The Problem of Peace: A Story of Corruption, Destruction, and Rebellion†

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Abstract: We demonstrate how the central presence of state institutions in civil wars generates unique explanations for the emergence of destructive war. We do so in a model where a kleptocratic government and an equally self-interested "rebel" rival compete for insecure resources by raising armies from a common labor population. This competition may take one of two forms, "conflict" (which destroys resources, including labor) or "settlement" (which preserves them). We show the government may choose conflict in this setting because conflict enhances the value it derives from its use of fiscal policy. Allowing some of the labor force to be destroyed makes buying loyalty from the remaining population using subsidies less costly. Conversely, destroying some of the insecure resources increases the value of taxation by decreasing the rebel leadership's recruitment of soldiers away from the tax base. Because we model whether to go to war and the acquisition of military strength as two distinct decisions, we observe novel trade-offs between peace and (socially wasteful) increases in both arming and taxation. We also explore, among other things, how limiting the government's fiscal capacity may tilt the balance towards settlement.

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1 Introduction

Every government that faces the prospect of civil war has a fundamental choice to make: push for a peaceful settlement or engage the rebel forces in destructive war. Since the destruction associated with war has devastating economic consequences that could in principle be avoided by settlement, one might expect that the private interests of these actors—governments and rebellion leaders alike—would normally be best served by avoiding war. Yet often that is not what we observe. On the contrary, the empirical literature on civil war often links the onset of war all too closely with indicators of self-interest, such as the corruption of state finances, the presence of natural resource wealth (and other rent sources), and/or the low incomes of potential rebel recruits (see, for instance, Collier and Hoeffler, 2004; Fjelde, 2009; Besley and Persson, 2011; Dube and Vargas, 2013). The question arises: if civil war is so closely associated with incentives for economic gain, then what are the economic incentives that drive the emergence of civil war itself?

General theories of conflict have been put forward in answer to this question, starting with Fearon's (1995) argument that the emergence of war reflects an inability to commit to a mutually beneficial peace.[1] Recent refinements of the "commitment problem" rationale, beginning with Garfinkel and Skaperdas (2000), have emphasized how victory in war today may be the only way to secure peace that does not involve continued costly investments in arming in the future. McBride and Skaperdas (2006), Powell (2013), and Garfinkel and Syropoulos (2015) have each drawn on Garfinkel and Skaperdas's essential argument as a way of explaining the emergence of civil war in particular. Otherwise, as documented in Blattman and Miguel (2010), relatively little theoretical work in this area has considered how motivations for civil war may be fundamentally distinct from motivations for other types of war. We, however, isolate an overlooked source of potential inefficiency that draws more narrowly on the specific nature of civil war: the fact that one side is a "government" who may use state fiscal institutions to manipulate (and prey on) its rival's source of recruits.

Specifically, we construct and study an otherwise standard model of armed conflict over rents from an insecure resource (e.g., Tullock, 1980) that has three distinguishing features. First, in order to stake a claim to these rents, each side must each hire armies from a common pool of labor (as in Dal Bó and Dal Bó, 2011, sec. 6.4).[2] Second, the two players may resolve their competing claims by one of two ways, "conflict" (which destroys resources, including labor) or "settlement" (which preserves them). Settlement is not costless, however. All settlements are conducted in the "shadow of conflict" (see Anbarci et al., 2002; Esteban and Sákovics, 2007). Thus, productive resources must be diverted towards arming under both conflict as well as settlement. Third, one of the players (the government) can directly influence the allocation of labor via the use of fiscal

[1] Fearon also formalizes "imperfect information" as an alternative explanation for war. Powell (2006) discusses the advantages and disadvantages of each approach.

[2] These "rents" may stem from either natural resource wealth (e.g., oil, timber) or more generally the privileges of power (e.g., diversion of foreign aid efforts). Recent empirical evidence (respectively, Dube and Vargas, 2013 and Besley and Persson, 2011) supports either interpretation.

instruments: it may either prey on labor's income using "taxes" or it may supplement it by issuing "subsidies".[3] Importantly, labor may evade taxation by joining the rebel group. Higher taxes thus reduce both the size of the government's tax base and its control over rents by swelling the ranks of the rebel group's forces.

Our main findings on the choice between conflict and settlement hinge on this central role given to fiscal policy. The government does not grant subsidies out of benevolence (it has none) nor does it always extract maximal taxes (no one would pay them.) Rather, its desire to amass both rents and tax revenues requires a delicate balancing act. In the case where the value of rents is relatively large, it prefers to issue generous subsidies in order to dissuade the population from siding with its rival. On the other hand, when rents are relatively less valuable, it would rather ignore these rents altogether and focus on taxing workers. However, subsidizing a large labor force is expensive. Moreover, even the smallest presence of rents can incentivize the recruitment of labor from the government's tax base towards predatory activities. Perversely, the destruction of productive resources associated with conflict can help resolve both of these issues. Allowing citizens to be killed and/or displaced makes buying allegiance from the remaining pool more affordable.[4] On the other hand, setting oil fields ablaze may be a useful way to minimize interference with the extraction of tax revenues.

Opportunities for bargained settlements tend to hold the government's incentives for choosing destruction in check, but not always. Logically, conflict can never be preferred *ex post* (i.e., once arming is determined) if avoiding destruction creates a positive surplus that can be shared. Nonetheless, the government's control over fiscal institutions grants it discretionary power over both the size and sign of the eventual surplus. Accordingly, it may intentionally induce a negative surplus, and therefore conflict, by choosing a large enough subsidy such that its savings on subsidizing a reduced labor force outweigh the benefits from preserving non-labor resources. This scenario only arises when the value of contested rents is large enough that the government finds labor destruction to be advantageous; otherwise, settlement always dominates conflict *ex post*. The set of circumstances in which the government would prefer to make a binding commitment to conflict *ex ante* (i.e., in order to influence subsequent arming choices) is more varied, however. Conflicts that destroy mainly the contested rents themselves (as opposed to destroying mainly the labor force) can only be preferred *ex ante*, for example.[5]

Broadly speaking, our explanations for the emergence of conflict are in tune with Fearon's (1995) rationalization of war as a "commitment problem", but differ in important ways. In Fearon's original framework, war emerges because strong players will not find promises of future conces-

[3] Our arguments may be generalized to include other policies which directly impact welfare, however (e.g., the production of public goods).

[4] Even if governments take an active role in violence against the population they still may be successful at obscuring the public record using misinformation, as discussed by Lowi (2005) in the case of Algeria.

[5] As we discuss later, this particular result requires that the division of the surplus under "settlement" introduces additional incentives for arming, as in the bargaining process proposed by Esteban and Sákovics (2007). The Esteban and Sákovics framework is not sufficient by itself for destruction to become appealing; the role of fiscal policy is still crucial.

sions by weak players to be credible if the balance of power is expected to shift exogenously in later periods. Our reasoning is more compact. In our analysis, the government prefers conflict because conflict itself is a useful tool for shifting the balance of power, whether it is by permitting larger subsidies (when the value of rents is large) or by directly reducing rebel incentives to recruit soldiers (when the value of rents is small). To phrase these results as a "commitment problem", war occurs because the rebel leader (the weaker player) cannot commit to restrain his recruitment of labor for a given level of taxation.

Interestingly, the logic of commitment problems can actually work both ways in our setting, since commitments to conflict *ex ante* are not always credible *ex post*. This feature of our model is notable. When conflict arises in Garfinkel and Skaperdas's (2000) multi-period model, for example, it is always unambiguously preferred both *ex ante* and *ex post*. Other theories which generate preferences for conflict in a static, complete information setting (e.g., Beviá and Corchón, 2010; Chang and Luo, 2013) require that commitments to conflict *ex ante* are credible and irreversible. Our analysis, however, shows that not being able to credibly commit to *conflict* (as opposed to Fearon's concept of not being able to commit to peace) can itself be an important commitment problem with its own negative consequences both for private payoffs and for welfare. Giving the government the opportunity to set fiscal policy at the beginning of the game may help resolve this latter commitment problem.

Additionally, the fact that we allow for both the balance of power (i.e., the build-up of arms) and the mode of interaction (i.e., conflict vs. settlement) to be endogenously determined enables us to capture the notion of an "armed peace": just because the two sides avoid war does not mean they cease trying to outmaneuver one another for rents. Our model therefore permits analysis of novel trade-offs between "peace" and (socially wasteful) increases in both arming and taxation. Strikingly, we find that both overall national income and total labor income may be higher under conflict than under settlement.[6]

Distinguishing in this way between incentives for arming and incentives for conflict, especially in the context of conflict within a small open economy, also grants a unique opportunity to explore how both peace and efficiency respond to external shocks and interventions. We focus specifically on how these incentives respond to changes in the prices of tradable goods. The formation of armed groups in response to trade shocks has been explored previously in Garfinkel et al. (2008) and Dal Bó and Dal Bó (2011), but we add to these perspectives in two important ways. First, we show how shocks that favor increases in arming may not necessarily favor conflict (and vice versa).[7] Second, we also consider the implications of allowing players to import weapons as part

[6]The concept of what is best for "welfare" here beyond pure income considerations is beyond our scope, however. We do not intend to deny or minimize the terrible human costs of war. Rather, our intent is to illustrate how a "peace" between corrupt elites may be inherently problematic in its own right.

[7]Another recent paper, Garfinkel and Syropoulos (2015), also embeds this distinction, but differs from ours in several important respects. In their setting, each group builds its forces from a fixed (and equal) share of the available labor force (as in Garfinkel et al., 2008) and may opt for conflict in order to avoid continued costly interactions in the future. In our analysis, by contrast, opportunities to influence the other player's supply of supporters are essential to the emergence of conflict, which notably arises despite the absence of future periods.

of their arming technologies. Surprisingly, restricting the supply of these imported weapons can have the indirect effect of making conflict more likely.

