The role of markets and preferences on resource conflicts

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PRELIMINARY AND INCOMPLETE

Abstract

This article investigates a generalized resource curse. The existing empirical and theoretical literature on the resources-conflict nexus argues that higher resource rents (lower opportunity cost of appropriation) exacerbates conflict. We demonstrate that these widely accepted results rely on two fundamental elements relating to market conditions and agents' preferences. When resource prices are treated as exogenous, we obtain the conventional result, where an increase in the profitability of either the appropriative or productive activity incentivizes agents to reorient efforts accordingly. When the price of the contestable resource is endogeneously set (i.e., locally determined), we find the opposite result may hold: conflict increases when the contestable resource is scarce. Intuitively, if the contestable resource is abundant, players' relative marginal utility of the resource will be low, thereby resulting in low relative prices. Increases in the size of the contestable resource will lead to a reduction of appropriation effort, whereas scarcities will be conducive to conflict. We show an identical result is obtained if markets are absent for the contestable resource, such as civil liberties and political rights.

Keywords: Resource Curse, Conflict.

JEL Classification: C72; D72

1 Introduction

The well known 'resource curse' explains that in places governed by weak institutions, resources may hamper the development process (Mehlum et al., 2006; Robinson et al., 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 (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 (Ross, 2015; Berman et al., 2017).

The concept of a contestable 'resource', however, 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. Indeed, from this perspective numerous emblematic and seemingly disconnected events—such as the suffragette movement, the gay rights movement, or the 1989 Tienanmen square protests—can all be viewed as rent-seeking activities over contestable resources. Yet viewing these events using the conventional understanding of the resource curse cannot provide us with any insight: in all of these broader scenarios, rent seeking has taken place at times when polities were becoming wealthier, i.e., when the opportunity cost of rent-seeking for these contestable rents were on the rise (the exact opposite of what one would expect from a conventional resource curse explanation). Thus it is natural to consider if a unifying theory on a general resource curse can be created to explain the existence, and implications, of rent seeking for contestable resources within society.

In this article we provide a framework to model a general resource curse. We show the existence (and extent) of a resource curse depends on two pivotal factors: the nature of the market for the contestable resource as well as the preferences of agents. We show the price determination of the resource determines the extent of conflict. We find conflict may increase (decrease) over a scarce (abundant) resource if the price of the resource is endogenously determined, i.e., when markets clear locally. We obtain the exact same conclusion if there exists no market for the resource, such as in cases of contestable public good provision or civil rights. In contrast, we show if the resource price is exogenous, say due to the existence of an accessible international market, then conflict is always increasing with the size and value of the resource, similar to the conventional natural resource curse. The structure of players' preferences are also influential. In particular, when prices are set locally, whether players view the contestable resource as complementary of substitutable to the produced good will determine whether conflict increases in resource size. In particular, we find a more elastic marginal rate of substitution between contestable resource and non contestable good will result in a reduction in conflict as the size of the contestable resource increases.

The conventional explanation of the resource curse focuses on two effects: a *rapacity effect* and *opportunity cost effect*. First, a more valuable rent generates a *rapacity effect* whereby agents are incentivized to invest effort in appropriating the wealth. Second, a more valuable resource is tantamount to a reduction in the *opportunity cost* of whichever alternative income-generating activity. Accordingly, the predictions of both the theoretical and empirical literature are that higher rents and/or lower opportunity cost of appropriation are conducive to increased inefficient rent-seeking activities. The empirical evidence on the rapacity and opportunity cost effects is clear. 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 effort in appropriative activities (e.g., Angirst and Kugler, 2008; Dube and Vargas, 2013; Berman et al., 2017). Similarly, the opportunity cost effect has equally received widespread empirical support since negative shocks to the income-generating activities have consistently been shown to spur violence (e.g., Miguel et al., 2004; Hsiang et al., 2013; Gawande et al., 2017).

Although the *rapacity* and *opportunity effects* identify a positive link between the amount of resources at stake and conflict, many scholars stand in stark opposition and insist that, in fact, scarcities constitute a central driver of violent conflict (Homer-Dixon, 1999; Kahl, 2006). Moreover, in these settings, which involve an income-generating activity and a grabbable resource akin to a common-pool resource, one would naturally expect the results to hold when replacing valuable minerals by non-marketable goods such as political rights. Yet, several examples point to the exact opposite mechanism, thus casting doubts on the encompassing nature of this theory. 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 nineteenth century women's right movements in the United States were pioneered by middle-class working 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). Since improved livelihoods seem to empirically dampen incentives to appropriate some marketable and contestable resources such as oil, while, on the other hand, sharpening the incentives to devote effort to appropriating resources in other contexts, it is essential to delve into the theoretical mechanisms underlying these results.

We create a framework where players consume both a contestable good and non-contestable good. Players 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. We are thus interested in the equilibrium distribution of players' time endowment between contestable and non-contestable good. In particular, our main focus is analyzing how a change in the resource size may alter the distribution of productive and rent-seeking (unproductive) activities. That is, how does resource abundance/scarcity affect the degree of conflict. Key distinctions include how the price (if any) of the contestable resource is determined as well as players' preferences.

