3.1 Resource abundance and civil war

As discussed above in the theory, a larger abundance in resources R is likely to make peaceful bargaining harder. Remember, when R surges, there is a direct increase in the ex ante probability of war for any given α, but also $\bar{\alpha}$ shrinks, and hence –if anything– A becomes less willing to concede upward revisions of α even when allowing some forms of bargaining). Further, as discussed above, even if the cost of conflict is increasing in R, typically many natural resource reserves are located under ground and are comparably less likely to be destroyed in war than other assets. Hence, the increased costs of conflict are unlikely to offset the aforementioned effect.

There has been amble empirical evidence in line with this theoretical prediction. While of course the literature on the resource curse and conflict dates several decades back, at the beginning of the new millennium this literature has started booming, fuelled among others by the pioneering contributions of Fearon and Laitin (2003) and Collier and Hoeffler (2004).[4] These articles and related work have focused on aggregate measures of resource value with respect to the size of the economy. These measures of resource abundance relative to GDP have been criticized on two grounds: First, as argued e.g. by Brunnschweiler and Bulte (2009) they may suffer from endogeneity, as any war-induced drop in GDP tends to mechanically increase the size of resource rents over GDP (i.e. due to a reduction in the denominator). Second, focusing on aggregate resource proxies may hide interesting heterogeneity between different resource types.

Hence, in order to address these shortcomings, the next generation of papers have focused on using more specific and narrow resource variables and aiming to use exogenous shocks. One commodity that has attracted a lot of attention is oil (see e.g. Humphreys (2005); Ross (2012)). In terms of recent papers studying the oil-conflict nexus, Cotet and Tsui (2013) and Lei and Michaels (2014) exploit oil discovery shocks – while Cotet and Tsui (2013) find in most

[4]See also the follow-up work of Collier et al. (2009).

specifications no significant effects of general discoveries of (small and large) oil fields on conflict, Lei and Michaels (2014) find a sizeable conflict-increasing impact of giant oil field discoveries. One potential weakness of this identification strategy based on discoveries is that drilling efforts may be endogenous, and more intense in countries with better institutions (see Cust and Harding (2020)). While –if anything– this endogeneity may tend to bias estimates of averse resource effects *downwards*, it still highlights the need the explore alternative, complementary causal identification strategies. One powerful alternative is to exploit oil price shocks: Dube and Vargas (2013) show that surges in oil prices fuelled conflict in Colombia. According the aforementioned theory, we would expect resource abundance to especially translate into a large R in the model, when the riches of mother nature can be easily appropriated. In line with this, Nordvik (2019); Andersen et al. (2022) show that coups and armed conflicts are driven by onshore oil (as opposed to offshore oil, which is harder to grab).

Beyond two-sided armed conflict, one-sided violence against unarmed civilians is also fuelled by oil presence, as found by Esteban et al. (2015). The logic of "strategic mass killings" studied in this article is related to the aforementioned argument that resource riches may typically be destroyed less by fighting than other economic activities (such as e.g. banking or the pharma industry). In the particular case of mass killings, Esteban et al. (2015) find that in resource dependent economies economic output is not very sensitive to the population size, which can push cynical leaders to kill or expel rival ethnic groups, without paying a steep economic price.

Another major commodity that has attracted attention are minerals (see for example Lujala et al. (2005); Humphreys (2005)). The recent paper of Berman et al. (2017) exploits mineral price shocks to identify the effects of mining on civil violence. The estimates suggest that the historical rise in mineral prices might explain up to one-fourth of the average level of violence across African countries over the 1997-2010 period. Further, exogenous shocks boosting coca cultivation have also been identified to give rise to conflict (see e.g. Angrist and Kugler (2008)).

Last but not least, it is useful to mention that resource abundance may not only fuel the risk of conflict through the channel highlighted above in our simple model (i.e. an increase in R). It has been stressed in the literature that greater natural resource abundance could also fuel a higher conflict risk by easing credit constraints of rebel organizations (see Fearon (2004), Collier et al. (2009), Berman et al. (2017) Vanden Eynde (2018) or Le Billon (2001)) or by hollowing out state capacity (see Fearon (2005), Besley and Persson (2011), Bell and Wolford (2015)).