Because we place state institutions at the heart of the interactions, the model provides many opportunities to explore how limits on the institutional capacity of the state matter in this context. We focus on two. First, we show that limiting the government's capacity to tax labor can tilt the balance towards peace. Intuitively, making the government relatively more dependent on contestable rents eliminates the appeal of destroying them.[8] Second (and perhaps more surprisingly), we find that limits on the ability to subsidize the rewards to labor may likewise favor peace. That is to say, restricting the government's ability to "bribe" its rival's source of recruits with gifts of land, food, work projects, and other transfers may be an effective way to promote peace, because of how it may use these instruments strategically in combination with conflict.[9] Obviously, how state institutions interact with the power dynamics of civil war is a much more complex issue than we depict it here.[10] Nonetheless, the powerful incentives we identify in our analysis suggest they may not only be important for understanding the nature of civil war, but for understanding its genesis as well.

Lastly, another recent paper, Bhattacharya et al. (2015), also models how a ruling group's ability to influence the size of an opposition group has implications for conflict. They do not, however, consider how movements of ordinary individuals between groups are shaped by strategic interactions between the leaders of each group. The latter is our specific focus.

The structure of the paper is as follows. Section 2 of our paper summarizes the model, starting with the basic conflict game and then introducing the possibility of negotiated settlement. In section 3, we establish the main result that situating both players within a common policy environment makes it possible for the player who controls policy to prefer conflict over peace, under several different variations of the model. Section 4 then discusses the novel dynamics of peace, arming, and taxation in this framework in response to external shocks and interventions. Section 5 adds concluding remarks.

2 Model

In a perfectly competitive general equilibrium model of a small open economy, there are L ordinary individuals—each endowed with one unit of labor—and two key actors/players at center stage: a kleptocratic governing elite, which we personify as "the ruler", and a self-serving leader

[8]This perspective resembles that of Acemoglu (2010), who argues that a highly capable predatory state would not hesitate to exploit conflict as a means to gain tighter control over its tax base. It would also seem consistent with the empirical findings of Fjelde (2009), who shows that civil war is closely linked with measures of state corruption (which arguably reflect the state's *capacity* for corruption), but only when natural resource wealth is low.

[9]For an example of how government forces have obviously and deliberately combined generous fiscal transfers with acts of violence in this way during civil war, see Schirmer's (1998) account of the "Beans and Bullets" strategy employed by the Guatemalan government during the 1980s. Section 3.4 touches on other examples as well.

[10]See Acemoglu and Robinson (2001, 2006), Besley and Persson (2011), and De Luca et al. (2011) for other recent perspectives examining this subject.

of a rebel group. These agents are indexed by 1 and 2, respectively. Actor i securely controls $K_i \geq 0$ units of a resource which, for convenience, we refer to as "capital". The ruler also possesses K_0 additional units of capital; however, its ownership of K_0 is contested by the rebel group.[11] The competing claims of these groups can be resolved in one of two ways: through destructive "conflict" or through peaceful "settlement". Under conflict a fraction $\delta_K \in [0, 1)$ of the contested resource K_0 and/or a fraction $\delta_L \in [0, 1)$ of the labor force are "destroyed",[12] whereas under settlement all endowments are preserved.[13] It would appear then, by preempting destruction, settlement ought to dominate conflict.

As we will show, however, both conflict and settlement are socially costly in this setting because they divert resources away from useful production. Furthermore, we will illustrate that, when power is endogenously determined, conflict may actually enhance the advantages the government derives from controlling the levers of policy.

2.1 Overview of the Game

The central innovation in our framework is our assumption that the rival groups differ fundamentally in the following respect: the ruler has the capacity to extract wage taxes from ordinary labor whereas the rebel leader does not. The ruler's capacity to obtain such revenues is limited, however. First, he can only tax/subsidize (at a rate τ) workers employed in legal sectors. Furthermore, his capacity is limited by the presence of an institutional ceiling $\tau_{\max}$ (i.e., $\tau \leq \tau_{\max}$), as in Besley and Persson (2011), as well as a lower bound $\tau_{\min} < 0$, such that the feasible interval of wage tax/subsidy rates is $T := [\tau_{\min}, \tau_{\max}]$. More figuratively, since a civil war-prone state may not explicitly be able to collect "income taxes" in this way, τ may alternatively be thought of as the degree to which the government preys on economic activity via corrupt practices.[14] As we will see, the ability to wield such policies is valuable to the ruler not only as a source of payoffs, but also as an instrument for influencing the balance of power.

A second key feature of the game we consider is the build-up of each side's military capabilities, which we denote by S_i ("S" for "strength" or "security") for $i = 1, 2$. It is this measure of military strength that matters for power and the resolution of conflict and settlement. Each player builds S_i units of strength in order to increase his share ϕ^i of the contested "capital" K_0 in the event

[11] Even though the rebels may securely "own" a portion K_2 of this resource, we can still think of all *de facto* legal claims to this resource as belonging to the government. K_2 then is the amount of appropriation that the ruler is unable to contest.

[12] The "labor destruction" we are considering here is not so much the killing of soldiers in battle, but rather the death (and/or dislocation) of citizens that occurs in civil wars.

[13] In general, conflict may also result in the destruction of K_1 and/or K_2. We focus on the destruction of K_0, as in Garfinkel and Skaperdas (2000), in order to preserve comparability with the existing literature.

[14] Without loss of generality, we could have also described τ as a tax on production, since the ruler already lays claim to all legal returns to capital and since firms are perfectly competitive. Even $\tau < 0$ may therefore be associated with some degree of "corruption" since the ruler can still draw on the state's capital wealth for his private consumption.

of conflict. We assume ϕ^i is given by a standard contest success function (CSF),

$$\phi^i(S_i, S_j) = \begin{cases} \frac{f_i(S_i)}{f_i(S_i)+f_j(S_j)} & \text{if } \sum_{h=1,2} S_h > 0 \\ 1 & \text{if } \sum_{h=1,2} S_h = 0 \end{cases}, \text{ for } i \neq j = 1,2, \tag{1}$$

where $f_i(\cdot) \geq 0$, $f_i(0) = 0$, $f_i'(\cdot) > 0$, $\lim_{S_i \to 0} f_i'(S_i) = \infty$, and $f_i''(\cdot) \leq 0$.[15] Thus, by definition, the ruler will control the insecure resource K_0 if the rebel group does not contest it. It is easy to verify that ϕ^i is increasing in S_i ($\phi^i_{S_i} \equiv \partial\phi^i/\partial S_i > 0$) and decreasing in S_j ($\phi^i_{S_j} \equiv \partial\phi^i/\partial S_j < 0$, $j \neq i$). A particular functional form for $f_i(\cdot)$ is

$$f_i(S_i) = \xi_i S_i^m, \; m, \xi_i \in (0,1], \tag{2}$$

where $\sum_j \xi_j = 1$, such that ξ_i is the "relative power" of agent i, and m captures the return to arming. This functional form is widely employed in the literatures on rent-seeking, tournaments, and conflict. We, too, will make use of it to obtain sharper results.

Naturally, military strength will depend in part on the number of soldiers each side has at its disposal. But, as noted earlier, workers and soldiers alike must be hired from the same pool of labor. In particular, each worker has the following occupational choices: (i) get employed in the production of consumption goods in the legal economy; (ii) serve in the military (controlled by the government); and (iii) join the rebel group (controlled by its leader).[16]

The sequence of actions/events is as follows:

1. The government announces a per unit wage tax/subsidy rate $\tau \in T$ in the legal sectors.

2. The government and the rebel leader determine non-cooperatively and simultaneously the size of their respective security forces (i.e., S_1 and S_2), each taking the actions of its rival as given.

3. Once arming commitments are declared, the contenders announce their respective preferences over "conflict" and "settlement". If at least one side chooses conflict, a contest ensues in which player i wins a fraction ϕ^i of $(1 - \delta_K) K_0$. However, if both sides choose settlement, they go on to negotiate a mutually agreeable and non-destructive division of the relevant surplus (see below).

4. Private production, consumption and trading decisions take place.

In the context of the above game, we wish to identify circumstances under which the ruler (and/or possibly the rebel leader) may prefer conflict over settlement in Stage 3. As we will demonstrate, the emergence of conflict is wholly dependent on how the government's discretion over tax policy

[15] This way of modeling rent competition is attributed to Tullock (1980). For a detailed discussion of this class of models, see Hirshleifer (1989) and Skaperdas (1996).

[16] Conceptually, an individual worker or household could be employed in all three activities simultaneously. The key point here is that the allocation of the labor endowment across these tasks depends on the tax rate.

shapes the strategic landscape in which both players make their arming decisions. We will also show, by considering other timing structures, that having the ability to set τ in advance provides the government with a useful way to credibly commit to conflict "*ex ante*", i.e., before arming decisions are made. Such commitments may not be credible otherwise.

A related modeling choice we should underscore here is that we only allow one player (the ruler) to set tax policy. What happens if, by contrast, we were to assume complete symmetry, such that both players may "tax" the population? We show in the Appendix that our essential results regarding conflict flow through under the timing structure described above. We stick to the case where only one player controls tax policy in our main presentation both because the adherence to symmetry is limiting and because it seems reasonable to assume that controlling the state grants the ruler a significant advantage in the ability to exercise such policies.

Put succinctly, an equilibrium in our model will be summarized by a tax policy (τ), non-cooperatively chosen military strength levels (S_1,S_2), and the mode of interaction ("conflict" or "settlement"). Actions by both players will be determined by backwards induction. That is, the government decides taxes in the first stage by internalizing how taxes will shape arming decisions and, ultimately, the mode of interaction. These decisions will be based on the other parameters of the model, most notably the size of the labor force, the size of the insecure resource, international prices, and the degree and incidence of destruction in the event of conflict. We now describe each of the key decision points in detail, starting with the allocation of productive resources.

