

The role of markets and preferences on resource conflicts

Alex Dickson[†], Ian A. MacKenzie^{*‡}, and Petros G. Sekeris[§]

[†]Department of Economics, University of Strathclyde, Glasgow, UK, G4 0QU.

[‡]School of Economics, University of Queensland, Brisbane, Australia, 4072.

[§]Montpellier Business School, Montpellier 34080, France.

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Abstract

Resources can incite conflict. The conventional explanation argues that higher resource rents—or a lower opportunity cost of appropriation—exacerbates conflict. Yet, it is also clear that not all conflicts conform to this mechanism: scarcity-driven conflicts are caused by a reduction in the value of resources (or higher opportunity cost of appropriation). We reconcile these seemingly contradictory observations by developing a generalized theory of resource conflict. We demonstrate that the existence of a resource curse (or blessing) relies on two fundamental elements: (i) market conditions; and (ii) agents' preferences. When resource prices are treated as exogenous, we obtain the conventional result, where an increase in the value of the resource rent (lower opportunity cost of appropriation) increases conflict. However, when the price of the contestable resource is endogeneously set (i.e., locally determined), we find the opposite result may hold depending on the nature of agents' preferences: conflict can increase when the contestable resource becomes scarcer. We show an identical result for contestable resources in the absence of markets, such as the determination of civil liberties and political rights. Our article therefore identifies fundamental transmission mechanisms in resource conflicts.

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*Corresponding author, e-mail: i.mackenzie@uq.edu.au

1 Introduction

The well-known ‘resource curse’ explains that in places governed by weak institutions, resources may hamper the development process (Mehlum, Moene and Torvik, 2006; Robinson, Torvik and Verdier, 2006). In particular, it is often observed that rent-seeking activities—such as lobbying, legal expenditures, or even armed conflict—are used to capture contestable rents to the detriment of economic growth. For example, such adverse consequences include dictators hampering the democratization of their polities via the strategic use of natural resources, or violent clashes erupting in the vicinity of newly discovered diamond fields.

The conventional mechanism to connect valuable resources to inefficient rent-seeking activities suggests that higher rents—or indeed a lower opportunity cost of appropriation—are conducive to increased inefficient rent-seeking activities. The *prima facie* empirical evidence appears to corroborate this story: when ‘resources’ are defined as natural wealth such as oil, diamonds, or other precious minerals, the empirical evidence demonstrating a causal effect on violence is compelling. Yet, if one explores a little deeper into the literature, there are also circumstances in which *reductions* in the value of resources, or *higher* opportunity costs of appropriation, give rise to increased conflict (Koren, 2018; Castillo, Mejía and Restrepo, forthcoming). This is inconsistent with leading theoretical explanations of conflict. The aim of this article is to develop a general model of conflict—where we consider the connectedness of the conflict environment to international markets, and the role of preferences—to understand the conditions under which the classic resource curse holds, and when it does not.

The current link between resources and conflict focuses on two main effects: a *rapacity effect* and *opportunity cost effect*. First, a more valuable resource rent generates a *rapacity effect* whereby agents are incentivized to invest effort in appropriating the wealth. Second, a less profitable alternative use of productive resources, i.e., a lower *opportunity cost* of an income-generating activity, also increases wealth-appropriation incentives. The predictions of the theoretical literature are that higher resource rents and/or a lower opportunity cost of appropriation are conducive to increased inefficient rent-seeking activities (e.g., Dal Bó and Dal Bó, 2011). There is a collection of empirical evidence on the rapacity and opportunity cost effects that corroborates this prediction. Using state-of-the-art econometric techniques, researchers have demonstrated that increases in the value of ‘grabbable’ resources such as oil, diamonds, or minerals incentivize agents to invest more effort in appropriative activities (e.g., Angrist and Kugler, 2008; Dube and Vargas, 2013; Ross, 2015; Berman, Rohner and Thoenig, 2017). Similarly, the opportunity cost effect has received widespread empirical support since negative shocks to income-generating activities have consistently been shown to spur violence

(e.g., Miguel, Satyanath and Sergenti, 2004; Hsiang, Burke and Miguel, 2013; Gawande, Kapur and Satyanath, 2017).

Many scholars, however, stand in stark opposition. For instance, Homer-Dixon (1999) and Kahl (2006) argue that, in fact, scarcities of appropriable resources are a source of violent conflict. A main driver identified by these authors is the relative deprivation that often affects poorer populations: with resources becoming scarcer and thus more valuable, the deprived will harbor higher incentives to violently appropriate, a result that is echoed within the literature on food riots (e.g., Bellemare, 2015). Likewise—and in direct contrast with the opportunity cost literature—Koren (2018) demonstrates empirically that negative land-productivity shocks reduce conflict. Evidence that is inconsistent with conventional conflict models can also be found within the civil rights movement in the United States, which was initiated by a rising black middle class whose civil liberties failed to grow in par with incomes (Bloom, 1987). Likewise, the nineteenth century women’s right movements in the United States were pioneered by middle-class women rather than by the lower strata of the society (Buechler, 1990). More broadly, and in line with Moore (1966) and Huntington (1991), economic development appears to generate new social forces standing for more democratic rights (Lipset, 1959). This empirical evidence suggests that improved livelihoods—and consequently a higher opportunity cost of conflict—seem to sharpen the incentives to devote effort to appropriating resources in these contexts, contradicting the opportunity cost effect.¹

In this article we reconcile all these seemingly contradictory observations into one general framework that allows investigation of the link between contestable resources and conflict to determine whether they are a curse (more resources generate more conflict) or a blessing (more resources give rise to less conflict, so by contrast resource scarcities drive more conflict). The model is simple: agents have a time endowment and the opportunity to consume both a contestable and non-contestable good; they invest their time endowment into either appropriating the contestable resource or producing the non-contestable good. We model rent appropriation as a contest where the share of the contestable resource is based on an individual’s appropriation effort relative to total outlays. Our innovation lies in the generalization

¹The concept of a contestable ‘resource’ is far broader than simply focusing on natural wealth: for example, contestable societal resources can include political rights, or public (club) good provision, to name but a few. In settings that involve an income-generating activity and a grabbable resource akin to a common-pool resource, one would naturally expect the results of the conflict literature to hold when replacing valuable minerals by such things as political rights. Although when focusing on well-traded natural resources the evidence is consistent with the classic resource curse, this is brought into question when a broader conception of contestable resources is considered. It is this observation that inspires our theoretical approach in which we attempt to reconcile this conflicting empirical evidence.

of agents' preferences, which provides a fundamental transmission mechanism for explaining the existence of either a resource curse or blessing. We are interested in the equilibrium distribution of agents' time endowment between the contestable and non-contestable goods. In particular, our main focus is on analyzing how a change in the resource size—and the opportunity cost of appropriation—may alter the distribution of productive and rent-seeking (unproductive) activities. That is, how does resource abundance/scarcity, and the value of the alternative use of appropriative effort, affect the degree of conflict?