3.2 Capital intensity of natural commodity production

As sketched above in the previous section, there are two countervailing forces. An increase in the value of commodities increases incentives for fighting, while higher commodity values also lead to an increased cost of conflict (due to greater destruction costs or higher opportunity costs). McGuirk and Burke (2020) show the presence of these two forces for food price shocks.

How big this second, countervailing effect of increased conflict costs is, depends among others on the capital versus labor intensiveness of an industry (see Dal Bó and Dal Bó (2011)). If a capital-intensive industry booms, there is hardly any effect of surging wages that would go along with a higher opportunity cost of conflict. In contrast, in labor-intensive industries, price increases typically translate into higher wages, which reduces conflict incentives. In line with this, Dube and Vargas (2013) find for Colombia that price spikes in the capital-intensive oil industry have fuelled conflict, while the inverse was observed for price booms in the labor-intensive coffee sector.

3.3 Grievances of the local population

Natural resource depletion often triggers local grievances within the local population (see e.g. Le Billon (2001); Humphreys (2005); Koos (2018); Rall and Pejan (2019); Stoop and Verpoorten (2021)), which suffers from local environmental degradation (see for example Sovacool (2014); Deiana and Giua (2023)), and often (rightly) thinks that it does not receive their fair share of revenues. This sense of not benefitting from large-scale fossil fuel or mineral exploitation is in line with the recent findings of Bazillier and Girard (2020) that while artisan gold mines in Burkina Faso increase local consumption, large-scale industrial miding does not have any statistically significant impact on local consumption.

3.4 Third-party intervention and strategic territory

The growing literatures on networks and conflict (see e.g. König et al. (2017)) and on the role of geographical space and distances on fighting incentives (Mueller et al. (2022)) are also relevant for our question at hand. In connected networks linking a multitude of countries, any bilateral change in a given node (e.g. if a inter-state war leads to the destruction of a node, or the merging of two nodes) affects payoffs of all countries in the network. Hence, in situations when bilateral conflicts have externalities on third countries, there may be incentives for third-party intervention. In particular, while higher resource rents can fuel conflict incentives of domestic actors (as shown above), they can also trigger international interventions by third countries, which may in some contexts help to diffuse tensions (see the formal models in Battiston et al. (2021) and Gallea and Rohner (2021)). Beyond resource networks such as the network of gas pipelines, the issue of third-party intervention is particularly salient when it comes to strategic territory. The control of strategically important landmarks for world trade such as straits, caps and channels yields rents and has the specificity of being of general international importance (as blocked trade flows affect every country, see the recent "traffic jam" at the Suez canal). Hence, given the rents at stake, one expects domestic rivalries about controlling strategic territory to be a source of tension. At the same time, during periods of large trade flows major powers have incentives to engage in pacifying these crucial bottlenecks for guaranteeing smooth shipping routes. Gallea and Rohner (2021) have built a novel dataset of strategic importance at the level of cells of 0.5 times 0.5 decimal degrees (roughly 50 times 50 kilometers) and show that strategic territory is associated to conflict in periods of low trade. In contrast, in times of world trade booms, strategic bottlenecks of world trade are safer, in line with the logic of fostered third-party intervention.

3.5 Resource asymmetry and mismatch

Last but not least, one somewhat overlooked aspect of the "resource curse" is the role of geographic asymmetry and mismatch. This focal point of the current handbook chapter has attracted some recent empirical analysis. In particular, Ogliari and Hong (2022) provide an empirical investigation of the power mismatch theory of Herrera et al. (2022): indeed in Africa and middle east civil war incidence is associated with the presence of significant power mismatch, namely a significant difference between relative military power and relative political power of an ethnic group with respect to the government. Morelli and Rohner (2015) focus in particular on the natural sources of mismatch: they compute measures of the asymmetry of oil holdings at the ethnic group level. This allows to both compute a resource-population mismatch at the ethnic group level, as well as computing at the country level an index of oil asymmetry (labelled "oil gini"). It is found that countries with a more unequal geographical distribution of oil fields suffer from a heightened conflict risk, and that groups out of power that have an ethnic homeland abundant in oil are most likely to be drawn into fighting.

Asymmetry has also been found to matter at the level of interstate disputes. In particular, Caselli et al. (2015) have built a novel dataset on the distance of oil fields from bilateral borders and study the role of asymmetry. They find –in line with the logic sketched in the previous section– that the highest dispute risk occurs under asymmetric constellations (i.e. with one country in a dyad having oil close to the border, and the other having either no oil or oil far away from the border).