1.1 Related literature

One of the workhorse models to study the relationship between resources and conflict can be traced back to Gordon Tullock's (1980) contribution on rent seeking and his use of what is commonly known as Tullock's Contest Success Function. Applying this setting to conflict over resources, players 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.,). 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). Hence contest models provide a good understanding of the time allocation between productive and appropriative activities. Alternative modeling approaches deriving similar results have also been used as in Chassang and Padró i Miquel (2009). [. . . complete]

Our focus is on multiple-goods/sectors settings, and a key methodology in that respect is presented by Dal Bó and Dal Bó (2011). In this approach, a Heckscher-Ohlin model of trade is created 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 appropriate sector, which competes with the other sectors for the scarce labor and generates revenue by predating 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 which are in line with most of the empirical literature on natural resources and conflict.

The existing theoretical literature does provide a consistent explanation for the resources-conflict nexus for a wide range of marketable commodities that have been studied empirically. Yet this literature cannot assist us in explaining a number of empirical realities. As already described, these models cannot explain why conflict arises in the presence of resource scarcity as well in the absence of markets for the contestable resource. By providing a theoretical explanation for negative effects of resources on conflict intensity, our model is able to provide a unifying framework that can account for conflict when resource are both in abundance and scarce, depending on the context, as well as in the absence of markets. Thus, in this article, we propose a novel theory able to comprehend the role of resource abundance/scarcity on conflict in a unified setting that opens up an avenue for future applied research. More specifically, our model establishes that the effect of resources on conflict depends on two critical features; namely, the nature of the markets in which commodities may or may not be traded, and the preferences of the agents.

First, consider the nature of the market for the contestable rent.[1] If the appropriable rent (e.g., oil) can be traded against the produced commodity (e.g., coffee) and the relative prices of these goods are taken as given, then our model tracks the theoretical results supporting the abundance-conflict nexus. When market prices clear locally, however—as will be the case in remote communities or when the object of the study are countries rather than individuals—we can obtain the opposite result. 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, the marginal benefit of appropriating the resource will

[1]This is not the first contribution to consider markets in the context of production-appropriation models. Garfinkel et al. (2015) study the effects of conflict on trade when agents can appropriate with violent means the *intermediate good* of their opponents, while deriving utility from the consumption of the final good. Given that agents produce a single finite good, their utility is monotonically increasing in the produced quantities, thus depriving the model from the possibility of accounting for the above-mentioned substitution and income effects. Piccione and Rubinstein (2007) consider a general equilibrium framework for an exchange economy where agents interact "in the jungle", namely they can appropriate each-other's endowment which are assumed to reflect the agent's exogenous power. Their paper draws strong parallels between their results and established results on exchange economies. On the other hand, their model features does not feature a production sector, and considers the most basic conflict technology (stronger agents costlessly appropriates goods from weaker agents), which in turn implies that their focus and results cannot address the resources-conflict question.

be high, and so will the marginal utility of consuming it. Accordingly, the relative price of the scarce resource will be high. This in turn will make players more sensitive to changes in the stock of scarce resources. Further reductions 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. Naturally, under these conditions, the same result applies if the produced commodity becomes more abundant, so that the marginal disutility of reducing production effort will be low enough to justify extra appropriation efforts. Interestingly, we demonstrate that in the absence of markets—for example the rents obtained from developments in civil rights—we obtain identical conditions to the case of locally clearing markets.

Second, preferences play a central role in our analysis, since the degree to which players view the commodities as substitutes or complements will play a crucial role in the market clearing prices in the presence of endogenous relative prices.[2] With endogenous prices and complementarity between valuable resources and consumable goods, improvements in the production technology (positive productivity shock) generates two mechanisms. First, the marginal rate of transformation between appropriation of valuable resources and production of the consumable will decrease, thus incentivizing agents 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, the first one (less appropriation effort), or the second one (more appropriation effort). When goods are sufficiently complementary, the "income effect" will dominate the "substitution effect": im-

[2]The concepts of complementarity and substitutability have also been considered in the literature, albeit in a very different way. In a seminal contribution, Skaperdas (1992) conceptualizes the contestable resource as the outcome of a complementary production technology, a modeling strategy improving our understanding of the management of common pool resources (e.g., Dasgupta and Heal, 1979). More recently, Silve (forthcoming) extends the production technology so as to accommodate for substitutable inputs too, and studies the optimal allocation of production *vs* appropriation effort when agents can influence the property rights over the CPR with appropriation efforts. Skaperdas (1992) and Silve (forthcoming) derive interesting results on the range of possible equilibria differing in the degree of cooperation among players, and on the endogenous determination of property rights. Yet, in both settings, exogenous increases in the value of the CPR will result in more appropriation effort because of the assumed substitutability between the contested good (CPR) and the alternative allocation of effort (cost of effort). Our model thus enriches their settings by allowing the CPR and its opportunity cost to be complementary, eventually opening the way for higher opportunity costs of conflict to generate more appropriation effort.

provements in the production technology will translate into additional utility to the agents only if the amount of (appropriable) valuable resource increases as well, thus incentivizing agents to expand appropriation effort.

In the next section we develop the model, before revisiting the existing empirical evidence in light of our theoretical findings, and then concluding.

2 The model

2.1 Economic environment

Consider an economy in which there is a set of agents $N = \{1, 2, \ldots, n\}$ 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. Each agent has a resource of $e^i > 0$ units of time available and they have 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 $(r^i, y^i) \in \mathbb{R}^2_+$ he receives utility $u^i(r^i, y^i)$ that we assume to be increasing in both arguments and strictly quasi-concave. 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 $i \in N$.