We show the existence and extent of a resource curse (or blessing) depends on two pivotal factors: (i) the nature of the market for the contestable resource; as well as (ii) the preferences of agents. If the resource price is exogenously determined, say due to the presence of an accessible international market, then conflict is always increasing with the size and value of the resource, similar to the conventional resource curse. If, however, the contestable resource price is endogenously determined, i.e., when markets clear locally, then resource abundance can either increase or reduce conflict. The determining factor is the nature of agents' preferences. We find that if agents have an elastic marginal rate of substitution between the contestable resource and non-contestable good—a very reasonable assumption on preferences, which is implied by a relatively high marginal utility of the contestable good and/or complementarities between the two goods—then conflict is decreasing in the size of the contestable resource—a resource blessing. This appears to be anecdotally true, as scarcity-driven conflicts appear to occur when markets clear locally such as with food conflicts (Bellemare, 2015) or where the local value of the resource may increase with scarcity, as with drug conflicts (Castillo, Mejía and Restrepo, forthcoming). Furthermore, this result extends to contestable rents that have no marketplace. If there exists no market for the resource, such as in cases of contestable public good provision or the determination of civil rights, then we can observe either a resource curse or blessing depending on the nature of agents' preferences.

One of the conventional models to study the relationship between resources and conflict can be traced back to Gordon Tullock's (1980) contribution on rent seeking. Applying this setting to conflict over resources, agents optimally choose the contest effort to appropriate resources at some endogenous cost (e.g., Hirshleifer, 2001), which has equally been modeled as the opportunity cost of an alternative payoff-enhancing activity (e.g., Grossman, 1991). This literature unambiguously identifies a positive relationship between appropriable resources and conflict. Similar results are obtained for a plethora of contest models on appropriable resources (e.g., Hillman and Samet, 1987; Epstein and Nitzan, 2006; Wick, 2006). These contest models provide us with a good understanding of the time allocation between production and appropriation activities. However, these approaches also have limited explanatory power be-

cause they assume a specific structure of preferences. This implies, for example, individuals' marginal utility of the contested good must always be constant, and there are no interactions between the contested and non-contested good, but there is no *a priori* justification for restricting individuals' preferences in this manner. Our contribution is to allow for a general utility function over the contested and non-contested good, which creates new transmission mechanisms to explain the underlying incentives behind conflict. Whether conflict increases or decreases in the value of the contested resource depends on the elasticity of the marginal rate of substitution between contested and non-contested goods, but the basic intuition is quite straightforward. Suppose an individual has diminishing marginal utility over the contested good. If they face receiving less of that good because of an impending scarcity, their marginal utility of additional consumption is higher at this smaller allocation, and they increase conflict in an attempt to appropriate more of it. Recently, Dickson, MacKenzie and Sekeris (2018) modeled a contest for the share of a rent and found that it was possible for equilibrium effort to be decreasing in the size of the rent. While this work provides insights into agents' underlying incentives—and extends the application of contest theory—it is based on the appropriation of a single rent in isolation. Yet to begin to understand the underlying incentives within a resource conflict setting, it is imperative to focus on the interaction between contestable and non-contestable goods, as is clear from the discussion on the aforementioned *opportunity cost effect*. Our contribution, then, is to develop a general model of conflict, which can include allowing for diminishing marginal utility of the contested resource (which is very natural) and interactions between the contested resource and appropriation effort (again very natural). Within this framework, if there is an international market for the contested good (prices are exogenous) there is no effect whatsoever, and the same results as the traditional conflict literature emerge giving the classic resource curse. However, when prices are endogenous—or there is no market for the resource—the story may be starkly different, as we have explained.

As our focus is on a multiple-goods/sectors setting, a key methodology is presented by Dal Bó and Dal Bó (2011). In this approach, a Heckscher-Ohlin model of trade is proposed with two productive sectors: a capital intensive one, and a labor intensive one. Dal Bó and Dal Bó (2011) develop the standard Heckscher-Ohlin trade model with an appropriative sector, which competes with the other sectors for the scarce labor and generates revenue by preying on the productive sectors. In line with Heckscher-Ohlin predictions, increases in the price of the capital-intensive (labor-intensive) good lead to an increase of the relative remuneration of capital (labor), thus reducing (increasing) the opportunity cost of joining the appropriative sector, and by extension reducing (increasing) conflict intensity. Hence, Dal Bó and Dal Bó (2011)'s theory draws predictions tying prices of resources and wages to conflict but cannot

reconcile the observations of scarcity-driven conflict.

Besides Dal Bó and Dal Bó (2011) who consider the question in a general equilibrium setting, other articles have equally considered the role of prices on the resources-conflict nexus, albeit in partial equilibrium settings. Berman, Couttenier and Soubeyran (2017), for instance, consider the price of fertilizers and they show in a dynamic setting with heterogeneous land plots that higher prices will intensify conflict in the presence of higher fertility-heterogeneity, as low fertility farmers will attempt grabbing more productive land. McGuirk and Burke (2017) distinguish institutional settings with net suppliers of the contested good, from ones with net demanders. High prices could then produce conflict—food riots—in net demand locations, while low prices reduce the opportunity cost of fighting in net supply locations, thereby also fueling conflict. Both studies propose an amended version of the rapacity and opportunity cost mechanisms, thereby contributing to the analysis of relative price variations and conflict. These articles, however, cannot explain why scarcities of a lootable resource and/or favorable conditions for producing the non-appropriable resource—frequently observed in the real world—can give rise to conflict.²

Our contribution is the development of a more general model in which to understand the underlying incentives behind resource conflict. This reconciles the existing literature that focuses on the rapacity and opportunity cost effects as well as the literature that focuses on scarcity and conflict. The remainder of the article is organized as follows. In Section 2 the model is introduced. Section 3 ties our theoretical contribution to the existing empirical literature. Section 4 provides some concluding remarks.

2 The model

2.1 Economic environment

Consider an economy in which there is a set of agents $N = \{1, 2, \dots, n\}$ and two goods—a contestable good r and a non-contestable good y . The total amount of the contestable good that is locally available is R . The aim of this article is to capture a situation in which individuals make a decision about how much time to dedicate to appropriation of the contestable good, with the remainder of their time going to production; and they may also have access to a market to trade their allocation of the contestable and non-contestable goods determined by

²Acemoglu et al. (2012) also propose a model where scarcities generate conflict, albeit in a radically different context since they design a dynamic game with a resource-exporting country trading with a resource-importing one. The latter being able to appropriate with certainty (at some cost) the renewable resources of the former at any point in time.

their time-allocation choice.