While the above papers capture rather directly the notion of asymmetry and mismatch, one shortcoming of this literature is that it is still quite slim, with only a handful of studies investigating these precise notions empirically. Yet, by broadening somewhat the scope, a more established literature provides evidence in line with the aforementioned concepts. In particular, there is substantial anecdotal evidence of resource-rich minorities involved in separatist conflict (see e.g. the detailed accounts of Ross (2004) or Collier and Hoeffler (2006)). One can cite for instance the attempt of Katanga to split from the Congo in 1960-1963, the civil war in the Biafra region of Nigeria from 1967 to 1970, the separatism in now independent Timor-Leste since at least 1975, or the "Aceh Freedom Movement" in Indonesia starting in 1976. Beyond case studies, there exists statistical evidence that ethnic minorities that live in natural resource-rich homelands are more frequently entangled in separatist conflict (Sorens (2012); Paine (2019)). Further, Esteban et al. (2015) find that resource-rich ethnic minorities are on average more often targetted in mass killings, and Asal et al. (2016) show that a particularly large conflict risk arises for ethnic groups that are both excluded from political power and located in petroleum-producing areas.

Note that resource abundance is also associated with non-violent or less violent calls for secession. For example, Suesse (2019) finds that whe the Soviet Union collapsed, popular support for the creation of new sovereign states was greater in the oil rich republics, whereas Gehring and Schneider (2020) conclude that the Scottish bid for independence has been systematically fuelled by the value of prospective oil fields. After this tour d'horizon of key drivers of the "resource curse" we shall now move to a discussion of policies.