Agent i's appropriation of the locally available contestable good R is described by a simple Tullock contest success function; the share of R appropriated by agent i is given by:

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

Accordingly, 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

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

We consider three alternative economic frameworks that capture the different settings we wish to consider:

1. where a market exists between the contestable and non-contestable goods but market clearing is at a higher geographical level so prices are (locally) exogenous;

2. where no market exists between the contestable and non-contestable goods; and

3. where a local market exists in which prices are determines endogenously with agents' choices.

We explore each of these in the following subsections.

2.2 Equilibrium with exogenous prices

If the relative price is exogenously fixed at $\bar{\phi}$, each individual will seek to optimize the following expression:

$$\max_{y^i,r^i,x^i} u^i(r^i,y^i) \;\; s.t. \;\; \begin{cases} y^i + \bar{\phi} r^i \leq \alpha l^i + \bar{\phi}\frac{x^i}{x^i+X^{-i}}R \\ e = x^i + l^i \end{cases} \tag{2}$$

We can thus re-write the optimization problem as:

$$\max_{y^i,r^i,x^i,\lambda} \mathcal{L}(r^i,y^i,x^i,\lambda) = \max_{y^i,r^i,x^i,\lambda} \left\{ u(r^i,y^i) + \lambda \left[\alpha(e-x^i) + \bar{\phi}\frac{x^i}{X}R - y^i - \bar{\phi}r^i \right] \right\} \tag{3}$$

Optimizing, we obtain the following first-order conditions when the constraint is binding,

$$\frac{\partial \mathcal{L}}{\partial y^i} = u_y(r^i,y^i) - \lambda = 0, \tag{4}$$

$$\frac{\partial \mathcal{L}}{\partial r^i} = u_r(r^i,y^i) - \lambda\bar{\phi} = 0, \tag{5}$$

$$\frac{\partial \mathcal{L}}{\partial x^i} = \bar{\phi}\frac{x_{-i}}{X^2}R - \alpha = 0, \tag{6}$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = \alpha(e-x^i) + \bar{\phi}\frac{x^i}{X}R - y^i - \bar{\phi}r^i = 0, \tag{7}$$

where partial derivatives of the utility function with respect to r^i and y^i are denoted by $u_r(.)$ and $u_y(.)$, respectively.

By jointly using (4) and (5) we reach the conventional result that $|MRS(r,y)| = \bar{\phi}$ at optimality, where $MRS(r,y)$ designates the (negative) marginal rate of substitution between goods y and r. We next denote the budget of player i by $\mathcal{B}^i(x^i;\bar{\phi}) = \alpha(e-x^i) + \bar{\phi}\frac{x^i}{X}R$, so that combining equations (4), (5), and (7) enables us to derive the demand schedules for good y, $\tilde{y}(\mathcal{B}^i(x^i;\bar{\phi});\bar{\phi})$ and r, $\tilde{r}(\mathcal{B}^i(x^i;\bar{\phi});\bar{\phi})$. To capture all three optimality conditions (4), (5), and (7) in a single expression we proceed as follows.

Consider Equation (6). Notice first that x^i is the only strategic variable in our environment, and we can thus verify that the equilibrium exists since the following second-order condition holds true:

$$-2\bar{\phi}\frac{x_{-i}}{X^3}R < 0$$

Using (6), we can derive player i's best response function which reads as:

$$x^i(X^{-i};\bar{\phi}) = \left(\frac{\bar{\phi}X^{-i}R}{\alpha}\right)^{1/2} - X^{-i} \tag{8}$$

We then re-write (7) as:

$$y^i = \alpha(e - x^i) + \bar{\phi}\frac{x^i}{X}R - \bar{\phi}r^i \tag{9}$$

And substitute for player i's reaction function as given by (8) so as to obtain:

$$y^i = \left(\left(\alpha X^{-i}\right)^{1/2} - (\bar{\phi}R)^{1/2}\right)^2 + \alpha e + \bar{\phi}r^i$$

And thus at optimality we obtain:

$$MRS\left(r^i, \left(\left(\alpha X^{-i}\right)^{1/2} - (\bar{\phi}R)^{1/2}\right)^2 + \alpha e + \bar{\phi}r^i\right) = \bar{\phi} \tag{10}$$

Since (10) features a single decision variable of i, r^i, we can easily show that for any $(X^{-i}, \bar{\phi})$, the above expression gives us the optimal consumption level of r-good, $r^i(X^{-i}, \bar{\phi})$. Plugging this value in (9) then yields the optimal consumption level of y-good, $y^i(X^{-i}, \bar{\phi})$, while equation (8) gives us the optimal appropriation effort $x^i(X^{-i}, \bar{\phi})$.