Each agent has a resource of $e^i > 0$ units of time available and has to decide on the number of units $x^i \in [0, e^i]$ of this time to allocate to appropriating the contestable good. The remainder of their time, $l^i = e^i - x^i$ is allocated to producing the non-contestable good according to the constant returns to scale production function $y^i = \alpha^i l^i$. If agent $i \in N$ consumes the bundle $(r^i, y^i) \in \mathbb{R}_+^2$ they receive utility $u^i(r^i, y^i)$ that we assume to be increasing in both arguments, differentiable as many times as required, and strictly quasi-concave. We denote by $MRS^i(r^i, y^i) \equiv \frac{u_y^i}{u_r^i}$ the absolute value of the marginal rate of substitution between the consumption of r^i and y^i . For simplicity of exposition we assume all agents are symmetric with $e^i = e$, $u^i(\cdot, \cdot) = u(\cdot, \cdot)$ and $\alpha^i = \alpha$ for all $i \in N$.

We suppose that appropriation of the contestable good is governed by a Tullock (1980) share contest, so agent i 's appropriated share of the contested good is given by

$$\pi^i(x^i, X^{-i}) = \begin{cases} \frac{x^i}{x^i + X^{-i}} & \text{if } x^i + X^{-i} > 0 \text{ or} \\ \frac{1}{n} & \text{otherwise,} \end{cases} \quad (1)$$

where $X^{-i} = \sum_{j \in N \setminus \{i\}} x^j$. Given a vector of appropriation effort choices \mathbf{x} , the quantities of the contestable and non-contestable goods allocated to agent i are given by

$$\hat{r}^i = \pi^i(x^i, X^{-i})R, \text{ and} \\ \hat{y}^i = \alpha(e - x^i).$$

Following the outcome of the contest, we want to consider that individuals may then be able to trade their allocation of the contested and non-contested good in a market. Accordingly, we consider three alternative economic frameworks:

1. where a local market exists between the contestable and non-contestable goods, in which prices are determined endogenously with agents' choices to locally clear the market (i.e., a general equilibrium setting);
2. where a market exists but market clearing is at a higher geographical level so prices are (locally) exogenous (i.e., a partial equilibrium setting); and
3. where no market exists between the contestable and non-contestable goods so the allocation from the contest is the final allocation.

In each case, we seek a Nash equilibrium of the simultaneous-move game of complete information that is played.

Consider this problem in (y^i, r^i) -space, as observed within Figure 1. The contest technology combined with the production function imply a production possibilities frontier (PPF) of

allocations of the contested and non-contested good that an individual can achieve by engaging in the contest (for given actions of the other contestants). If there is no market between the contested and non-contested goods this gives the final combinations of goods the individual can achieve and so they will seek to choose their contest effort to get them to the point on their PPF that maximizes their utility. This case is represented in Figure 1 (a). Conversely, if there is a market between the contested and non-contested goods then the outcome of the contest essentially determines the budget an individual has to transact in this market. If prices are exogenous it is intuitively clear that the individual will seek an outcome from the contest that maximizes their budget, then they will choose the allocation that maximizes their utility subject to a linear budget constraint, as observed in Figure 1 (b). If prices are endogenous, however, the situation is somewhat more nuanced since the rate of exchange between the contested and non-contested good is not fixed, but the basic story is the same: the initial contest outcome determines the goods available for trade in the market, but where the price is influenced by individuals' actions.

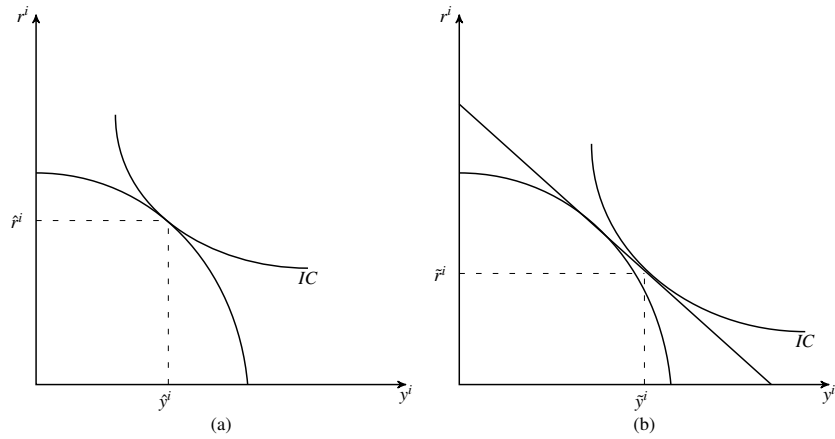


Figure 1: The consumption choice of contestable and non-contestable goods under (a) no market and (b) exogenous market prices, where \hat{r}^i and \hat{y}^i denote the allocation of the contested and non-contested goods following transacting in the market.

First, let us note some relationships that will allow us to derive the PPF that is common to all settings. The resource constraint requires that $l^i + x^i = e$, and the production function implies $\hat{y}^i = \alpha l^i$. Combining these equations gives $x^i = e - \hat{y}^i/\alpha$, and therefore we can write the PPF, which depends on the actions of other contestants, as

$$\hat{r}^i = \frac{e - \hat{y}^i/\alpha}{e - \hat{y}^i/\alpha + X^{-i}} R, \quad (2)$$

the absolute value of the slope of which is the marginal rate of transformation:

$$MRT = \frac{X^{-i}}{[e - \hat{y}^i/\alpha + X^{-i}]^2} \frac{R}{\alpha}. \quad (3)$$

We next turn to consider each market setting in turn.

2.2 Equilibrium with endogenous price formation

When individuals engage in the contest the allocation of the contestable good they receive is given by $\hat{r}^i = \frac{x^i}{x^i + X^{-i}}R$ and the amount of non-contestable good produced is $\hat{y}^i = \alpha[e - x^i]$. As such, if ϕ is the price of the contested good (with the price of the non-contested good normalized to 1) the budget available to the individual is $\alpha[e - x^i] + \phi \frac{x^i}{x^i + X^{-i}}R$. Denoting by \tilde{r}^i and \tilde{y}^i the allocation of the contested and non-contested good following transacting in the market, the value of an individual's chosen bundle $\tilde{y}^i + \phi\tilde{r}^i$ must not exceed this budget. Moreover, since here we assume markets clear locally the price must adjust so that the market for the contestable good clears (of course, by Walras' law, the market for the non-contested good will also clear). We envisage market clearing, as in Cournot markets, being administered by an auctioneer who sets the price and individuals understand their influence on the price by anticipating how the auctioneer would respond to changes in their behavior. Market clearing thus requires $\sum_{j \in N} \tilde{r}^j(\phi) = R$.

As such, individuals may be seen as solving the problem

$$\max_{x^i, \tilde{r}^i, \tilde{y}^i} u(\tilde{r}^i, \tilde{y}^i) \text{ s.t. } \begin{cases} \tilde{y}^i + \phi\tilde{r}^i \leq \alpha[e - x^i] + \phi \frac{x^i}{x^i + X^{-i}}R \\ \sum_{j \in N} \tilde{r}^j(\phi) = R. \end{cases}$$

The outcome of the contest determines the point on the PPF the individual reaches, that they can then trade away from in the market subject to their budget constraint. When markets clear locally and prices are determined endogenously, the budget constraint an individual will face is a complicated non-linear function.