2.2 Production and Employment

The production technology for each consumption good j $(= x, z)$ is described by the unit cost function $c^j \equiv c^j(w,r)$, which is increasing, concave and linear homogeneous in factor prices. $c^j_w = \partial c^j/\partial w$ and $c^j_r = \partial c^j/\partial r$ then serve as the conditional demand functions associated with one unit of good j. We assume that production technologies can be ranked in terms of factor intensities and factor intensity reversals are absent. Due to competitive pricing in the output markets, we have the following invertible system

$$p_j = c^j(w,r), \text{ for } j = x,z \tag{3}$$

when both goods are produced. In less technical terms, rewards to both labor (w) and capital (r) in the model are pinned down by international trading prices, which (by our "small open economy" assumption) cannot be affected by changes in domestic production.[17]

To examine how incomes and payoffs are determined we must also describe the production of

[17]This price linkage, which is known in the literature as the Stolper-Samuelson theorem (Stolper and Samuelson, 1941), simplifies the analysis of a small open economy considerably. We could relax this assumption by considering the possibility of complete specialization in production or by introducing specific factor inputs. These extensions would alter the analysis by restoring the sensitivity of factor prices to factor endowment changes and, therefore, to arming decisions. Similarly, we also abstract from the idea that predation drives up the cost of trade, as in Anderson and Marcouiller (2005).

military strength, S_i. We view this strength as a composite good that depends on the size of one's forces and the degree of armament. More specifically, we suppose S_i is a linear homogeneous function of the number of troops L_i and the quantity of guns/weapons G_i bought internationally ($i = 1, 2$). Let $\psi^i \equiv \psi(w_i, q)$ be the cost function associated with the purchase of one unit of military strength by group i, where w_i and q capture the costs of hiring one soldier and purchasing one gun respectively. The total cost to group i of securing S_i units of military force is $\psi^i S_i$.[18]

To keep the analysis compact, we mainly assume a Cobb-Douglas production function for S_i. Furthermore, as labor is an essential input for strength, we define $\theta^i \equiv w_i \psi^i_w / \psi^i$ as the share of labor (troops) in the cost of producing security. Under the Cobb-Douglas assumption, this share can be treated as a constant. For more general production functions (e.g., CES), the rebel leader's labor share will depend on τ. Specifically, $\theta^2_\tau \equiv \partial\theta^2/\partial\tau > 0$ if guns and labor are gross substitutes; $\theta^2_\tau < 0$ if they are gross complements. The latter case (gross complements) may be more empirically relevant in the case where imported weapons are simply "guns". If we instead consider heavier weaponry (e.g., tanks, helicopters), weapons and soldiers may be gross substitutes. We also assume that $\theta^i \geq \underline{\theta}^i \in (0, 1]$, for $i = 1, 2$, so that hiring soldiers figures prominently in both players' arming decisions. The requirement that $\theta^2 \geq \underline{\theta}^2$ also has added significance for our characterization of payoff functions in Section 2.3.

Recall $K(\delta_K) \equiv (1 - \delta_K)K_0 + K_1 + K_2$ and $L(\delta_L) \equiv (1 - \delta_L)L$ give the effective endowments of capital and labor. Letting Q_j denote the aggregate output of good j ($= x, z$), the conditions for full employment of resources can be written down as

$$c^x_r Q_x + c^z_r Q_z + \psi^1_r S_1 + \psi^2_r S_2 = K(\delta_K) \tag{4a}$$

$$c^x_w Q_x + c^z_w Q_z + \psi^1_w S_1 + \psi^2_w S_2 = L(\delta_L), \tag{4b}$$

where, again, $\delta_J \in (0, 1)$ under conflict ($J = K, L$) and $\delta_J = 0$ under settlement. To keep the analysis simple and compact we will assume these endowments are sufficiently large so that the country's aggregate production of consumption goods remains diversified.[19]

A crucial determinant of the endogenous asymmetry that underlies our main results is the allocation of labor. Let w be the pre-tax wage rate paid by employers (including the state) to employees in formal/legal markets. In the presence of a wage tax/subsidy τ, workers in these sectors will obtain the after-tax rate $(1 - \tau)w$. In contrast, members of the rebel group can evade taxation.[20] Nonetheless, because occupational choice is based on the reward to productive labor,

[18]The cost function we use for S_i is unique in its usage of tradable weapons; other work (c.f., Garfinkel et al., 2008) tends to assume instead the contested resource is itself involved in the production of military force. In principle, we could allow S_i to involve capital, without affecting our main results. We could likewise amend the analysis to capture the possibility that rebels may have access to an inferior technology and/or a higher cost of acquiring weapons, again without affecting results.

[19]In principle, if either factor endowment is sufficiently small, the economy will completely specialize in the production of one of the two goods. In this case, the relative reward to capital, r/w, will no longer be held fixed by world prices, but instead will vary endogenously with net factor supplies.

[20]This assumption is consistent with the observation that in developing nations the state's ability to tax the informal sector is woefully inadequate (Marcouiller and Young, 1995).

the effective opportunity cost (to a self-serving rebel leader) of recruiting an additional rebel will be $w_2 = (1-\tau)w$. Therefore, the rebel leader's cost function of building/maintaining a force of S_2 will be $\psi((1-\tau)w, q)S_2$, where again q is the price per gun paid to international suppliers of weapons. The ruler's opportunity cost of arming differs, however. Each soldier he hires not only costs him the compensation owed, $(1-\tau)w$, but also reduces his tax collection from the productive workforce by an amount τw. The cost to the ruler of securing a force S_1 will then be $\psi(w, q)S_1$; in other words, his per-soldier cost w_1 is not $(1-\tau)w$ but rather the full before-tax wage w.[21] His choice of fiscal policy therefore not only serves as an instrument for extracting revenues from his tax base, but also directly affects the balance of power by influencing his security costs (without affecting his own). We pay special attention to how τ shapes the nature of equilibria in our characterization of payoff functions below.

2.3 Conflict

We are now ready to derive the equilibria that hold in the event of conflict, and in turn serve as "threat points" in the bargaining game. Let all agents' consumption preferences be identical, homothetic, and risk-neutral. Payoffs for all agents are then given by the following indirect utility function

$$v^i = \mu(p_x, p_z)Y^i, \tag{5}$$

where Y^i denotes individual i's income, p_j the price of good j, and $\mu(\cdot)$ the marginal utility of income.[22] Then, because world relative trading prices are taken as given, $\mu(\cdot)$ can be treated as a constant, and utility maximization becomes isomorphic to income maximization.

Incorporating these model elements into the indirect utility functions in (5) delivers the following payoff functions for players 1 and 2 and for aggregate welfare under conflict:

Payoffs under Conflict:

$$U^1 = \mu\left[rK_1 + A\phi^1 - \psi^1 S_1 + \tau(w(1-\delta_L)L - w\psi^2_w S_2)\right] \tag{6a}$$

$$U^2 = \mu\left[rK_2 + A\phi^2 - \psi^2 S_2\right] \tag{6b}$$

$$U \equiv \mu(1-\tau)w(1-\delta_L)L + \sum_i U^i, \tag{6c}$$

[21] The analysis could be extended to enable either player to recruit soldiers at below-market wage rates, either through conscription (e.g., the forced recruitment of child soldiers) or by appealing to a shared ideology. Conversely, we might also consider cases in which soldiers require additional compensation for disutilities associated with fighting. At any rate, even if the two sides have differential access to recruits, our main results still hold so long as the government's fiscal policy still directly affects labor's incentives for joining the rebel group.

[22] Note that, because prices are fixed, introducing risk aversion would alter the analysis only if we considered a "winner-take-all"-type contest. In this case, a rationale for settlement would exist (for any given arming choices and in the absence of destruction) for reasons similar to those studied in Anbarci et al. (2002). As we will see shortly, the value of our approach is that it allows us to focus more narrowly on the role played by destruction in the choice between conflict and settlement.

where $A \equiv r(1-\delta_K)K_0$ is the value of the contested rents (the "prize"). Noting that the asymmetry in payoffs between the two players is entirely driven by the presence of the tax rate, τ, several observations are in order here.

To preview our discussion of the ruler's optimal tax policy, several observations are in order at this juncture. Several observations are in order here. First, by virtue of the fact that the ruler has exclusive access to tax revenues, the size of its tax base (the expression inside the parentheses in the third term in (6a)) is important to him. Clearly, the larger the tax base the larger his tax revenues. Second, by reducing the price of a recruit in the rebel group relative to the price of guns, higher taxes erode the tax base due to substitution effects. Third, by reducing the rebel leader's opportunity cost ψ^2 of building additional military capacity (but not the ruler's cost ψ^1), higher taxes also generate an adverse scale effect that would further erode the tax revenue base.[23] Fourth, as noted above, higher taxes also lead to a reduction in the rebel's arming cost ψ^2, which has direct implications for arming incentives and, in turn, the determination of the ruler's share of rents ϕ^1. Naturally, a self-serving kleptocrat will aim to balance these effects at the margin in setting his optimal fiscal policy.

In terms of overall welfare, two additional points deserve some emphasis here. First, it is plain from (6c) that aggregate income in the economy decreases when more resources are diverted from production into arming. This relationship has important implications for welfare throughout the analysis: to the extent that peace is associated with more extractive tax policy, the resulting increase in arming can mitigate, or even offset, the benefits of avoiding destruction.

Second, however, measuring "welfare" in this way has the disadvantage of ignoring considerations that should be given towards loss of human life in the event of labor destruction ($\delta_L > 0$). We can motivate this simplified perspective by noting that much of the disruption of the labor endowment that occurs during civil wars is via dislocation—rather than death—though we admittedly do not model additional human costs that may be associated with this latter channel either. Nonetheless, we do think it worthwhile to highlight the amount of income that is captured specifically by labor—$(1-\tau)w(1-\delta_L)L$—as an alternative welfare criterion to focus on since it is naturally easier to be more sympathetic to the welfare of the "powerless" in this kind of setting.