Importantly, (6) can be rewritten as $\bar{\phi} = \frac{\alpha X^2}{x_{-i}R}$, with the RHS of the equality designating (the absolute value of) the marginal rate of transformation between goods r and y, i.e. $MRT(y, r)$. To see that, we can straightforwardly compute $MRT(r, y)$ as follows:

$$MRT(r, y) = \frac{\partial \hat{y}^i / \partial x^i}{\partial \hat{r}^i / \partial x^i} = -\frac{\alpha X^2}{X^{-i}R}$$

Substituting in the above expression for $\frac{X^{-i}}{X}R = R - \hat{r}^i$ and for $\hat{r}^i = \frac{x^i}{X}R \Leftrightarrow x^i = \frac{X^{-i}\hat{r}^i}{R - \hat{r}^i}$, we deduce:

$$\bar{\phi} = \frac{\alpha R X^{-i}}{(R - r^i)^2} = \left| MRT\left(r^i, \left(\left(\alpha X^{-i}\right)^{1/2} - (\bar{\phi}R)^{1/2}\right)^2 + \alpha e + \bar{\phi}r^i\right)\right| \tag{11}$$

We therefore reach the conventional conclusion that at equilibrium we must have that $MRS(r, y) = -\bar{\phi} = MRT(r, y)$.

Since the players are symmetric, we can easily derive the equilibrium allocation of contest effort by imposing symmetry on (6) and deducing:

$$x^{i*} = \frac{\bar{\phi}(n-1)R}{n^2\alpha} \quad, \forall i \in N \tag{12}$$

Accordingly, we can obtain player i's equilibrium budget $\mathcal{B}^{i*}(\bar{\phi})$, after replacing for the symmetric value x^{i*} in (7) to obtain:

$$\mathcal{B}^{i*}(\bar{\phi}) = \alpha e + \frac{\bar{\phi}R}{n^2} \tag{13}$$

Replacing for $\mathcal{B}^{i*}(\bar{\phi})$, we can deduce the equilibrium demand of player i, $(\tilde{y}^i(\mathcal{B}^{i*}(\bar{\phi});\bar{\phi}), \tilde{r}^i(\mathcal{B}^{i*}(\bar{\phi});\bar{\phi}))$ for any well-behaved utility function.

This problem can essentially be thought of as first choosing x^i to maximize the budget given prices $\bar{\phi}$ (i.e. securing $\bar{\phi} = MRT(r,y)$), and then choosing the combination of r^i and y^i maximizing the utility given this budget constraint (i.e. securing $\bar{\phi} = MRS(r,y)$). To visualize this, we consider the above maximization problem 2 in the (y^i, r^i) space. The production possibility frontier must satisfy $e = l^i + x^i$. Given the production technology $\hat{y}^i = \alpha l^i$, and given the appropriation function $\hat{r}^i = \frac{x^i}{x^i + X^{-i}}R$, which can be re-written as $x^i = \frac{\hat{r}^i X^{-i}}{R - \hat{r}^i}$, we can substitute in the endowment constraint so as to derive the production possibility frontier:

$$e = \frac{\hat{y}^i}{\alpha} + \frac{\hat{r}^i X^{-i}}{R - \hat{r}^i} \Leftrightarrow \hat{y}^i = \alpha\left(e - \frac{\hat{r}^i X^{-i}}{R - \hat{r}^i}\right)$$

Plotting in the (y^i, r^i) space this concave PPF, since the player's budget constraint is defined as the line of slope $-\bar{\phi}$ passing through the 'produced' bundle, it naturally follows that the ideal point on the PPF requires a tangency with the budget constraint. In other words, the player will maximize his revenue $\alpha(e - x^i) + \bar{\phi}\frac{x^i}{X}R$ by choosing the revenue-maximizing x^i as given by (12), in turn yielding a budget B^{i*} as given by (13). The player's generated endowment, E, at equilibrium is therefore given by $\left(\alpha e - \bar{\phi}(n-1)R/n^2, R/n\right)$. The utility-maximizing player therefore selects his optimal consumption bundle along the budget constraint $y^i = B^{*i}(\bar{\phi}) - \bar{\phi}r^i$, which we designate on Figure XX by point $C = (\tilde{y}^i(B^{*i}(\bar{\phi}), \bar{\phi}), \tilde{r}^i(B^{*i}(\bar{\phi}), \bar{\phi}))$. Accordingly, player i will be a net demander (supplier) of good y whenever $\tilde{y}^i(B^{*i}(\bar{\phi}), \bar{\phi}) > (<) \alpha e - \bar{\phi}(n-1)R/n^2$, and a net demander (supplier) of good r whenever $\tilde{r}^i(B^{*i}(\bar{\phi}), \bar{\phi}) > (<) R/n$.

Having derived a closed form solution for x^{i*} in (12), we can straightforwardly deduce that:

$$\frac{dx^{i*}}{dR} = \frac{\bar{\phi}(n-1)}{n^2\alpha} > 0$$

Thus, in accordance with the literature, our model suggest that with exogenously set prices players will exert a higher effort of appropriation if the prize at stake becomes more valuable. This increased effort being symmetric across players, the sharing of the prize will remain unaltered, thus implying an increase in relative wealth dissipation. Despite this increase in appropriative effort, however, the budget of players will nevertheless expand since using (13) we obtain:

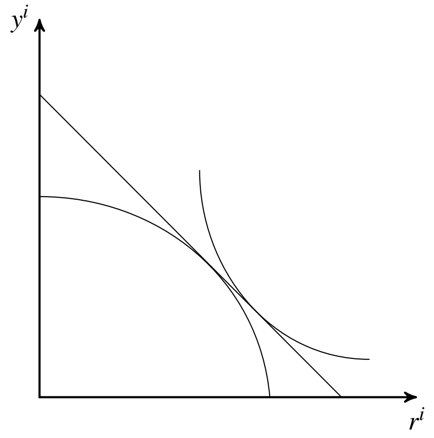

Figure 1: TBD.

$$\frac{dB^{i*}}{dR} = \frac{\bar{\phi}}{n^2} > 0$$

In other words, the increased relative rent dissipation will be outmatched by the increase in the value of the prize, thus implying that at equilibrium players will see their appropriated allocation increase, in turn expanding their consumption possibilities.