For a symmetric equilibrium, the solution to the above optimization problem will coincide with where utility is maximized subject to being on the PPF, at which point the marginal rate of substitution will be equal to the marginal rate of transformation:

$$MRS^i(\tilde{r}^i, \tilde{y}^i) = \frac{X^{-i}}{[e - \tilde{y}^i/\alpha + X^{-i}]^2} \frac{R}{\alpha}.$$

In a symmetric equilibrium $\tilde{r}^i = R/n$, $\tilde{y}^i = \alpha[e - x^*]$ and $X^{-i} = [n - 1]x^*$. As such, the above optimality condition can be written

$$MRS^i(R/n, \alpha[e - x^*]) = \frac{n - 1}{n^2} \frac{R}{\alpha x^*}. \quad (4)$$

We can use this expression to determine how the optimal allocation of the non-contested good, and consequently effort in the contest (since $x^* = e - \tilde{y}/\alpha$), changes as the total amount of the contested good changes. Consider, in particular, the effect on the optimality condition

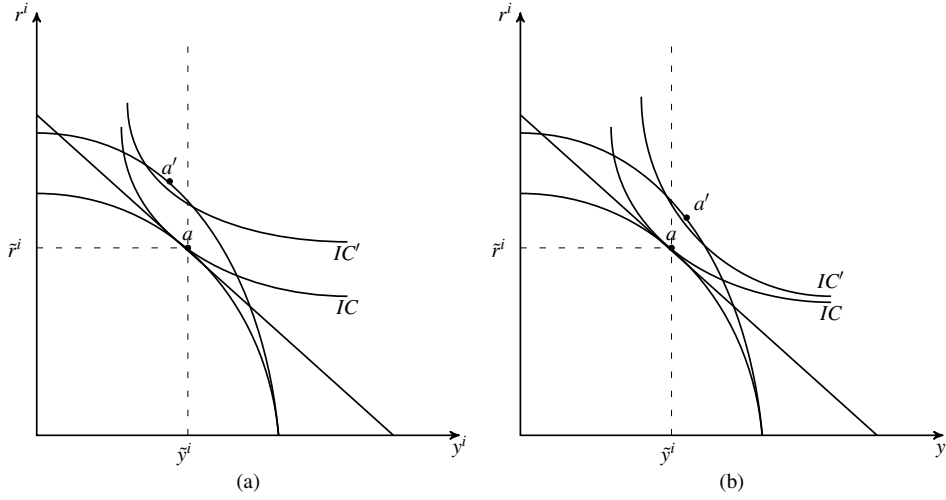


Figure 2: The effects of an increase in the contestable good. In case (a) the marginal rate of transformation increases faster than the increase in the marginal rate of substitution and there is an increase in appropriation time (decrease in \tilde{y}^i). In case (b), the marginal rate of transformation increases at a slower rate than the marginal rate of substitution and an increase in R results in a decrease in appropriation time.

when R increases keeping the contest effort fixed at the old x^* . The MRS changes by $\frac{1}{n}MRS_r^i = \frac{1}{R}r^iMRS_r^i$; and the MRT changes by $\frac{n-1}{n^2} \frac{1}{x^*\alpha} = \frac{1}{R}MRS^i$ (using the optimality condition). Now, if the MRT changes by more than the MRS then the equilibrium will involve a smaller \tilde{y}^i and consequently larger x^* . This is represented in Figure 2 (a). In this case, an increase in R expands the PPF and consequently increases the MRT more than the increase in the MRS. Thus the agent's optimal consumption of $(\tilde{y}^i, \tilde{r}^i)$ moves from point a to point a' , so there is an increase in appropriation time x^* . Conversely, if the MRT changes by less than the MRS then the new equilibrium will involve a larger \tilde{y}^i and therefore smaller x^* . This is observed in Figure 2 (b) with an optimal consumption bundle moving from point a to point a' with an associated decrease in appropriation time. As such, when the amount of the contested good, R , increases, the effort dedicated to contesting this good will increase (decrease) if and only if $MRS^i > (<)r^iMRS_r^i$.

Proposition 1. *When relative prices are endogenously determined, an increase in the stock of the contested good distorts effort toward (away from) appropriation activities iff³*

$$\eta^i \equiv \frac{r^iMRS_r^i}{MRS^i} < (>)1.$$

³Since $MRS^i = \frac{u_y^i}{u_x^i}$, $MRS_r^i = \frac{u_r^i u_{ry}^i - u_y^i u_{rr}^i}{[u_x^i]^2}$ and so $\eta^i = r^i \frac{u_r^i u_{ry}^i - u_y^i u_{rr}^i}{u_x^i u_y^i}$. As such, higher u_{ry}^i (i.e., stronger complementarities between the goods) or lower (more negative) u_{rr}^i (i.e., more strongly diminishing marginal utility) is more conducive to an elastic marginal rate of substitution.

Proposition 1 implies that if the marginal rate of substitution between the contested and non-contested good is inelastic, then increases in the stock of the contested good will call for contestants to substitute production time for appropriation time, as per the usual conclusion in production-appropriation settings: the effort dedicated to contesting contestable goods is monotonically increasing in the quantity in which they are available. But if the marginal rate of substitution between the contested and non-contested good is elastic, the reverse is true. This implies that when the contested good becomes scarcer time will be shifted from production to appropriation even though the quantity of the contested good has declined.

Now we turn to study the effect of the productivity parameter, α . Keeping x^* fixed, if α increases the change in the marginal rate of substitution is given by $[e - x^*]MRS_y^i = \frac{1}{\alpha}y^i MRS_y^i$, which is negative. The change in the marginal rate of transformation is $-\frac{n-1}{n^2} \frac{R}{\alpha^2 x^*} = -\frac{1}{\alpha} MRS^i$. As such, the equilibrium allocation of the non-contested good will increase (decrease) if the reduction in the marginal rate of transformation is more (less) than the reduction in the marginal rate of substitution, i.e., if $MRS^i > (<)|y^i MRS_y^i|$. Since x^* and the equilibrium allocation of the non-contested good are inversely related, this allows us to draw the following conclusion.