Keeping in mind that $A \equiv r(1-\delta_K)K_0$ captures the value of contested rents (the "prize"), the first-order conditions (FOCs) for interior solutions for arming are:

$$U^i_{S_i} = A\phi^i_{S_i} - \psi^i = 0, \text{ for } i = 1, 2. \tag{7}$$

It is straightforward to show that our general assumptions on the nature of the CSF imply the above system of equations has a unique solution.[24] Moreover, the simplifying functional form (2)

[23]Erosion of the tax base may also arise in the presence of labor-leisure choice that gives rise to a Laffer-type curve in revenues. Though our analysis has interesting implications for the shape of the Laffer curve, it differs from standard analyses in that the diversion of labor into distributive conflict further undermines the tax authority's ability to appropriate resource rents and is, of course, socially wasteful. Clearly, the higher the death rate under conflict the lower the tax base.

[24]As noted above, this solution will qualify as equilibrium only if the associated quantities of factor input demands

(which requires $f_i(S_i) \equiv \xi_i S_i^m$, $m \leq 1$) allows us to present an analytical solution to (7). Let a tilde "~" over variables describe their noncooperative equilibrium values under the contest. One can show that:

$$\widetilde{\phi}^1 = \frac{1}{1+\gamma}, \; \widetilde{\phi}^2 = \frac{\gamma}{1+\gamma}, \; \widetilde{S}^i = \frac{Am\widetilde{\phi}^1\widetilde{\phi}^2}{\psi^i} = \frac{Am\gamma/\psi^i}{(1+\gamma)^2}, \; (i = 1, 2). \tag{8}$$

where

$$\xi \equiv \xi_2/\xi_1, \quad \rho \equiv \psi^2/\psi^1, \quad \text{and} \quad \gamma \equiv \xi\rho^{-m}. \tag{9}$$

Parameters ξ and m capture the technology of conflict, whereas ρ (which is really a function that depends on the wage tax/subsidy rate τ, the wage rate w, and the price of guns q) captures the rebel leader's relative cost of arming.

Again, what is important to note here is the role of τ in determining equilibria via its effect on relative unit costs (ρ). Fig. 1 depicts three different equilibrium arming outcomes and how they depend on τ. Consider first the point e^0, where $\tau = 0$ implies that arming choices are balanced. From this point, an increase in τ has the effect of shifting the rebel leader's best response curve upward without affecting that of the ruler. The net effect is a change to a new equilibrium e', where $\widetilde{S}^2 > \widetilde{S}^1$. Intuitively, an increase in τ shifts the distribution of power towards the rebel leader by making it cheaper for him (but not the ruler) to hire soldiers. Naturally, reductions in τ have the opposite effect, as shown by the third equilibrium point e'', where $\tau < 0$ results in $\widetilde{S}^1 > \widetilde{S}^2$. Fig. 1 also demonstrates one other salient point: if $\xi < 1$, such that the ruler has an inherent military advantage (as assumed in Fig. 1), increases in τ also have the effect of increasing the overall level of arming, because they make the contest more competitive.

To preface any consideration of how taxes may be used strategically, it is useful first to address the following question: How does an increase in the value of the contested prize A (which may be due to a fall in the rate of destruction, an increase in K_0, or a rise in the rental price of capital r) affect agent payoffs and efficiency? Inspection of (8) readily reveals that both agents will expand their military strengths in proportion to A without any resulting change in shares (power). Applying this observation to the rebel leader's payoff function in (6b) readily implies (after invoking the envelope theorem) that the increase in A proves unambiguously beneficial to him because the direct (and positive) effect of the prize on the payoff dominates the strategic (and negative) effect of its rival's increased strength. But this is not necessarily the case for the ruler nor for overall welfare. Inspection of (6a), for example, indicates the presence of effects similar to those experienced by the rebel leader. However, there is a new adverse effect here: the resulting increase in the rebel leader's military capability $\widetilde{S}^2$ (effected by hiring more troops and purchasing more weapons)

are sufficiently low (as compared to the economy's effective factor endowments noted in (4)) so that production of consumption goods remains diversified. To avoid unnecessary complications that may cloud the clarity of our arguments, we continue to maintain the assumption of sufficient slack in factor endowments so that the possibility of complete specialization is not a concern. The Appendix touches on some of the complications that may enter otherwise.

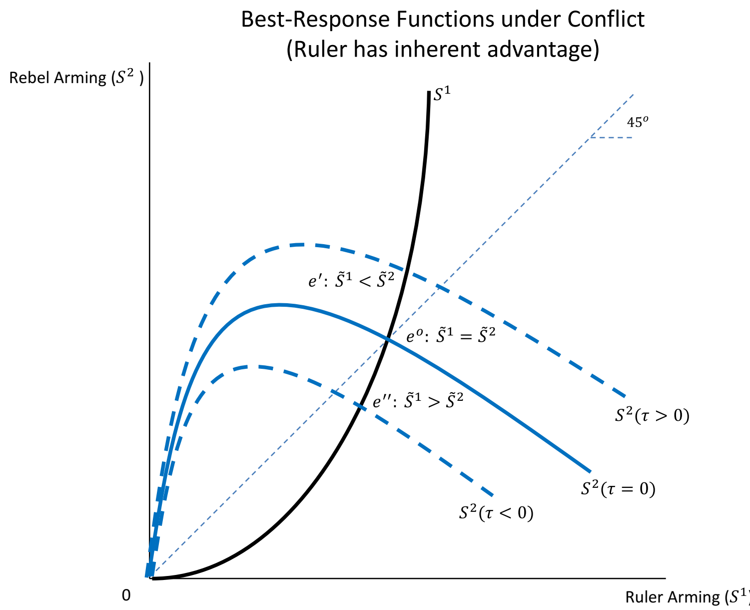

Figure 1

reduces the ruler's tax collections by eroding his tax base. The intensity of this adverse effect varies in proportion with the size of the tax, thus generating the possibility that the ruler's payoff and overall efficiency may fall if the tax rate is sufficiently high.

For clarity, we collect these observations in Proposition 1 below.

Proposition 1 *For any given wage tax/subsidy rate τ, payoffs under conflict are related to the value of the contested rents A as follows:*

(a) There exists a tax rate $\overline{\tau} \in (0,1)$ such that $d\widetilde{U}^1/dA \gtreqqless 0$ if $\tau \lesseqqgtr \overline{\tau}$.

(b) The rebel leader's payoff function is increasing in A.

(c) Aggregate welfare may fall as A rises if the tax rate is sufficiently high.

The prediction in part (a) that the ruler's payoff may fall with the value of the contested rents is interesting. As noted earlier, this relationship is due to the rebel leader's increased willingness to recruit more soldiers when the size of the contested pie increases, thereby eroding the state's tax base. The fact that this effect dominates when τ is large suggests the ruler will prefer lower taxes for larger values of A. In our proof of part (a) in the Appendix, we add comments on how $\overline{\tau}$ depends on the technologies of conflict and arming. Note that the existence of $\overline{\tau} < 1$ depends on our earlier requirement that the share of labor in the rebel leader's arming cost, θ^2, is bounded from below by some positive value $\underline{\theta}^2 \in (0,1]$.

Part (b) is due to the fact that the direct (and positive) effect of an increase in A on the rebel leader's payoff dominates the strategic (and negative) effect of the ruler's expansion of military capacity. The prediction in part (c), that aggregate welfare may fall when the value of the contested resources rises is also interesting because it suggests, at least in part, the possibility that negotiation and settlement may help improve efficiency. We will address this issue in subsequent discussion. Still, it is worth noting that we may view this welfare finding as an example of "immiserizing growth" (Bhagwati, 1958) due to internal conflict and suboptimal fiscal policy. Even closer may be its relationship to the more recent literature on the "resource curse" problem—see Sachs and Warner (1995); Ross (2003); Mehlum et al. (2006); Robinson et al. (2006); among others—which identifies a negative link between resource abundance and rates of growth or, more liberally, welfare. While our work resembles the strand that attributes inefficiency to rent-seeking and domestic conflict—see Torvik (2002); Garfinkel et al. (2008)—it differs in that the tax plays a pivotal role here. In particular, if $\tau = 0$, an increase in the value of rents benefits both contenders, as would be the case in a standard contest over a fixed prize.[25] For clarity and added emphasis, we summarize a more general version of this observation in

Corollary 1 *If the tax rate on labor is sufficiently low or negative (specifically, if $\tau < \overline{\tau}$), then an increase in the value of the contested rents A is Pareto improving under conflict.*

Several questions arise at this juncture. Going to an earlier stage of the game, if the ruler uses fiscal policy to further his own interest what are the salient features of his optimal fiscal policy? How does varying this policy affect the rebel leader? And, what are its consequences for economic efficiency? Moreover, how does the optimal tax/subsidy, and the payoffs it gives rise to, depend on the value of contested rents? Clearly, the ruler's discretion over τ is a key strategic consideration in this setting and thus we need to examine it in more detail.

2.4 Optimal Tax Policy under Conflict

To address the above issues let us first derive explicitly the effects of taxes on conflict payoffs. Starting with the ruler, differentiation of his payoff $\widetilde{U}^1$ with respect to τ (while normalizing $\mu = 1$ for simplicity) yields

$$\widetilde{U}^1_\tau = w\left[(1-\delta_L)L - \psi^2_w \widetilde{S}^2\right] + \left(-\tau w \psi^2_w + A\widetilde{\phi}^1_{S_2}\right)\widetilde{S}^2_\tau + \tau w^2 \psi^2_{ww}\widetilde{S}^2. \quad (10)$$

What (10) says is that while taxes have the direct, positive effect of increasing revenues extracted per worker (the first term on the right-hand side of (10)), the ruler must also balance this benefit against several other negative effects at the margin. For example, because $\widetilde{S}^2_\tau > 0$, making it less expensive for the rebel leader to hire soldiers will not only erode the ruler's tax base (a "scale effect", given by $-\tau w \psi^2_w < 0$), but will also diminish his share of the contested capital (a "strategic effect", which is negative by $A\widetilde{\phi}^1_{S_2} < 0$).[26] The increase in rebel soldiers can be worsened

[25]Since taxes are still being considered exogenous here, at this point it would be worth pointing out that the fall in income comes purely from the change in the government's payoff. We will see later, however, that under certain conditions ordinary citizens (labor) can also be negatively affected by increases in A because of associated changes in taxes and/or destruction.