Looking next at changes in the players' productivity, α, we obtain:

$$\frac{dx^{i*}}{d\alpha} = -\frac{\bar{\phi}(n-1)R}{n^2\alpha^2} < 0$$

Here too our results are in accordance with the literature: when the opportunity cost of fighting increases because of higher productivities, the resources devoted to appropriation activities will decline. This in turn will result in higher budgets for players since using (13) we obtain:

$$\frac{dB^{i*}}{d\alpha} = e > 0$$

As players become more productive, the marginal return to producing y increases for a fixed marginal return of appropriation of r. Players will accordingly reallocate resources to producing y rather than appropriating r and will therefore expand the production of good y while retaining an unchanged share of R since all players act likewise. Since the relative price at which the goods trade on the market is fixed, this eventually results in an expanded budget, and thus in an expansion of their consumption possibilities.

Turning finally to the effect of changes in the relative price of r, $\bar{\phi}$, we can easily show that:

$$\frac{dx^{i*}}{d\bar{\phi}} = \frac{R(n-1)}{n^2\alpha} > 0$$

and,

$$\frac{dB^{i*}}{d\bar{\phi}} = \frac{R}{n^2} > 0$$

And the interpretation of these results is similar to the one of the previous comparative statics exercises.

Proposition 1 below summarizes our results:

Proposition 1. *In the presence of markets with non-locally set prices, appropriation effort increases if the relative value of the contested good increases, either because of a rapacity effect ($\nearrow \bar{\phi}$, $\nearrow R$), or because of an opportunity cost effect ($\nearrow \bar{\phi}$, $\searrow \alpha$).*

This proposition states that the equilibrium individual - and by extension aggregate - contest effort is increasing in the relative value of the rent, $\bar{\phi}$, and in the total amount of available rent R, and is decreasing in the productivity of the productive sector α. The intuition of this result rests in fact that the appropriation-labour decisions ultimately solely determine the available budget to be spent over the two goods, r and y, so that any modification that increases the relative value of appropriation will shift the allocation of labour towards appropriation activities. More specifically, when the marginal return to contest effort increases as a consequence of increases in the total value of the rent, or when the marginal opportunity cost of contest effort decreases because of higher $\bar{\phi}$ or lower production productivity α, it is profitable to switch effort from labour activities to appropriative activities.

The following lemma summarizes the comparative statics results on the equilibrium budget $\mathcal{B}^{i*}(\bar{\phi}, R, \alpha, e, n)$:

Lemma 1. *In the presence of markets with non-locally set prices, the equilibrium budget of players $\mathcal{B}^{i*}(\bar{\phi}, R, \alpha, e, n)$ is an increasing function of $\bar{\phi}, R, \alpha, e$, and a decreasing function of n.*

This straightforward result bears important consequences since it allows us to explore the effect of parameter changes on the players' equilibrium utility. Higher values of α and e, and lower values of n increase the players' budget, which in turn allows them by a revealed preferences' argument to reach higher levels of utility. Importantly, increases in $\bar{\phi}$ will also increase the players' budget, but will simultaneously make consumption bundles more expensive. Eventually, the effect of a price increase on players' equilibrium utility will be unambiguous if the player is a net supplier of the good (endowment income effect smaller than the the ordinary income effect), but the players' utility could decrease for players who are net demanders of the good. We can then state the following proposition summarizing these findings:

Proposition 2. *Increases (decreases) in the relative price of the contested (non-contested) good distorts effort towards appropriation activities, and increases (decreases) the players' budgets, but can lead to a utility decrease (increase) if players are net demanders of the contested good.*

2.3 Equilibrium in the absence of markets

We first consider a setting without markets, so that players can only consume the goods they produce (y-good), and they appropriate (r-good). Accordingly, the maximization problem of player i is given by:

$$\max_{r_i} u^i(r^i, y^i) \quad s.t. \;\; y^i = \alpha \left(e - \frac{r^i X^{-i}}{R - r^i} \right) \tag{14}$$

Where the constraint defines the PPF as explained earlier, and the symbols distinguishing consumption from production are ignored because markets are absent.

Optimizing yields:

$$u_r \left(r^i, \alpha \left(e - \frac{r^i X^{-i}}{R - r^i} \right) \right) - u_y \left(r^i, \alpha \left(e - \frac{r^i X^{-i}}{R - r^i} \right) \right) \alpha \frac{X^{-i} R}{(R - r^i)^2} = 0 \tag{15}$$

Which can be written as:

$$|MRS^i(r,y)| = \frac{u_r \left(r^i, \alpha \left(e - \frac{r^i X^{-i}}{R - r^i} \right) \right)}{u_y \left(r^i, \alpha \left(e - \frac{r^i X^{-i}}{R - r^i} \right) \right)} = \alpha \frac{X^{-i} R}{(R - r^i)^2} = |MRT^i(r,y)|$$

Upon inspection this optimality condition is identical to (17), thus implying that at equilibrium in the absence of markets player i will choose the same equilibrium values (r^{*i}, y^{*i}, x^{*i}) as in the setting with endogenously determined prices.