Proposition 2. *When relative prices are endogenously determined, an increase in productivity α distorts effort away from (toward) appropriation activities iff⁴*

$$\zeta \equiv -\frac{y^i MRS_y^i}{MRS^i} < (>)1.$$

Proposition 2 echoes Proposition 1 since it establishes that when the marginal rate of substitution of r to y is inelastic to changes in the quantity of the produced good y^i , increases in the productivity α will incentivize players to substitute appropriation time for production time, while if it is elastic increases in productivity will lead to less production and consequently more appropriation activity. The intuition of this result is similar to the one of the previous proposition: when players produce large amounts of y , and if the marginal utility of y^i is not very sensitive to changes in y^i , contestants place a relatively low valuation on incremental amounts of y . This in turn drives upwards the relative price, ϕ , hence incentivizing players to compete more fiercely for the control of the contestable good. In such instances, the effect on production will be indeterminate since while less time is dedicated to production that time is more productive. If, however, the marginal rate of substitution of r to y is inelastic to changes in the quantity of the produced good y^i , then the relative price of good r will be low and positive productivity shocks will drive away effort from appropriative activities to-

⁴Analogously, $MRS_y^i = \frac{u_r^i u_{yy}^i - u_y^i u_{ry}^i}{[u_r^i]^2}$ and therefore $\zeta^i = y^i \frac{u_y^i u_{ry}^i - u_r^i u_{yy}^i}{u_r^i u_y^i}$ so higher u_{ry}^i and/or more negative u_{yy}^i is more conducive to an elastic marginal rate of substitution.

wards production. This in turn will unambiguously result in an increase in production of the y good.

2.3 Equilibrium with exogenous prices

If there is a market between the contestable and non-contestable goods, but that market clears at a higher geographical level, then we may consider that both goods can flow in and out of the local economy in which the contest takes place and that actions in the local economy have no influence on the relative price of the contested good. In this case, an individual's allocation from the contest determines their goods available for trade in the market, which does not affect the market price. As such, individuals can be seen as choosing their market allocation to maximize their utility subject to a linear budget constraint where the budget is given by the value of the allocation from the contest.

Each individual's optimization problem is thus simply to

$$\max_{\tilde{r}^i, \tilde{y}^i, x^i} u(\tilde{r}^i, \tilde{y}^i) \text{ s.t. } \bar{\phi}\tilde{r}^i + \tilde{y}^i \leq \bar{\phi}\frac{x^i}{x^i + X^{-i}}R + \alpha(e - x^i)$$

where $\bar{\phi}$ is the market price.

To maximize utility through trade in the market, each individual will seek to maximize their budget available as a result of the outcome of the contest. As such, in choosing their effort each individual will seek to

$$\max_{x^i \in [0, e]} \bar{\phi}\frac{x^i}{x^i + X^{-i}}R + \alpha(e - x^i).$$

The necessary and sufficient (since the objective function is readily confirmed to be concave) first-order condition is given by

$$\frac{X^{-i}}{[x^i + X^{-i}]^2}\bar{\phi}R - \alpha = 0.$$

Imposing symmetry thus gives

$$x^* = \frac{n-1}{n^2}\frac{\bar{\phi}R}{\alpha}.$$

It then readily follows that the maximized budget available for trade in the market is given by $\alpha e + \bar{\phi}\frac{R}{n^2}$.

From the explicit solution we find in this case of exogenous markets, it follows that

$$\begin{aligned} \frac{dx^*}{dR} &= \frac{n-1}{n^2}\frac{\bar{\phi}}{\alpha} > 0, \\ \frac{dx^*}{d\alpha} &= -\frac{n-1}{n^2}\frac{\bar{\phi}}{R}\alpha^2 < 0, \text{ and} \\ \frac{dx^*}{d\bar{\phi}} &= \frac{n-1}{n^2}\frac{R}{\alpha} > 0. \end{aligned}$$

As such, a greater abundance of goods, or a reduction in productivity, will give rise to an increase in effort dedicated to appropriation.

Proposition 3. *When relative prices are exogenously determined, an increase in the stock of the contested good (R) or an increase in the relative price of the contested good ($\bar{\phi}$) unambiguously distort effort toward appropriative activity, while an increase in productivity of the non-contested good (α) unambiguously distorts effort towards productive activity.*

The intuition of this result is that with exogenous prices, agents strategically interact only in the allocation of the contested good. Hence, the time-allocation problem and the utility maximization problem for a given budget can be seen as two independent problems, and thus solved sequentially. It follows that any individual will seek an outcome from the contest that maximizes their budget. Upon inspection of any individual's budget constraint, we observe that the time-allocation problem then simply consists of maximizing an additive objective function of two terms: $\bar{\phi} \frac{x^i}{x^i + X^{-i}} R - \alpha x^i$. Increasing the amount of contestable good then implies an increase in the marginal return from the appropriation activity, for a given marginal return from the production activity, hence incentivizing any individual to increase their appropriation effort. Likewise, an increase in the productivity parameter α will incentivize individuals to increase the time devoted to production.

2.4 Equilibrium with no market

In the case where no market exists between the contested and non-contested good, each individual's allocation from the contest will be their final allocation of goods. The PPF determines the combination of allocations that can be achieved by engaging in the contest, and therefore we may see each individual as choosing their allocation of the contested and non-contested goods to maximize their utility subject to the constraint of being on the PPF. As such, the equilibrium with no markets will be characterized by the tangency condition of each individual's marginal rate of substitution being equal to their marginal rate of transformation, just as we argued was the case when markets with endogenously determined prices exist. Consequently, with no markets the equilibrium will be exactly the same as in the case with endogenous markets, allowing us to apply Propositions 1 and 2 to this case as well.

3 Revisiting the empirical evidence

The results derived in the previous section suggest that the two crucial factors determining the allocation of resources between production and appropriation activities are the market

structure and the shape of the utility functions. First, provided markets exist, the way prices are determined proves central to the activities the agents invest their time in. When prices are exogenously given, the relative profitability of either activity will not be reflected in the goods' relative prices, and will thus only affect the income-generating capabilities of players. Accordingly, any increase in the relative return to productive effort will unambiguously imply a substitution from appropriative to productive effort. Second, when either prices are endogenously determined, or when there are no markets, the sensitivity of the marginal rate of substitution between the two goods to the quantities of either good will prove essential for determining the changes in effort allocation. If the MRS is sensitive to changes in quantity of the first argument, this will imply that even if that good was to become more abundant, players would nevertheless *reduce* the time allocated to producing/appropriating that good.

We can now revisit the existing empirical literature in light of our theoretical predictions to better understand the mechanisms driving the results.

3.1 Markets and prices

Most of the existing literature on resources and conflict has concentrated on resources that are marketable and for which markets exist. The two most robust findings in the empirical literature on conflicts are the empirical confirmation of the *rapacity effect* and the *opportunity cost effect*.

Regarding the rapacity effect, numerous articles uncover a positive causal impact of valuable lootable resources' price increases on conflict incidence and/or intensity. Micro-econometric studies provide overwhelming support of this theoretical channel since increases in the price of coca (Angrist and Kugler, 2008), oil (Dube and Vargas, 2013) or minerals (Maystadt et al., 2014; Berman, Rohner and Thoenig, 2017) all lead to more violence at subnational geographical units. These findings uncover that in localized geographical areas, when the looting activity becomes more profitable following an exogenous price shock, efforts to appropriate the valuable resource increase. It is noteworthy to mention that the focus of the above studies has exclusively been on resources that are not consumed locally, and whose price is determined on international markets. These two features combined imply that relative prices can be seen as exogenous, and as such the above observations are in line with the predictions of Proposition 3.