[26]One can show that, even when $\tau < 0$, $A\widetilde{\phi}^1_{S_2} - \tau w \psi^2_w < 0$. In other words, even though the scale effect may become positive, the (negative) strategic effect always dominates.

further for the ruler by an additional "substitution effect" (captured by $\psi^2_{ww} < 0$) since, as labor becomes cheaper relative to guns, the rebel leader will hire relatively more labor.[27]

Turning to the rebel leader, differentiation of his payoff $\widetilde{U}^2$ with respect to the wage/tax subsidy gives

$$\widetilde{U}^2_\tau = A\widetilde{\phi}^2_{S_1}\widetilde{S}^1_\tau + w\psi^2_w\widetilde{S}^2. \tag{11}$$

The first term in (11) is a strategic effect that is associated with the ruler's response to the rebel leader's action when $\tau \uparrow$. This effect is positive or negative depending on whether $\widetilde{S}^1_\tau < 0$ or $\widetilde{S}^1_\tau > 0$. In this case, it is straightforward to show that $\widetilde{S}^1_\tau \lesseqqgtr 0$ if $\gamma \gtreqqless 1$. Regardless, however, the second term in (11), the "direct effect" of reducing the opportunity cost of recruiting rebels, is the more important of the two. In Lemma 1 below we show that this latter effect dominates; therefore, $\widetilde{U}^2_\tau > 0$.

Naturally, higher taxes affect labor adversely because they reduce the after-tax wage rate. Therefore the question that remains is: how do taxes affect overall welfare? Differentiation of (6c) yields

$$\widetilde{U}_\tau = A\widetilde{\phi}^2_{S_1}\widetilde{S}^1_\tau + A\widetilde{\phi}^1_{S_2}\widetilde{S}^2_\tau - \tau w\psi^2_w\widetilde{S}^2_\tau + \tau w^2\psi^2_{ww}\widetilde{S}^2. \tag{12}$$

All terms in (12) are negative, except perhaps the first. Yet, even that term is negative if the ruler has a sufficient advantage in the contest (i.e., when ξ is sufficiently lower than 1 and τ is not too high). In short, the overall impact of taxes on welfare is negative; therefore, the optimal policy of a (hypothetical) benevolent leader is a subsidy that hits the institutional bound $\tau_{\min}$. It is easy to verify that this fiscal policy coincides with the policy that minimizes $\psi^1\widetilde{S}^1 + \psi^2\widetilde{S}^2 + \tau\psi^2_w\widetilde{S}^2$.

With this in mind, let us consider the optimal policy of a kleptocratic ruler. To deepen our understanding of this policy, it is useful to temporarily abstract from fiscal capacity constraints. To this end suppose the admissible tax interval T is sufficiently wide. In addition to summarizing our discussion on the impact of wage taxes/subsidies on payoffs, the following lemma describes several key features of the optimal tax/subsidy rate under conflict, including its dependence on the value of the contested rents.

Lemma 1 *The higher (lower) the wage tax (subsidy) rate the higher the conflict payoff to the rebel leader ($d\widetilde{U}^2/d\tau > 0$) and the lower overall welfare ($d\widetilde{U}/d\tau < 0$). However, for the ruler, there exists a unique optimal tax/subsidy rate under conflict $\tau^*_C(A) \in T$ that is negatively related to the value of the contested rents (i.e., $d\tau^*_C/dA < 0$). Moreover, there exist positive levels A^0 and $\overline{A}$ of the contested rents such that*

(a) $\tau^*_C(A) \gtreqqless 0$ *if* $A \lesseqqgtr A^0$*; and*

(b) $\tau^*_C(\overline{A}) = \overline{\tau}$.

In the Appendix, we show that: (i) $\widetilde{U}^1$ is concave in τ (i.e., $\widetilde{U}^1_{\tau\tau} < 0$, which implies uniqueness

[27] This effect is actually positive when $\tau < 0$, however, since a shrinking tax base has the opposite effect in this case.

of τ_C^*), and (ii) a marginal increase in the value of the resource rents A reduces the net marginal benefit of a tax/subsidy increase to the ruler (i.e., $\widetilde{U}^1_{\tau A} < 0$).[28] This explains why $d\tau_C^*/dA < 0$ in Lemma 1. The lesson is clear. The higher the value of resource rents, the lower the ruler's need (and incentive) to rely on fiscal policy for revenue purposes. Part (a) takes this observation one step further: it establishes that the optimal tax turns negative (i.e., it becomes a subsidy) when the value of resource rents is sufficiently high. This interesting finding suggests that resource abundance may not only temper the ruler's appetite for tax revenues, but also induce him to subsidize labor! However, this incentive is not based on altruistic motives or a concern for labor's fortune. Rather, it is purely a reflection of the ruler's calculation that wage subsidies, by raising the opportunity cost of recruiting rebels, curb the rebel leader's willingness to expand his military capacity.

Part (b) utilizes the monotonicity of the kleptocratic ruler's optimal fiscal policy in the value of resources to establish that $\tau_C^*(A)$ will cross tax rate $\overline{\tau}$ (from Proposition 1) once at some level $\overline{A}$, as depicted in Fig. 2a below. The monotonicity of $\tau_C^*(A)$ also implies that $A_0 > \overline{A}$ (since $\overline{\tau} > 0$). These results will prove helpful in our analysis of equilibrium payoffs when taxes are endogenous.[29]

Let us index all variables, including agents' payoffs, with a star "$*$" when the tax/subsidy is set optimally by the ruler. How might resource abundance affect payoffs in this case? First, we address this question under the assumption that the capacity constraints on fiscal policy is not binding. Later, we examine how these constraints matter.

Once again, as in the case of a fixed tax rate, increases in the value of contested rents induce both contenders to expand their military capacities. However, there is a difference: A rebel leader's incentive to produce more guns is now tempered (but not entirely offset) by a negative effect due to the accompanying fall (rise) in the tax (subsidy) rate. This induced policy effect generates another effect as well: it increases the ruler's share of the contested resource rents, and thus his power. Proposition 2 below summarizes our key findings on the dependence of equilibrium payoffs under conflict on the value of rents A.

Proposition 2 *In an unconstrained subgame perfect equilibrium in which the ruler uses fiscal policy optimally, conflict payoffs are related to the value of the contested resource A as follows:*

(a) The ruler's payoff function is quasi-convex in A and is minimized at $\overline{A}$, the level of A that ensures $\tau_C^*(A) = \overline{\tau}$.

(b) The rebel leader's payoff function and labor's welfare are increasing in A.

[28] $\widetilde{U}^1_{\tau\tau} < 0$ can be shown analytically for the baseline case where production of S_i is Cobb-Douglas, so long as the labor share in production, θ^i, is sufficiently large. We have also confirmed $\widetilde{U}^1_{\tau\tau} < 0$ generally holds holds both when guns and labor are gross substitutes as well as when they are gross complements.

[29] We have expressed the optimal tax/subsidy τ_C^* as a function of A to highlight the importance of the value of the contested rents in the design of optimal policy. But this policy also depends on the technology of conflict (parameters ξ and m), the contenders' arming technologies (ψ^i), the price of guns in the world market (q), and the bounds of fiscal capacity (the endpoints of T). The implied relationships between τ_C^* and these parameters can be studied with the help of standards comparative statics methods. The same methods can also be used to study the determinants of A^0 and $\overline{A}$.

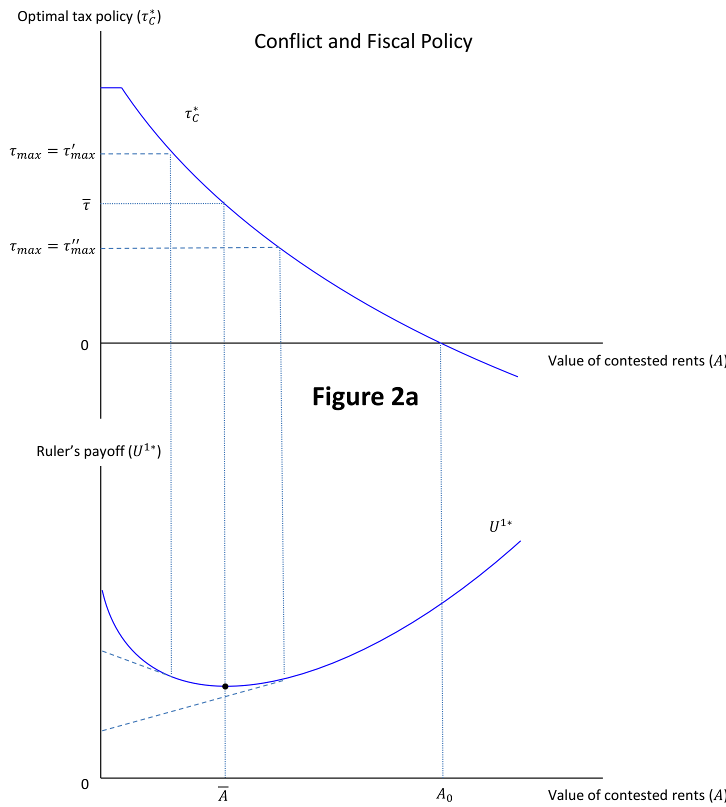

Figure 2a

Figure 2b

(c) Abundance in resource rents may reduce efficiency if A is sufficiently small initially.

Part (a) of Proposition 2 is an outgrowth of Proposition 2(a) and Lemma 1(a), and Fig. 2 illustrates it. Its key message is that the endogeneity of the tax rate tends to generate a U-shaped relationship between the ruler's payoff U^{1*} and contested resource rents. As shown in Fig 2a, the tax policy curve τ_C^* starts out at the institutional constraint τ_{max}, because the disruption of the tax base by rebel arming is minimal when $A \to 0$. The position of τ_{max} relative to $\overline{\tau}$ is thus what determines the monotonicity or non-monotonicity of U^{1*} in τ. For example, in Fig. 2, the lower level of τ_{max}—τ''_{max}, which is below $\overline{\tau}$—corresponds with the upward-sloping tangent line shown in the bottom panel. If, on the other hand, $\tau_{max} > \overline{\tau}$—as is the case with τ'_{max} in Fig. 2—U^{1*} will be non-monotonic, by Proposition 1. We will explore this relationship in more detail later when we discuss the role fiscal capacity plays in the emergence of conflict.