The setting with no markets is graphically represented on Figure XX, where the equilibrium consumption bundle is such that the PPF is tangent to the indifference curve passing through that point.

In the absence of markets for exchanging r and y, we demonstrated in section 2.4 that the problem is the same to the setting with markets and endogenously determined prices, up to the difference that adjustments occur with transiting from the market. Our comparative statics results therefore track the ones in the previous section, with the additional nuance that instead of players adjusting their resources allocation to the endogenously determined prices, they adjust their decisions to changes in the relative returns from various activities. We can thus state the following propositions:

Proposition 3. *In the absence of markets, increases (decreases) in the stock of the contested good distorts effort towards appropriation activities if* $\epsilon_{MRS^i(r,y), r^i} < (>) -1 \Leftrightarrow r^i MRS^i_r(y,r) - MRS^i(y,r) > (<$

)0.

The mechanism at play is the same as in the presence of markets with endogenously determined prices. When players appropriate small amounts of R, so that the marginal utility of r^i is highly sensitive to changes in r^i, increases in R raise the marginal utility of extra effort devoted to appropriation by more than the marginal cost, so that players substitute appropriation for production time. This in turn reduces the quantities of the alternative good being produced, while at the new (symmetric) equilibrium the quantities of good r obtained increase, since the equilibrium shares remain unaffected when R increases.

The effect of a change in α is also the same as in the setting with endogenous prices:

Proposition 4. *In the absence of markets, increases (decreases) in the players' productivity distorts effort towards appropriation activities if* $\epsilon_{MRS^i(y,r),y^i} > (<) - 1 \Leftrightarrow y^i MRS^i_y(y,r) - MRS^i(y,r) < (>)0$.

Likewise Proposition 6, Proposition 4 establishes that when the marginal rate of substitution of r to y is inelastic to changes in the quantities of produced goods y^i, increases in the productivity α will incentivize players to substitute production time for appropriation time. Here again, the intuition driving this result is the same as in the case with endogenously determined prices, up to the difference that instead of players adjusting their resources allocation to changes in the relative prices, they do so by comparing the marginal returns of the two available activities, namely production and appropriation. When players produce large amounts of y, so that 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. Increases in the productivity will then produce two effects: on the one hand players will substitute appropriation effort for the now more efficient production effort, but on the other hand they will also be able to cut down on production effort (to the benefit of appropriation effort) at a minor cost given the low elasticity of the MRS to changes in y. If the MRS is sufficiently inelastic, the latter effect will dominate, thus resulting in a more intense competition over the control of the appropriable good. Here too the effect on production will be indeterminate despite the absolute reduction in production effort because of the higher per-unit of effort yield. If, however, the marginal rate of substitution of r to y is elastic to changes in the quantities of produced goods y^i, the predictions are unambiguous since appropriation effort goes down while production effort increases eventually resulting in an increase in production of the y good.

2.4 Equilibrium with endogenous price formation

With endogenously determined prices, players face the same problem as above, with an additional 'market-clearing' constraint, since prices will only stabilize when the demand for each good equals its supply. In other words. denoting player i's demand for good r by $\tilde{r}^i$, player i maximizes (2) with the additional constraint that $\sum_{k\in N} \tilde{r}^k(\phi) = \sum_{k\in N} \hat{r}^k(\phi)$, which by Walras' law implies that the market for good y will equally clear. The maximization problem of player i then reads as:

$$\max_{y^i,r^i,x^i} u^i(r^i, y^i) \ \ s.t. \ \begin{cases} \tilde{y}^i + \phi\tilde{r}^i \leq \alpha l^i + \phi\frac{x^i}{x^i+X^{-i}}R \\ \sum_{k\in N} \tilde{r}^k(\phi) = \sum_{k\in N} \hat{r}^k(\phi) \\ e = x^i + l^i \end{cases} \tag{16}$$

We can then derive as in the previous section the optimality condition (10) for exogenously given prices. Yet, when markets clear, prices will adjust for any appropriation effort. Accordingly, we substitute for $\phi = \frac{\alpha X^{-i}R}{(R-r^i)^2}$ in (10) and obtain:

$$MRS(r,y)\left(r^i, \left(\left(\alpha X^{-i}\right)^{1/2} - \left(\frac{\alpha X^{-i}R^2}{(R-r^i)^2}\right)^{1/2}\right)^2 + \alpha e + \frac{\alpha X^{-i}R}{(R-r^i)^2}r^i\right) = \frac{\alpha X^{-i}R}{(R-r^i)^2}$$

Developing and simplifying the first argument of the $MRS(r,y)$ in the above expression eventually enables us to rewrite the expression describing the equilibrium allocation of contest effort as:

$$|MRS^i(r,y)| = \frac{u_r\left(r^i, \alpha\left(e - \frac{r^iX^{-i}}{R-r^i}\right)\right)}{u_y\left(r^i, \alpha\left(e - \frac{r^iX^{-i}}{R-r^i}\right)\right)} = \alpha\frac{X^{-i}R}{(R-r^i)^2} = |MRT^i(r,y)| \tag{17}$$