To complement these findings, the literature has consistently established the empirical validation of the opportunity cost channel as well. Following the pioneering study of Miguel, Satyanath and Sergenti (2004) on negative shocks on agricultural income and civil wars in

Sub-Saharan Africa, a series of studies provided further econometric support of this channel (Bruckner and Ciccone, 2010; Hidalgo et al., 2010; Hsiang, Burke and Miguel, 2013; Couttenier and Soubeyran, 2014; Harari and La Ferrara, 2018; Vanden Eynde, 2018). Similar causal conclusions are indeed reached when considering the effect of negative commodity price shocks (Bruckner and Ciccone, 2010), negative international demand shocks (Berman and Couttenier, 2015), the introduction of more drought-resistant crops (Jia, 2013), or simply accounting for poverty and local income levels (Humphreys and Weinstein, 2008; Do and Iyer, 2010; Bohlken and Sergenti, 2010).

The empirical literature studying the link between resources and conflict has mostly remained silent on the underlying market structure. Yet, while the above micro-empirical findings are all consistent with our theoretical findings in settings with exogenously given prices, it is not implausible in the case of agricultural goods to conceive of prices that—in some cases—are endogenous to local conditions. Such would be the case when the agricultural production is consumed locally, a reality in remotely located areas. The above results would still be consistent with our theoretical predictions in settings with endogenous prices, under some conditions, but the above-cited empirical literature nevertheless does not account for market conditions. The two exceptions we are aware of that account for market isolation are Maystadt and Ecker (2014) and Berman and Couttenier (2015), neither of which goes against our theoretical predictions. Maystadt and Ecker (2014) show that severe periods of drought in Somalia have pushed cattle owners to over-supply the market, thereby provoking prices to fall and thus increasing the likelihood of conflict because of the reduction in the opportunity cost of fighting. Berman and Couttenier (2015) claim that international price shocks do not affect prices in remotely located areas, thus shielding such localities from conflict-inducing price downturns. Two studies partly challenge the above findings. von Uexkull et al (2016) show that the opportunity cost effect is salient for vulnerable groups alone, thereby potentially suggesting that the marginal return of appropriative vs productive activities varies with income levels. But the most challenging finding is provided by Koren (2018) who empirically establishes a reverse opportunity cost effect whereby drought leads to decreased levels of violence.

Our theory predicts that when prices are endogenously determined, resource scarcities (rather than abundance) may be a driver of increased conflict. It is perhaps not surprising that most empirical studies have failed to uncover these mechanisms, since the market conditions that play a central role in our analysis have not been explicitly accounted for in the empirical literature. By emphasizing the role of markets and of preferences, our contribution helps clarifying the unsettled debate on the role of environmental depletion and resource

scarcity on conflict. Kahl (2006) succinctly summarizes this debate. The literature has identified both abundance (e.g., Collier and Hoeffler, 2004) and scarcities (e.g., Homer-Dixon, 1999; Kahl, 2006) as drivers of violence and conflict. The above-cited literature brings support to the scarcity-driven conflict by demonstrating the validity of the *opportunity cost* channel in explaining conflict. Yet, this argument fails to explain rising concerns of conflict surrounding scarcities of resources with ill-defined property rights like fish, forests, or water. Our theoretical framework sheds light on a fundamental mechanism incentivizing agents to increase appropriation efforts in such instances: as the stock of resources becomes scarce, the marginal utility of the resource use increases, and the marginal rate of substitution between the scarce resource and other consumables becomes highly sensitive to changes in the size of the stock of resources. Consequently, further depletion of the resource stock will incentivize agents to devote more effort to appropriate the scarcer resource. The historical example of Easter Island, as documented by Diamond (2005), illustrates this phenomenon well. As the island population rose to unsustainable levels in the absence of strong institutions, the various clans inhabiting the island competed for scarce resources with the competition becoming so intense that a civil war erupted, *de facto* plunging the population into chronic poverty. Generally speaking, one should expect different degrees of market integration depending on the remoteness of the unit of observation in the datasets employed in the above-mentioned studies. As such, carefully accounting for market penetration could produce opposing results across geographical units, such as in Maystadt and Ecker (2014) and Berman and Couttenier (2015).

Turning next to the cross-country literature on the topic, it appears less conclusive than the micro-empirical literature. Cross-country data confirming the rapacity channel for the case of oil include Ross (2006) and Lei and Michaels (2014), although these results have been contested by some researchers (Cotet and Tsui, 2013; Bazzi and Blattman, 2014). Nunn and Qian (2014) uncover a positive effect of (lootable) US food aid on the intensity of ongoing civil conflicts, while de Ree and Nillesen (2009) identify a peace-promoting effect of foreign aid. The same contrasting image is obtained when considering resource-dependence within countries. As another example, Collier and Hoeffler (2004)'s highly publicized results on the positive correlation of resource dependence and civil conflict were later refuted by Brunnschweiler and Bulte (2009).

The above articles feature different datasets and identification strategies, but even after accounting for the limitations of some studies, the evidence does not unambiguously point in one direction. One needs to consider cross-country evidence with precaution since such studies may, by construction, attenuate the impact of local resources on surrounding regions at a fine level of geographical disaggregation. In natural resource-rich countries, for instance,

increases in resource prices are likely to have a differential effect on the propensity to take up arms across geographical entities depending on the local specificities (i.e., on the local production and appropriation technologies). The dilution of such localized effects on national aggregates can eventually explain the lack of statistical significance; what is commonly known as an *ecological fallacy*. Couttenier and Soubeyran (2014) and Berman and Couttenier (2015) provide evidence in support of this phenomenon. Another reading of the cross-country results, however, is that on global markets prices can be considered endogenous. In such instances, (relative) abundance of resources will have a pacifying effect, while (relative) scarcities will boost conflict. The country-heterogeneity may therefore mask opposing mechanisms taking place across countries, eventually yielding ambiguous econometric results.

3.2 Absence of markets

Our theory is flexible enough to equally study settings where markets are absent. While commodities can always be traded, either on markets or in the context of a barter economy, there are no markets for other 'goods' such as political rights and civil liberties, or public goods. As such, one reading of our theory is that positive (negative) shocks on the income-generating activity can induce individuals to devote more (less) time to expanding their political rights, to defending their civil liberties, or to obtain public goods.