Part (b) affirms that increases in resource rents enhance labor's well-being. The reason for this is the reduction in tax policy that such rent increases give rise to. Similarly, the rebel leader's payoff also rises because the possibly adverse strategic effect due to the ruler's response (which is dominated by the favorable direct effect when the tax rate is fixed) is ameliorated by the falling tax rate. (See Fig. 1.)

The validity of part (c) hinges on the reasoning that in societies where resource rents are small initially (and, therefore, where the politically optimal tax τ_C^* is high), the fall in the ruler's payoff may not be offset by the payoff gains of the rebel leader and labor, for reasons similar to those outlined in connection with Proposition $1(c)$. It should be noted though this possibility is less likely to arise when τ is endogenous (because τ_C^* falls as A rises).

The U-shape of the ruler's payoff with respect to the value of contested rents is a novel feature of our analysis that is entirely dependent on the endogenous determination of tax policy. In similar settings which lack this added dimension (e.g., Garfinkel and Skaperdas, 2000; Garfinkel et al., 2008), all agents' payoffs are always positively related to the value of the contested spoils. This distinction is notable mainly for what it says about the potential strategic utility of destruction in this setting: if the ruler had a choice, he might wish to destroy as much capital as possible in order to maximize his total payoff. Intuitively, for low enough values of A (specifically, $A < \overline{A}$), the presence of insecure capital becomes a detriment to the ruler because he begins to care more about the revenues he extracts from his tax base, $\tau(w(1-\delta_L)L - w\psi_w^2 S_2)$, than he does from his winnings from the contest. Destroying capital directly diminishes his rival's incentive to arm in (7), reducing his choice of S_2 and thereby mitigating the erosion of the ruler's tax base due to rebel arming. Note, however, that the ruler cannot increase his payoff simply by "giving up" his "rights" to some of the contested capital; he can only benefit if some or all of K_0 is destroyed. The problem with "consensual" transfers of capital in this context is that they are not credible so long as the transferred rents can still be contested in a later stage.

Similarly, it is also important to observe that labor is not immune to strategically motivated violence in this setting either. This incentive enters specifically when the optimal tax is negative (i.e., a subsidy), since any given $\tau < 0$ will be less expensive to the ruler when there is less labor. We formalize the implications for conflict payoffs in the following proposition:

Proposition 3 *In an unconstrained subgame perfect equilibrium in which the ruler uses fiscal policy optimally, the ruler's conflict payoff is quasi-convex in the size of the labor endowment L and is minimized at some level $\overline{L} > 0$.*

For formal explanation, we refer to how we have represented the ruler's first-order condition for τ in (10) (which must hold with equality). Destroying a fraction of the labor force reduces the ruler's optimal tax policy (that is, $d\tau_C^*/d(-L) < 0$) by making positive taxes less valuable and negative taxes (subsidies) less expensive. However, by (6a), this type of violence enhances the ruler's payoff if and only if the tax is negative; that is, $dU^{1*}/d(-L) \gtreqless 0$ if $\tau_C^* \lesseqgtr 0$.[30] In short, $U^{1*}(L)$ attains a minimum at the (positive) value of L that solves $\tau_C^*(L) = 0$, which we call "$\overline{L}$" in Proposition 3.[31]

These observations pave the way to the central question we wish to address: Will a "deal" with the rebel leader, conducted in the "shadow of conflict", always be able to circumvent incentives

[30]This result only requires applying the envelope theorem to the ruler's payoff function: $dU^{1*}/d(-L) = d\widetilde{U}^1/d(-L) = \tau w(1-\delta_L)$.

[31]Statements about how destroying labor may affect other agent's payoffs—in particular the implications for labor's own "welfare"—are reserved for Section 4.

for destruction of capital and/or labor? To begin answering this question, we turn to describing how payoffs and tax policies differ under settlement.

2.5 Settlement

The notion of "settlement" we consider here entails one player (the ruler) offering to "buy peace" from the other player, using transfers of rents and other payments, in order to avoid the costly destruction associated with conflict. A key motivation for settlement then is that preserving resources from destruction creates a "surplus", which, conceivably, could be shared in a mutually beneficial way.[32]

Our basic treatment of settlement assumes that, for any given arming and tax choices implemented in earlier stages, the two sides use the Nash bargaining solution to settle their claims over the surplus. More formally, let β be the share of K_0 received by agent 1 (which implies agent 2's share is $1-\beta$) and let V^i denote i's payoff under settlement. Noting that V^i depends on β, the agents solve the following problem:

$$\max_{\beta} \ [V^1(\beta) - U^1]^{\lambda^1}[V^2(1-\beta) - U^2]^{\lambda^2},$$

where $\lambda^i \in (0,1)$ are the relevant Nash bargaining weights ($\lambda^1 + \lambda^2 = 1$) and U^i is agent i's (disagreement) payoff under conflict. Keeping in mind that, in the presence of trade, the marginal utility of income, $\mu(\cdot)$, remains the same under conflict and settlement, the "surplus" due to settlement, for given military strengths, is defined as $B \equiv \frac{1}{\mu}\left(V^1 + V^2 - U^1 - U^2\right)$. One can show that

$$B(\tau) \equiv r\delta_K K_0 + \tau w \delta_L L. \tag{13}$$

That is, the value of the surplus to agent i is the market value of the contested rents/resource and the tax revenues that would have been destroyed under conflict (but are not under settlement). Note that if conflict is not destructive (i.e., if $\delta_J = 0$ for $J = K, L$), then $B(\tau) = 0$ and so there is no essential distinction between conflict and settlement. Thus, the conditions for the surplus to be positive are: (i) conflict must destroy a fraction of the contested resource or of labor (i.e., $\delta_K + \delta_L > 0$), and (ii) $\tau > \check{\tau} \equiv -\frac{r\delta_K K_0}{w\delta_L L}$ if $\delta_L > 0$. This latter requirement points to circumstances in which conflict will clearly dominate settlement for given arms. We will take up the importance of this condition when we discuss optimal taxation.

The solution to the above bargaining problem defines the following payoffs and aggregate welfare under settlement:

[32]Byman (2002) and Fjelde (2009) describe how kleptocratic regimes have used such transfers (usually of political favors and other privileges) to successfully co-opt internal threats in Morocco, Bahrain, and Gabon, among other examples.

Payoff Functions under Settlement:

$$V^i \;=\; \lambda^i \mu B(\tau) + U^i,\; i = 1,2 \qquad (14)$$
$$V \;\equiv\; \mu(1-\tau)wL + \sum_i V^i = \mu B(\tau = 1) + U, \qquad (15)$$

For any given tax rate $\tau > \breve{\tau}$ and a pair of military strengths (S_1, S_2), the surplus $B(\tau)$ will be positive and thus the contenders will prefer settlement over conflict for all $\lambda^i \in (0,1)$. Similarly, all else equal (i.e., holding taxes fixed), the labor force collectively will also prefer settlement over conflict because settlement involves no destruction. Thus, under the noted circumstances, settlement improves overall efficiency as compared to conflict. This is a standard, unsurprising result: for given arming choices, when conflict involves destruction of resources, settlement should always Pareto dominate conflict.

How is it possible then that one side might choose conflict when settlement is clearly more efficient? The key consideration here is the relationship we have noted between τ and the balance of military power, not just because τ shapes the threat points for settlement (the U^i's) but also because the incentives for taxation themselves may depend on the expected mode of interaction (i.e., conflict vs. settlement). We formalize how tax policy under Nash bargaining resembles tax policy under conflict in the following lemma.

Lemma 2 *Assuming Nash bargaining, the ruler's optimal tax policy under settlement ("τ_S^*") relates to optimal tax policy under conflict ("τ_C^*") in the following two main ways:*

(a) $d\tau_J^*/dA < 0$ *for* $J = C, S$.

(b) $\tau_S^* > \tau_C^*$.

For part (a), we have already established that $d\tau_C^*/dA < 0$ in our discussion of Lemma 1. The reasoning why $d\tau_S^*/dA < 0$ is similar. Explicitly speaking, since $B'(\tau) = w\delta_L L$ is independent of τ and A, it follows from (14) that the sign of $d\tau_S^*/dA$ is the same as the sign of $-\widetilde{U}^1_{\tau A}/\widetilde{U}^1_{\tau\tau}$, which is strictly < 0. Intuitively, tax policy under settlement is decreasing in A because conflict payoffs still enter directly into bargaining solutions. Furthermore, as we observe from the ruler's objective functions in (6a) and (14), if conflict reduces the size of the labor force ($\delta_L > 0$), then we have that $B'(\tau) > 0$, such that the government has an added incentive to charge higher taxes in the event of settlement in order to increase the value of the eventual surplus. That is, $\tau_S^* > \tau_C^*$, as stated in part (b).

The endogeneity of fiscal policy thus creates an indirect link between the expectation of settlement and the determination of the balance of power. Higher taxes under settlement enhance the rebel leader's ability to build strength—thus reshaping the division of A—but also in turn introduce additional social costs via the intensification of arming. As we will show in the following section, the cost to the government of the concession of strength associated with settlement may outweigh the benefits of peaceful surplus-sharing under settlement. We also explore the implications of allowing the expectation of settlement to influence arming incentives more directly.