With symmetric players, the above expression defining the equilibrium appropriation effort becomes:

$$\frac{u_r(R/n, \alpha(e - x^{i*}))}{u_y(R/n, \alpha(e - x^{i*}))} = \frac{\alpha n^2 x^{i*}}{(n-1)R} \tag{18}$$

The above expression uniquely defines x^{i*}, which in turn defines the equilibrium budget of player i:

$$\mathcal{B}^{i*} = \alpha(e - x^{i*}) + \frac{\alpha n x^{i*}}{(n-1)} = \alpha\left[e + \frac{x^{i*}}{(n-1)}\right]$$

We can eventually deduce the equilibrium demand of player i, $(\tilde{r}^i(\mathcal{B}^{i*};\phi^*), \tilde{y}^i(\mathcal{B}^{i*};\phi^*))$ for any well-behaved utility function.

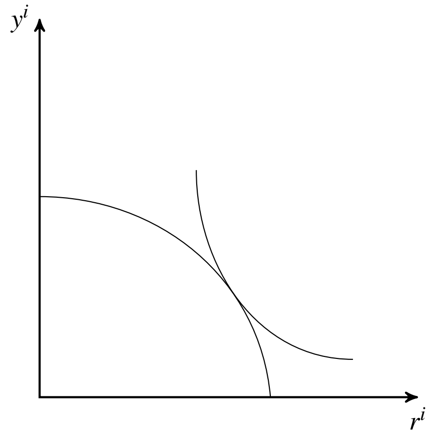

Figure 2: TBD.

On Figure XX we perform the same graphical exercise as in the previous section. Unlike the case where prices are exogenously set, in the current setting markets ought to clear locally, which in combination with the players being symmetric implies that each player's consumption will equate his production at equilibrium. Graphically we then obtain that at equilibrium the prices ϕ^* will be such the MRS equals to the MRT when the individual net demands for both goods are nil for all the players (because of symmetry).

To study the effect of changes in R on the equilibrium, we begin by recalling the reader that at optimality $MRS^i(r, y) = MRT^i(r, y) \Leftrightarrow MRS^i(y, r) = MRT^i(y, r)$. Reasoning in a $r - y$ space, we can deduce that increases in R lead to an increase in x^{i*} if and only if, *ceteris paribus*, the MRT becomes steeper than the MRS following the increase in R. Accordingly we need to inspect the changes induced by ΔR on the MRS and on the MRT.

$MRT^i(y, r)$ is derived as follows. By definition, $r^i = \frac{x^i}{x^i + X^{-i}} R$ and $x^i = e - y^i/\alpha$. Combining these expressions we obtain: $r^i = \frac{e - y^i/\alpha}{e - y^i/\alpha + X^{-i}} R$. This enables us to compute $MRT^i(y, r)$ as:

$$
\begin{aligned}
MRT^i(y, r) &= \frac{dr^i}{dy^i} = \frac{-\frac{1}{\alpha}\left(e - y^i/\alpha + X^{-i}\right) + \frac{1}{\alpha}(e - y^i/\alpha)}{\left(e - y^i/\alpha + X^{-i}\right)^2} R \\
&= -\frac{\frac{1}{\alpha} X^{-i}}{\left(e - y^i/\alpha + X^{-i}\right)^2} R
\end{aligned}
$$

And to therefore deduce:

$$
\frac{dMRT^i(y, r)}{dR} = \frac{MRT^i(y, r)}{R}
$$

Turning next to the effect on $MRS^i(y, r)$ we obtain:

$$\begin{aligned}\frac{dMRS^i(y,r)}{dR} &= \frac{x^i}{x^i+X^{-i}}MRS^i_r(y,r)\\ &= \frac{r^i}{R}MRS^i_r(y,r)\end{aligned}$$

It thus follows that if

$$\frac{dMRT^i(y,r)}{dR} = \frac{MRT^i(y,r)}{R} < \frac{r^i}{R}MRS^i_r(y,r) = \frac{dMRS^i(y,r)}{dR},$$

the MRT will become steeper than the MRS, as a consequence of which player i will need to reduce y^i (and thus to increase x^i) to restore optimality. Since $MRT^i(y,r) = MRS^i(y,r)$, we can deduce that:

$$sign(dy^i/dR) = -sign(dx^i/dR) = -sign\left(r^iMRS^i_r(y,r) - MRS^i(y,r)\right). \qquad (19)$$

This result can be summarized as follows:

Proposition 5. *When relative prices are endogenously determined, increases (decreases) in the stock of the contested good distorts effort towards appropriation activities if* $\epsilon_{MRS^i(r,y),r^i} < (>) -1 \Leftrightarrow r^iMRS^i_r(y,r) - MRS^i(y,r) > (<)0$.

Proposition 5 thus states that when the marginal rate of substitution of y to r is elastic to changes in the share of appropriated goods, r^i, increases in the stock of R will incentivize players to substitute production time for appropriation time. The intuition of this result tracks the theoretical contribution of Dickson et al. (2017): when players appropriate small amounts of R, so that the marginal utility of r^i is highly sensitive to changes in r^i, contestants place a relatively large valuation on incremental amounts of R. This in turn drives upwards the relative price of goods, ϕ, hence incentivizing players to compete more fiercely for the control of the appropriable good, while reducing by the same token the quantities of the alternative good being produced.