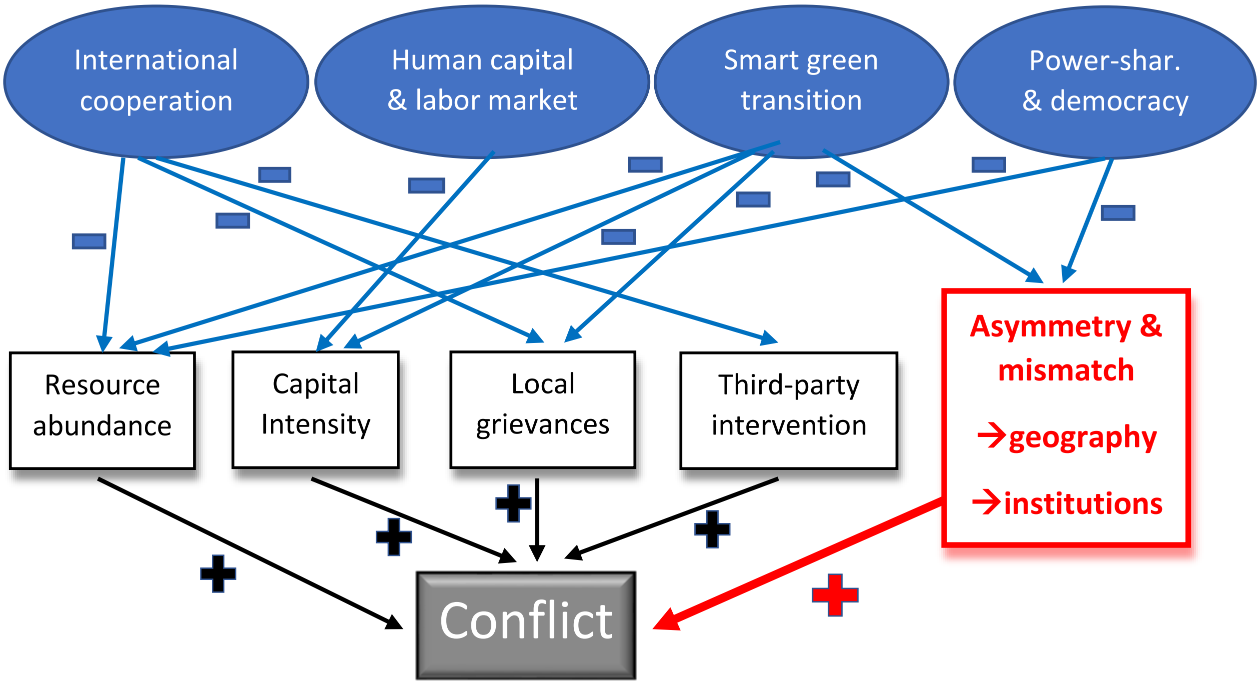
4 Policy

4.1 Overview

The aforementioned key reasons for which natural resources can fuel conflict can be addressed by a series of policies that attenuate the "toxic" incentives generated by the windfalls of mother nature. Figure 1 highlights how particular policies can tackle main conflict drivers. The lower part of the figure contains the aforementioned key drivers of the natural resource curse and conflict, whereby each risk factor is represented in one rectangle. While the first four risk factors are standard aspects abundantly discussed in the literature, the fifth risk factor corresponds to the main focus of the current handbook chapter, namely "Asymmetry and mismatch". Given that this is where our emphasis lies, we have highlighted it in red and bold. This rectangle also points out the two aspects of asymmetry and mismatch that we mentioned above. In particular, if mismatch is due to an unfortunate geographical distribution of natural resources and fighting advantages, it is much harder to address than if the underlying culprit for mismatch is discriminatory politics. In that case, appropriate institutional reform would be able to remedy this.

On the top of Figure 1 there are four key policy spheres that can help tackling one or several of the major risk factor, as illustrated by the negative-signed arrows. To take for example the first policy dimension, "International Cooperation", it is indicated by the arrows that it may be able to attenuate the risk factors "Resource abundance", "Local grievances" and "Third-party intervention", and so on for other policy dimensions. In what follows, these particular policy spheres are examined one-by-one.

Figure 1: Overview



4.2 International coordination

There are a battery of policies specifically linked to resource exploitation and trade. As shown in Berman et al. (2017), when mining companies obey to principles of corporate social responsibility the conflict-fuelling effect of their mining activity is attenuated. Related to this, they find that when commodities are covered by international transparency and traceability initiatives, the conflict risk is again reduced.[5] In line with this, also Armand et al. (2020) find for Mozambique that public information campaigns reduce resource-related conflict risks. Recent findings in Sonno (2023) point out that multinational companies investing in Africa may increase conflict risk when their investments require land grabbing and resources.

As discussed above, third party intervention may reduce the risk of conflict in areas of high strategic importance (see Gallea and Rohner (2021)). This principle of international coordination could be broadened beyond assuring free shipping routes. International gas pipelines could be overseen by a supranational body and also the mining of rare, critical minerals and earths could be put under the constituency and oversight of an international organization. To manage successfully the very pressing green transition global access to key ingredients for innovative green technologies is crucial and there is an overarching international public interest for achieving this. Put differently, whenever there is a heavy international externality present, there may be a case for governance taking place at a supranational level.

[5]This being said, the devil is in the detail, and the particular design of a given law or agreement matters heavily. For example, Stoop et al. (2018) found that the US Dodd-Frank act backfired in the Democratic Republic of Congo.

4.3 Human capital accumulation and labor market policies

Another promising policy is to turn resource riches into human capital. The underlying logic is outlined in De la Brière et al. (2017). In short, rents that can be looted fuel appropriative (conflict) behavior. However, once the oil or mining cash has been invested in human capital, it cannot be stolen anymore, and human capital cannot be appropriated contrary to physical capital. In addition, a great human capital goes along with higher productivity and hence a greater opportunity cost of giving up productive labor for taking up armed fighting.

By the same token, a series of labor market policies have been found to reduce the scope for fighting. In particular, both an employment program in Liberia (Blattman and Annan (2016)), as well as the Indian National Rural Employment Guarantee Act (Fetzer (2020)) have been found to curb conflict. Similarly, Lyall et al. (2020) finds that the combination of vocational training and cash transfers have reduced combatant support in Afghanistan.