One instance of particular interest where our paper contributes to the literature is by proposing micro-foundations for the *modernization hypothesis* proposed by Lipset (1959). The Lipset hypothesis posits that democratization emerges in tandem with economic development for reasons such as the development of a middle class, or the rise in citizens' education. Our theory brings forward an alternative explanation regarding the microfoundations of this hypothesis. To see that, taking for granted that agents obstructing democratization do so because of self-interest, it is reasonable to conceive of agents as having preferences on the optimal degree of democratization on a line segment in the Euclidean space. Accordingly, the implemented degree of democratization will reflect the relative effort invested by the various concerned parties with divergent objectives. As citizens see their income rise, the marginal utility of income becomes lower, and the sensitivity of the marginal rate of substitution of income to political rights becomes higher. This in turn implies that when wealthy individuals see their income rise further, they will substitute resources devoted to income generation by resources devoted to increasing their political rights.

The empirical support for Lipset's hypothesis has been mixed so far since Acemoglu (2008) showed the absence of a correlation between income per capita and democracy, while Cerve-

latti, Sunde and Valmori (2017) do demonstrate the existence of correlations, conditional on countries not being former colonies. The latter result is of particular interest since rising incomes may very well spark a desire for more democratic rights, alongside mobilisation attempts, but the particular context in which this happens will determine whether such desires and attempts translate to increased democratic rights. In former colonies governed by strong elites and—typically—strong security apparatuses, state repression will contain democratic demands more effectively, and rent-seeking elites will likely appropriate wealth. In regimes without a history of military repression, democratization demands are more likely to be accommodated. To observe this, consider popular demands for extending civil liberties in Western countries. The civil rights movement in the United States, for example, was initiated by a rising black middle class whose civil liberties failed to grow in par with incomes (Bloom, 1987). Likewise, the 19th century women’s rights movement in the United States was pioneered by middle-class working women rather than by the lower strata of the society (Buechler, 1990). More generally speaking, and in line with Moore (1966) and Huntington (1991), economic development seems to give rise to new social forces standing for more democratic rights.

4 Conclusion

Resources have been shown to spark conflict in a wide range of contexts. The empirical literature has established that conflicts are more likely in the presence of valuable lootable resources, thus confirming the *rapacity channel* identified in the theoretical literature, but also when income-generating opportunities dwindle, confirming the *opportunity cost channel*, which has also been theorized. Yet, not all conflicts occur in the presence of abundant valuable resources, as exemplified by the neo-malthusian theses. Moreover, no consistent theoretical framework is able to capture these two contradictory results. Our theory bridges this theoretical gap by proposing a unified production-appropriation model that identifies two crucial ingredients as drivers of conflicts, namely the market structure and the agents’ preferences.

We demonstrate that when agents are unable to influence the relative prices of commodities, any change in the relative profitability of either activity will incentivize players to devote relatively more time to that activity so as to be able to expand their income, and thus to purchase a utility-enhancing consumption bundle. When markets clear locally, however, the opposite result can obtain. With locally clearing markets, relative prices will reflect the relative desirability of agents to both appropriate/produce goods and to consume them. If the appropriable resource is scarce, this will drive the relative price of the resource up. This in turn will make players more sensitive to changes in the stock of scarce resources. Further re-

ductions in the stock of the scarce (appropriable) resource will then induce players to reduce their production of the other (relatively abundant) commodity so as to devote more time to claim a share of the scarce resource. The specular results derived from this mechanism are that conflict will be more likely when the appropriable resource becomes scarcer, and also when the opportunity cost of fighting is lower, results that stand in stark contrast with the established literature. Interestingly, we demonstrate that in the absence of markets we obtain the same exact conditions than with locally clearing markets.

Preferences—and in particular the degree of diminishing marginal utility and complementarity of the goods in the agents' utility function—prove to be of central importance as well. With endogenous prices, an exogenous shock to the production or appropriation technologies will lead to a relative price change that produces two mechanisms. If the marginal rate of transformation between appropriation of valuable resources and production of the consumable good increases because of an improvement in productivity or because of a degradation of the appropriation technology, agents will want to devote more time to production. Second, however, and by analogy to the income effect in consumer theory, for a given marginal rate of transformation, improvements in the production technology generate *ceteris paribus* a positive income shock enabling agents to obtain more of *both* goods, with lower production effort. In essence, therefore, whether better production technologies will translate in more or less appropriation effort will depend on which effect dominates.

This new theory enables us to better comprehend a plethora of empirical results, and to clarify the debate on the resources-conflict nexus. By identifying the market structure and preferences as key elements driving agents' decisions, our model opens up a new avenue for future research on the impact of environmental depletion or of Malthusian pressures on conflict.

References

- Acemoglu, D. (2008) "Oligarchic versus democratic societies," *Journal of the European Economic Association*, **6(1)**, pp. 1–44.
- Acemoglu, D., Golosov, M., Tsyvinski, A., and Wacziarg, R. (2012) "A dynamic theory of resource wars," *Quarterly Journal of Economics*, **127**, pp. 283–331.
- Angrist, J. D. and Kugler, A. D. (2008) "Rural windfall or a new resource curse? coca, income, and civil conflict in Colombia," *Review of Economics and Statistics*, **90**, pp. 191–215.
- Bazzi, S. and Blattman, C. (2014) "Economic shocks and conflict: Evidence from commodity prices," *American Economic Journal: Macroeconomics*, **6**, pp. 1–38.
- Bellemare, M. F. (2015) "Rising food prices, food price volatility, and social unrest," *American Journal of Agricultural Economics*, **97**, pp. 1–21.
- Berman, N. and Couttenier, M. (2015) "External shocks, internal shots: The geography of civil conflicts," *Review of Economics and Statistics*, **97**, pp. 758–776.
- Berman, N., Couttenier, M., and Soubeyran, R. (2017) "Fertile ground for conflict," *LAMETA WP*.
- Berman, N., Rohner, D., and Thoenig, M. (2017) "This mine is mine! How minerals fuel conflicts in Africa," *American Economic Review*, **107**, pp. 1564–1610.
- Bloom, J. M. (1987) *Class, Race, and the Civil Rights Movement*: Indiana University Press.
- Bohlken, A. T. and Sergenti, E. (2010) "Economic growth and ethnic violence: An empirical investigation of Hindu-Muslim riots in India," *Journal of Peace Research*, **47**, pp. 589–600.
- Bruckner, M. and Ciccone, A. (2010) "International commodity prices, growth and the outbreak of civil war in Sub-Saharan Africa," *Economic Journal*, **120**, pp. 519–534.
- Brunnschweiler, C. N. and Bulte, E. W. (2009) "Natural resources and violent conflict: Resource abundance, dependence and the onset of civil wars," *Oxford Economic Papers*, **61**, pp. 651–674.
- Buechler, S. M. (1990) *Women's Movements in the United States: Woman Suffrage, Equal Rights, and Beyond*: Rutgers University Press.
- Castillo, J. C., Mejía, D., and Restrepo, P. (forthcoming) "Scarcity without leviathan: The violent effects of cocaine supply shortages in the Mexican drug war," *Review of Economics and Statistics*.