Considering next the effect of changes in the productivity parameter α, and working now on the $y - r$ space, we compare the relative changes of $MRS^i(r,y)$ and $MRT^i(r,y)$, following an increase in α. Bearing in mind that $MRT^i(r,y) = \frac{\alpha x^i R}{(R-r^i)^2}$, it follows that

$$\frac{dMRT^i(r,y)}{d\alpha} = \frac{MRT^i(r,y)}{\alpha} = \frac{MRS^i(r,y)}{\alpha}.$$

Next, since $y^i = \alpha(e - \frac{r^iX^{-i}}{R-r^i})$, we deduce:

$$\frac{dMRS^i(r,y)}{d\alpha} = \frac{y^i}{\alpha}MRS^i_y(r,y).$$

Combining these expressions, we conclude:

$$sign(dx^i/d\alpha) = -sign\left(y^i MRS^i_y(r,y) - MRS^i(r,y)\right), \tag{20}$$

This in turn enables us to deduce that if $MRS^i(r,y) - y^i MRS^i_y(r,y) < 0$, so that $dx^i/d\alpha < 0$, it follows from $e = y^i + x^i$ that $dx^i/d\alpha > 0$. On the other hand, if $MRS^i(r,y) - y^i MRS^i_y(r,y) > 0$ so that $dx^i/d\alpha > 0$, while effort devoted to y-production will drop, the effect on actual production will be indeterminate because of the increase in productivity positively affecting effort devoted to production. Our findings are summarized in the following proposition:

Proposition 6. *When relative prices are endogenously determined, increases (decreases) in the players' productivity distorts effort towards appropriation activities if* $\epsilon_{MRS^i(y,r),y^i} > (<) -1 \Leftrightarrow y^i MRS^i_y(y,r) - MRS^i(y,r) < (>) 0$.

Proposition 6 echoes Proposition 5 since it establishes that when the marginal rate of substitution of r to y is inelastic to changes in the quantities of produced goods y^i, increases in the productivity α will incentivize players to substitute production time for appropriation time. The intuition of this result is similar to the one of the previous proposition: when players produce large amounts of y, so that 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 of goods, ϕ, hence incentivizing players to compete more fiercely for the control of the appropriable good. In such instances, the effect on production will be indeterminate since the amount of time devoted to productive activities generates a higher per-unit of effort yield, hence counterbalancing the reduction in production time. If, however, the marginal rate of substitution of r to y is elastic to changes in the quantities of produced goods y^i, then the relative price of good r will be low and positive productivity shocks will drive away effort from appropriative activities towards production. This in turn will unambiguously result in an increase in production of the y good.

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 players 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 productive to appropriative 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 not sensitive to changes in quantities of the first argument, this will imply that even if that good was to become more handily available, 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 literature's 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 the positive causal impact of valuable lootable resources' price increases on conflict incidence and/or intensity. Microeconometric 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 et al. forthcoming) 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 resources increase. It is noteworthy to remind the reader 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 1.

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 et al. (2004) on negative shocks on agricultural income and civil wars in Sub-Saharan Africa, a series of papers provided further econometric support of this channel (Bruckner and Ciccone 2010, Hidalgo et al. 2010, Hsiang et al. 2013, Couttenier and Soubeyran 2014, Harari and

La Ferrara 2016, Vanden Eynde forthcoming). 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 prices in some cases to be 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 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 plumet 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 remotely located areas' prices, thus shielding such localities from conflict-inducing price downturns.

Our theory predicts that when prices are endogenously determined, resource scarcities (rather than abundance) may be a driver of conflict. Given the absence of micro-econometric studies accounting for market conditions, we revert to cross country studies and descriptive papers analyzing the role of resource scarcities in fueling conflict. 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) summarizes well the 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 model 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 resources' 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 well this phenomenon. As the island's population rose to levels that could hardly be sustainable 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 like 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 Quian (2014) uncover a positive effect of (lootable) US food aid on the intensity of ongoing civil conflicts, while de Ree and Nilesen (2009) identify a peace-promoting effect of foreign aid. The same contrasting image obtains when considering countries' resource-dependence. As another example, Collier and Hoeffler's (2004) 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 their prices is 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 Lipset's (1959) *modernization hypothesis*. 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 agents as having preferences on the optimal degree of democratization on a segment of line in the euclidian 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 et al. (2008) show the absence of a correlation between income per capita and democracy, while Cervelatti et al. (2014) 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 with mobilisation attempts, but the particular context in which this happens will determine whether such desires and attempts translate in 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 the population's wealth. In regimes not having a history of military repression, democratization demands are more likely to be accommodated for. To see 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 right movements in the United States were 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 contests. 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 players 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 upwards the relative price of the resource. This in turn will make players more sensitive to changes in the stock of scarce resources. Further reductions 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 result derived from this mechanism is that when the appropriable resource is scarce, conflict will be more likely when the opportunity cost of fighting *decreases*, a result 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 substitutability of the goods in the players' 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 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. When goods are sufficiently complementary, the "income effect" will dominate the "substitution effect": improvements in the production technology will translate in additional utility to the agents only if the amount of (appropriable) valuable resource increases as well, thus incentivizing agents to expand appropriation effort.

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 players' decisions, our model opens up a new avenue for future research on the impact of environmental depletion or of Malthusian pressures on conflict.

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