3 Conflict vs. Settlement

The goal of this section is to illustrate the potential limits of surplus sharing agreements that arise in our setting (thus the limits to deal-making between kleptocrats). Since conflict involves the destruction of productive resources, the natural expectation is that settlement will dominate conflict by creating a positive surplus that can be shared. As we will see, however, allowing state institutions (in our case, fiscal policy) to play a central role may enhance the value of "conflict" in this context. Under the noted assumptions regarding timing and bargaining, for example, we find that the ruler may choose conflict when the value of contested rents is relatively high because the higher taxes associated with settlement hurt his position in the contest over rents. We also find that varying the timing of the game generally does not affect this result, with one important caveat: Under the original timing, the ruler's tax policy can serve as a credible mechanism for committing to conflict *"ex ante"*, i.e., before arming decisions are made. When we explore alternate timing structures, where tax policy is chosen later in the game, there exist cases where the ruler would find it advantageous to commit to conflict *ex ante* even though he does not continue to prefer conflict *"ex post"*, i.e., after arming decisions.

In each of these cases, conflicts that predominantly destroy capital (as opposed to labor) are always dominated by settlement. This result changes when we allow arming decisions to affect the division of the surplus. In a variation of the model where bargaining weights (λ^i's) themselves are endogenously determined, we observe that conflicts that destroy mainly capital become appealing if the value of contested rents is sufficiently low. Again, however, while commitments to conflict in this last case may be optimal *ex ante*, they are not necessarily credible *ex post*. We then add further remarks focusing more specifically on the role that constraints on institutional capacity may play in determining the preferences for conflict, both *ex ante* and *ex post*.

3.1 When does settlement fail?

Consider first a simplified setting without either taxes (i.e., $\tau = 0$) or labor destruction (i.e., $\delta_L = 0$). The surplus in (13) then reduces to a fixed (positive) quantity $B = r\delta_K K_0$ and it is obvious the two sides will find a mutually agreeable way to divide it via settlement. This result is standard; see discussion of "The One-Period Model" in Garfinkel and Skaperdas (2000). Generally, settlement always dominates conflict in this setting unless either payoffs in future periods are taken into account (as in Garfinkel and Skaperdas, 2000) or settlement introduces additional incentives for arming (as in Chang and Luo, 2013, where destruction is endogenous).

Introducing tax policy alone does not change this standard result, despite the noted "U-shape" of the ruler's payoff U^{1*} with respect to the value of contested rents. Even on the downward-sloping portion of U^{1*}, the ruler has no reason to turn down the opportunity to share a positive surplus. That is not to say he does not still prefer larger values of capital destruction associated with conflict (i.e., larger values of δ_K).[33] Rather, the opportunity for settlement provides him with a way of avoiding destruction that does not incentivize increased arming by his rival, since by assumption each player receives a fixed share λ^i of any surplus (we relax this assumption in Section 3.3.)

When conflict destroys some of the labor force (i.e., $\delta_L > 0$), however, settlements cannot always compensate the ruler completely for the benefits he derives from destruction. As established in Proposition 3, under conflict, the ruler prefers a smaller labor force whenever the optimal tax is negative (i.e., a subsidy). A smaller labor force allows the ruler to use larger subsidies, which in turn increase his advantage in the contest over rents. The ruler may then induce conflict in order to retain the opportunity to use larger subsidies, even in cases where a settlement would have resulted in a positive surplus.

When specifically does settlement fail? To answer this question, we first refer to the simple case where conflict emerges even when taxes are held fixed. This is the case where tax policy (in this case, a subsidy) is fixed at a value less than $\check{\tau}$ ($\equiv -\frac{r\delta_K K_0}{w\delta_L L}$), the value at which the surplus becomes negative. In Fig. 3*a*, $\check{\tau}(A)$ is the dotted line, shown as a function of the (modified) value of rents $A = r(1-\delta_K)K_0$ (such that $\check{\tau}(A) \equiv -\frac{\delta_K}{1-\delta_K}\frac{A}{w\delta_L L}$). If the ruler adopted a wage subsidy below this line, the subsidy would be so costly to the ruler that destroying some of the labor endowment would become attractive (as it would reduce the overall bill). This case is not especially interesting, since we are simply noting that conflict would be preferred to settlement when there is no positive surplus to be bargained over. This boundary on the overall appeal of settlement is nonetheless important for explaining what can happen when tax policy is endogenously chosen prior to recruitment. As we now demonstrate, conflict may be preferred even when there would have been positive surplus under settlement.

Proposition 4 *Suppose taxes are endogenously determined. If both the relative incidence of labor destruction resulting from conflict ($\frac{\delta_L}{\delta_K}$) and the ruler's capacity to issue subsidies ($|\tau_{min}|$) are sufficiently large, there will exist a range of values of contested rents $A \in (A_D, \breve{A}_S)$, for which conflict will emerge in equilibrium even though settlement generates a positive surplus. Furthermore, $A_D > \overline{A}$, such that this range occurs on the upward-sloping portion of the ruler's conflict payoff U^{1*}.*

Figs. 3*a* and 3*b* together illustrate the key details behind Proposition 4. To explain these results we need to reiterate the salient facts unveiled in Lemma 2: (i) $B'(\tau) > 0$, and (ii) $d\tau_J^*/dA < 0$ for $J = C, S$. Together, these two points explain the behavior of optimal taxes under conflict and under settlement, as shown by the $\tau_C^*(A)$ and $\tau_S^*(A)$ curves (respectively) in Fig. 3*a*.

Existence of the point A_D, where the ruler begins to reject surplus sharing, is guaranteed if both $\tau_C^*(A)$ and $\tau_S^*(A)$ cross the zero-surplus line $\check{\tau}(A)$ depicted in Fig 3*a*.[34] For this to occur, we require that δ_L/δ_K is sufficiently large such that the slope of $\check{\tau}(A)$ is not too steep and that τ_{min} permits the ruler sufficient flexibility to choose levels of $\tau < 0$ (i.e., subsidies). We can then define

[33] As shown in Fig. 3, the ruler's payoff under settlement is also U-shaped with respect to A.

[34] Existence may also hold under other conditions, as we explain in the Appendix.

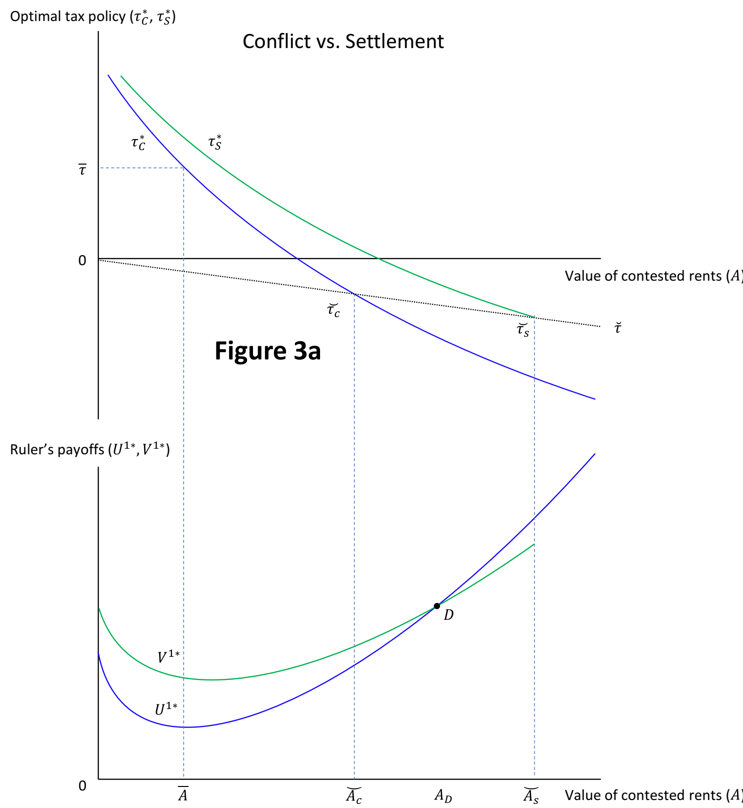

Figure 3a

Figure 3b

$(\breve{A}_S, \breve{\tau}_S)$ as the point where the $\tau_S^*(A)$ curve intersects $\breve{\tau}(A)$ in Fig. 3*b*. At $(\breve{A}_S, \breve{\tau}_S)$, even though the government optimizes its tax policy in anticipation of settlement, both sides will be indifferent between conflict and settlement because $\tau = \breve{\tau}_S$ implies the surplus under settlement is zero. But, because $\tau_C^* < \tau_S^*$, $\breve{\tau}_S$ is not the optimal tax the ruler would choose under conflict for $A = \breve{A}_S$. Thus, the government's payoff under conflict for $\tau = \tau_C^*(\breve{A}_S)$ must be strictly greater than its payoff under settlement for $\tau = \breve{\tau}_S$ (the best it can do under settlement).

The rebel leader for his part will also prefer conflict for $\tau = \tau_C^*(\breve{A}_S)$, because the surplus under settlement would be negative at that tax rate. More generally, however, he prefers settlement for all values of contested rents up until $\breve{A}_S$ since—unlike the ruler—he always prefers higher taxes and since settlement is associated with a positive surplus for $A < \breve{A}_S$. Both players would then continue to opt for conflict for values of $A > \breve{A}_S$ up until an upper bound $\breve{A}_M$, beyond which tax policies are sufficiently constrained by τ_{min} to the point where $\breve{\tau}(A) \leq \tau_{min}$ and surpluses become positive again.[35]

Similarly, let $(\breve{A}_C, \breve{\tau}_C)$ be the point at which the $\breve{\tau}(A)$ and $\tau_C^*(A)$ curves intersect, with $\breve{A}_C < \breve{A}_S$ following directly from $\tau_C^* < \tau_S^*$. Now suppose that at $\breve{A}_C$, the government chooses $\breve{\tau}_C$ to be its tax rate and the two sides then proceed to considering conflict versus settlement. Obviously since $\breve{\tau}_C$ lies on the $\breve{\tau}(A)$ line, both sides will be indifferent between conflict and settlement at that

[35]The determination of $\breve{A}_M$ is not shown in Fig. 3. Instead, we defer these details until Fig. 6 (in Section 3.4).

particular tax policy. But the government's best payoff under settlement will actually be secured when it charges the higher tax policy $\tau_S^*(\breve{A}_C) > \breve{\tau}_C$. Since $\breve{\tau}_C$ was defined as the government's optimal tax under conflict for $A = \breve{A}_C$, the government can do better under settlement in this case. Furthermore, since both tax policy functions are greater than $\breve{\tau}$ to the left of $\breve{A}_C$, the ruler will prefer settlement for all values of $A \in (0, \breve{A}_C)$.