- Cervellati, M., Sunde, U., and Valmori, S. (2017) "Pathogens, weather shocks, and civil conflicts," *Economic Journal*, **127**, pp. 2581–2616.
- Collier, P. and Hoeffler, A. (2004) "Greed and grievance in civil war," *Oxford Economic Papers*, **56**, pp. 563–96.
- Cotet, A. M. and Tsui, K. K. (2013) "Oil and conflict: What does the cross country evidence really show?" *American Economic Journal: Macroeconomics*, **5**, pp. 49–80.
- Couttenier, M. and Soubeyran, R. (2014) "Drought and civil war in Sub-Saharan Africa," *Economic Journal*, **124**, pp. 201–244.
- Dal Bó, E. and Dal Bó, P. (2011) "Workers, warriors, and criminals: Social conflict in general equilibrium," *Journal of the European Economic Association*, **9**, pp. 646–677.
- Diamond, J. (2005) *Collapse: how societies choose to fail or succeed.*: Viking Books, New York.
- Dickson, A., MacKenzie, I. A., and Sekeris, P. G. (2018) "Rent-seeking incentives in share contests," *Journal of Public Economics*, **166**, pp. 53 – 62.
- Do, Q.-T. and Iyer, L. (2010) "Geography, poverty and conflict in Nepal," *Journal of Peace Research*, **47**, pp. 735–748.
- Dube, O. and Vargas, J. F. (2013) "Commodity price shocks and civil conflict: Evidence from colombia," *The Review of Economic Studies*, **80**, pp. 1384–1421.
- Epstein, G. S. and Nitzan, S. (2006) "Effort and performance in public policy contests," *Journal of Public Economic Theory*, **8**, pp. 265–282.
- Gawande, K., Kapur, D., and Satyanath, S. (2017) "Renewable natural resource shocks and conflict intensity: Findings from India's ongoing Maoist insurgency," *Journal of Conflict Resolution*, **61**, pp. 1–33.
- Grossman, H. (1991) "A general equilibrium model of insurrections," *American Economic Review*, **81** (4), pp. 912–921.
- Harari, M. and La Ferrara, E. (2018) "Conflict, climate and cells: A disaggregated analysis," *Review of Economics and Statistics*, **100**, pp. 594–608.
- Hidalgo, D., Naidu, S., Nichter, S., and Richardson, N. (2010) "Occupational choices: Economic determinants of land invasions," *Review of Economics and Statistics*, **92**, pp. 505–523.

- Hillman, A. L. and Samet, D. (1987) "Dissipation of contestable rents by small numbers of contenders," *Public Choice*, **54**, pp. 63–82.
- Hirshleifer, J. (2001) *The Dark Side of the Force: Economic Foundations of Conflict Theory*: Cambridge University Press.
- Homer-Dixon, T. F. (1999) "Environment, scarcity, and conflict," *Princeton University Press*.
- Hsiang, S. M., Burke, M., and Miguel, E. (2013) "Quantifying the influence of climate on human conflict," *Science*, **341**.
- Humphreys, M. and Weinstein, J. M. (2008) "Who fights? the determinants of participation in civil war," *American Journal of Political Science*, **52**, pp. 436–455.
- Huntington, S. P. (1991) *The Third Wave: Democratization in the Late Twentieth Century*: University of Oklahoma Press, pp.579-616.
- Jia, R. (2013) "Weather shocks, sweet potatoes and peasant revolts in historical China," *Economic Journal*, **124**, pp. 92–118.
- Kahl, C. H. (2006) *States, Scarcity, and Civil Strife in the Developing World*: Princeton University Press.
- Koren, O. (2018) "Food abundance and violent conflict in Africa," *American Journal of Agricultural Economics*, **100**, pp. 981–1006.
- Lei, Y.-H. and Michaels, G. (2014) "Do giant oilfield discoveries fuel internal armed conflicts?" *Journal of Development Economics*, **110**, pp. 139–157.
- Lipset, S. M. (1959) "Some social requisites of democracy: Economic development and political legitimacy," *American Political Science Review*, **53**, pp. 69–105.
- Maystadt, J.-F. and Ecker, O. (2014) "Extreme weather and civil war: Does drought fuel conflict in Somalia through livestock price shocks?" *American Journal of Agricultural Economics*, **96**, pp. 1157–1182.
- Maystadt, J.-F., De Luca, G., Sekeris, P. G., and Ulimwengu, J. (2014) "Mineral resources and conflicts in drc: a case of ecological fallacy?" *Oxford Economic Papers*, **66**, pp. 721–749.
- McGuirk, E. and Burke, M. (2017) "The economic origins of conflict in Africa," *NBER Working Paper*, **WP 23056**.

- Mehlum, H., Moene, K., and Torvik, R. (2006) "Institutions and the resource curse," *The Economic Journal*, **116**, pp. 1–20.
- Miguel, E., Satyanath, S., and Sergenti, E. (2004) "Economic shocks and civil conflict: An instrumental variables approach," *Journal of Political Economy*, **112**, pp. 725–753.
- Moore, B. (1966) *Social Origins of Democracy and Dictatorship: Lord and Peasant in the Making of the Modern World*: Beacon Press, pp.417-54.
- Nunn, N. and Qian, N. (2014) "Us food aid and civil conflict," *American Economic Review*, **104**, pp. 1630–1666.
- de Ree, J. and Nillesen, E. (2009) "Aiding violence or peace? the impact of foreign aid on the risk of civil conflict in Sub-Saharan Africa," *Journal of Development Economics*, **88**, pp. 301–313.
- Robinson, J. A., Torvik, R., and Verdier, T. (2006) "Political foundations of the resource curse," *Journal of Development Economics*, **79**, pp. 447–468.
- Ross, M. (2006) "A closer look at oil, diamonds, and civil war," *Annual Review of Political Science*, **9**, pp. 265–300.
- Ross, M. L. (2015) "What have we learned about the resource curse?" *Annual Review of Political Science*, **18**, pp. 239–259.
- Tullock, G. (1980) *Toward a Theory of the Rent-Seeking Society*, Chap. Efficient Rent Seeking, pp. 97–112: in J.M. Buchanan, R.D. Tollison and G. Tullock (eds), College Station: Texas A&M University press.
- von Uexkull, N., Croicua, M., Fjelde, H., and Buhaug, H. (2016) "Civil conflict sensitivity to growing-season drought," *Proceedings of the National Academy of Science*, **113**, pp. 12391–12396.
- Vanden Eynde, O. (2018) "Targets of violence: Evidence from India's naxalite conflict," *Economic Journal*, **128**, pp. 887–916.
- Wick, K. (2006) "Contesting resources – rent seeking, conflict and the natural resource curse," *Public Choice*, **128**, pp. 457–476.