4.4 Smart green transition

The elephant in the room is that fossil fuels are toxic – for the environment and for politics. So, unsurprisingly, the first best policy would be to get unhooked from our dependence to oil, gas and coal. There are of course plenty of obstacles and vested, narrow interests try to derail this indispensable move to renewable energy. Further, if the answer to the question "when" is clear (immediately!) the question of "how" to design green energy production is maybe more complex. As argued in recent work (see e.g. Rohner et al. (2023); Rohner (2023a)), it is key that green energy provision is decentralized (to prevent concentrated resource rents), creates local jobs, ensures a fair sharing of benefits and protects the local environment (which all contribute to attenuate grievances and social tensions). This being said, if moving away from fossil fuels will (at terms) solve the *fossil fuel* resource curse, the demand for minerals will –if anything– increase, also due to their key role in batteries. Hence, we need to complement this "smart green transition" by further policies that tackle the *mineral* resource curse.

4.5 Power-sharing and democratization

Beyond the green transition, it is striking that while some proportion of autocracies and intermediate regimes (sometimes called "anocracies") are plagued by armed violence, full mature democracies are more often shielded from civil conflict (Hegre (2001); Laurent-Lucchetti et al. (2023). This appears a fortiori true for resource-rich countries. For instance, Mehlum et al. (2006); Fetzer and Kyburz (2022) find that averse economic effects of resource abundance only apply to states with non-cohesive or "grabber friendly" institutions. Consistent with this, Couttenier et al. (2017) show for US data that in areas where mineral discoveries occurred before the establishment of formal institutions, more homicides per capita occurred historically, with the effect persisting until today. The need for solid democratic institutions is also highlighted by recent evidence that mining wealth tends to increase corruption and the election of politicians charged with serious crimes (Knutsen et al. (2017); Asher and Novosad (2023)) – hence, fostering transparency and sound governance are key as ramparts against such threats.

Through the lens of the simple canonical model presented above, a notable aspect of democracy is that it can make sure that ethnic groups are represented according to their demographic weight (for example if using pure proportional representation electoral systems and voting is for parties that represent the groups' interests). To the extent that group size on average positively correlates with military group strength, the rent sharing in democracy often reduces mismatches between relative strength and relative power. Unsurprisingly, it has been found that political exclusion is associated with rebellion (Cederman et al. (2010)), and that power-sharing (Mueller and Rohner (2018)) and franchise extension (Marcucci et al. (2023)) reduce the risk of conflict.[6] In contrast, policy reforms that shift a country towards a more extractive resource policy lead to a surge in the conflict risk, as shown for data from the Philippines by Crost and Felter (2020).

Importantly, one needs to keep in mind though that mismatch can arise from at least two sources. First of all, some geographical factors could lead to a minority group being extremely resource rich and/or having disproportionately high or low winning chances for particular types of war. Second, mismatch can arise if a given ethnic minority group does not benefit from inclusion in the political system and obtains a dismal share of the country's resources, relative to its size (as reflected by a very low α in the model. While a well-designed democratic system is well-suited to address the second type of trigger of mismatch, it may on its own not suffice to also address the first type of geographical asymmetry reasons for mismatch. This can be illustrated by telling historical examples. For instance, the case of UNITA rebels in Angola suggests that elections are not a panacea, since with winner-take-all-elections the post-election distribution of power can indeed determine a mismatch. Moreover, even proportional representation elections cannot suffice to eliminate mismatches for every possible circumstance: a proportional electoral system could guarantee a group with 30 percent of ethnic group voters 30 percent of political power, but if such a group has a probability of victory against the majority group that is much higher or much lower, then the mismatch is not eliminated, and hence the need for a complementary set of power sharing agreements may remains even within a democracy. The Good Friday agreement is a good example of a successful solution, where the mismatch potential has been eliminated by the compensation of arms deposition with commitment to include quotas in public employment, military, police, and alike.

[6] Horowitz (2014) highlights three typical challenges faced by ethnic power sharing, spanning from adoption over degradation to immobilism.

5 Conclusion

This chapter emphasizes that natural resources can be very powerful drivers of appropriation and armed conflict, but especially so when paired with geographic and/or power asymmetries. Sketching in a simple model key trade-offs and mechanisms, we have highlighted the role of geography and power mismatch in the so-called "natural resource curse". Recent empirical evidence has been presented, which shows how resource abundance, asymmetry and capital-intensiveness account for the toxic policies in rentier states. The roles of grievances of the local population and third-party intervention have also been documented. When it comes to policy solutions, they range from a "smart green transition", over power-sharing and democracy to labor-market interventions. Importantly, a series of specific policies linked to transparency initiatives and security guarantees require international cooperation, which highlights the scope for fostering multilateral coordination.

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