It remains to be shown then there will be a point on the A axis between $\breve{A}_C$ and $\breve{A}_S$ at which the ruler will begin to prefer conflict. But this last piece follows directly from the fact that the ruler's payoff functions under conflict and settlement are both continuous in A. If the ruler strictly prefers conflict for values of A in the neighborhood of $\breve{A}_C$ and strictly prefers settlement for points in the neighborhood of $\breve{A}_S$, then there must be a point in between where his tax policy switches. On Fig. 3*b*, this is point D, the point where the U^{1*} curve (the ruler's payoff under conflict) begins to exceed the V^{1*} curve (his payoffs under settlement). The presence of this switching point ("A_D") to the left of $\breve{A}_S$ is noteworthy because it means there exist cases where the ruler will prefer conflict even if the surplus under settlement would have been positive. Lastly, note that D must be on the upward sloping portion of U^{1*}: $\breve{\tau}_C < 0 < \overline{\tau}$ implies that $A_D > \overline{A}$ (by $A_D > \breve{A}_C > \overline{A}$).

The implications are troubling. Bear in mind that the principal difference between conflict and settlement here, under the stated restrictions on destruction, is that some of the labor force is destroyed.[36] When the government is choosing tax rates that will be in the neighborhood of the $\breve{\tau}$ line, as occurs when $A \in (\breve{A}_C, \breve{A}_S)$, then the value of τ_C^* will definitely be negative. The role of labor destruction is key here: by reducing the labor force, conflict gives the ruler the budgetary freedom to issue a larger subsidy than would be possible under settlement. The larger subsidy helps subdue rebellion and in turn gives the ruler sufficient advantage in the contest over resources to make conflict viable. In other words, a self-interested government may deliberately allow its population to be decimated in order to make controlling the remainder more affordable.

A notable feature of this explanation for the emergence of conflict is that the ruler uses his choice of tax policy *ex ante* (i.e., before arming decisions are made) to induce a situation where both players prefer conflict *ex post* (i.e., after arming choices). In other words, tax policy serves as a credible mechanism for the ruler to signal his commitment to conflict to the other player. As we show in the following section, this ability to make credible commitments to conflict should not be taken for granted. In settings where either the timing of the game is changed (such that tax policy is no longer chosen first) or the division of the surplus is endogenously determined (such that settlement itself introduces additional arming incentives), there will exist cases where the ruler would find it advantageous to commit to conflict *ex ante* (but may not be able to do so credibly).

[36]For simplicity's sake thus far we have regarded "labor destruction" as being equivalent to the "death" of some of the potential working population, but it could also be thought of as due to dislocation. In the current Syrian conflict, for instance, 100,000 civilians have died but another 4 million have fled to neighboring countries (U.N. Refugee Agency, 2015). Nonetheless, violence against non-combatants is an all-too-common feature of civil wars; see Eck and Hultman (2007).

3.2 Alternate Timing

Our assumption that the ruler chooses his tax rate before militaries are formed has important consequences for the model because it allows him to anticipate how his tax rate affects the formation of military power. In this section, we discuss how varying the timing of the game may affect the emergence of conflict.

Suppose, for instance, that instead of being chosen first, τ is chosen simultaneously with S_i's. To characterize how this timing structure affects our findings, we focus on how the government's first-order condition for τ changes. First, consider the government's tax/subsidy choice in the event of conflict under our original timing assumption, characterized in (10).

On the one hand, increases in tax revenues draw higher revenues per worker, a positive effect. But this positive effect must be balanced against resulting reductions in the tax base, which occur via two different channels: (i) increased utilization of labor by the rebel leader for a given $\widetilde{S}^2$ (a "substitution" effect, induced by $\psi^2_{ww} < 0$), and (ii) increased arming in equilibrium by the rebel leader (i.e., $\widetilde{S}^2_\tau > 0$), which in turn generates a shift in the balance of power (a "strategic" effect) and a reduction in the tax base (a "scale" effect).

The effect of varying the timing of the game such that the ruler cannot internalize his rival's arming response in his optimal tax decision is equivalent to removing both the strategic effect and the scale effect from (10). Since $w[(1-\delta_L)L] - \psi^2_w \widetilde{S}^2 > 0$ and $w^2 \psi^2_{ww} \widetilde{S}^2 < 0$, τ^*_C will always be positive when taxes are decided simultaneously with arming. Obviously, since the potential optimality of negative taxes plays a key role in the explanation for the emergence of conflict described above, this alternate timing assumption has a material effect on our results. Conflict then will never be preferred to settlement *ex post* under this alternate timing.

Instead, however, we now have the new result that—for sufficiently large values of A—conflict may be preferred *ex ante*, but not *ex post*. The intuition for why this new result emerges would seem to help justify our original timing assumption. Suppose that before arming decisions are made, the ruler has the opportunity to declare a binding commitment to choosing conflict at the end of the game. Furthermore, suppose this commitment is considered credible; we will discuss potential means for ensuring credibility later. When the ruler cannot internalize the effect of his tax choice on its rival's arming decision, he instead may wish to declare a commitment to conflict *ex ante* in order to convince his rival he will choose the lower tax rate associated with conflict and thereby cause him to be less aggressive in his arming. In this case, the opportunity to pre-commit to conflict is directly analogous to the implicit choice the ruler makes between the $\tau^*_C(A)$ and $\tau^*_S(A)$ curves under the original timing. Only here, instead of using taxes to signal his preferences about conflict, he effectively must use pre-commitment to conflict to signal his preferences about taxes. In either case, his ultimate goal is to use the linkage between taxes and arming to influence the balance of power.

This example also reveals that, even under the original timing, the ability to commit to conflict is important. In that case, the opportunity to set taxes first makes such commitments possible. By intentionally inducing a negative surplus, the ruler effectively ensures that conflict will prevail in the later stage. Furthermore, this experiment also reveals the common thread that underlies the emergence of conflict in each of the settings we consider: the rebel leader cannot credibly commit to restrain his arming for a given level of taxation. If his choice of arms were somehow contractible, he would realize that he and the ruler together could enjoy much larger spoils if neither armed and if labor were taxed up to the maximum amount τ_{max}. Without perfect contracting, however, the absence of arms is unsustainable: either player would regard the lack of arming by the other as an opportunity to seize the entire pie of rents.

A related alteration to the game tree we should consider is what happens when both players can tax (or subsidize) labor. We show in the Supplementary Appendix that even when both players are symmetric in every way, including the ability to use tax policy, preferences for conflict still emerge—for both players in this case—because each player internalizes how his use of taxes will affect labor supply for the other player.[37] This finding is important to keep in mind since it reveals that, for the most part, it is not any fundamental asymmetry in the model that generates conflict, but rather the added layer of strategic interdependence provided by the effect of one's policy choices on a common pool of labor. It is also important to note, however, that a symmetric model can only generate preferences for conflict when fiscal policy is set first and does not generalize to cases in which we alter the timing of the game. Furthermore, avoiding the need for symmetry facilitates our discussion of equilibrium dynamics—which we turn to in Section 4—and can be justified on the grounds that official state institutions may be significantly less constrained than those of rebel groups.[38]

3.3 A Variation on the Model: Endogenous Bargaining Weights

Thus far, our main result has relied heavily on the idea that conflict eliminates workers who would have provided productive labor in the event of settlement. But what if instead the destruction from conflict is characterized more so by destruction of the contested resource than by destruction of labor? Is it still possible that the endogeneity of the tax rate can once again cause the government to prefer conflict to settlement in certain cases? The answer is yes. However, we would need to introduce an alternate bargaining framework in which bargaining weights (λ^is) depend endogenously on one's military strength, as in the "agreements in the shadow of conflict" (ASC) bargaining concept formalized by Esteban and Sákovics (2007).

In the simplest implementation of the Esteban and Sákovics framework, the bargaining weights λ^i in Nash's bargaining model coincide exactly with ϕ^i, the CSF that determines the division of the prize under conflict (i.e., $\lambda^i = \phi^i$ for $i = 1, 2$). Its general appeal is that it provides an intuitive

[37]Intuitively, for large enough A, the marginal benefit of using negative taxes to drive up the other player's cost of arming grows so large that each player finds it optimal to eliminate some of the labor force.

[38]More general treatments of asymmetry (where each player possess different levels of institutional capacity) go beyond the scope of this paper but should not be considered unimportant. Our essential reasoning should still apply directly, however, in cases where one player is constrained in his policy choice and the other is not.

and yet powerful link between the value of the surplus and arming even in the absence of risk aversion or endogenous destruction.[39] The key for our purposes is that the need to compete for the negotiation of the surplus under peaceful settlement generates additional arming incentives that are not present under conflict.[40]

It is important to emphasize at the outset, however, that endogenous bargaining weights by themselves are neither necessary nor sufficient for obtaining conflict in equilibrium.[41] The main result still depends on the differential effects of tax policy on payoffs, although here the linkage between destruction and the balance of power is more direct. In addition, the mechanism by which conflict is chosen may be different than under fixed bargaining weights (i.e., Nash bargaining). Once again, the emergence of conflict will require that the ruler is able to make a credible promise that it will refuse to settle at the end of the game. Because preserving capital always adds to the size of the eventual surplus, conflicts that destroy mainly capital are still dominated *ex post* as before. From an *ex ante* perspective, however, the opportunity to commit to an outcome where capital is destroyed may be very appealing for the ruler.

For a simple example, take the case where τ is held fixed at some positive level (as would be the case, for example, if taxes are tightly bound by the capacity constraint τ_{max}). As the following lemma formalizes, the anticipation of settlement by the rebel leadership leads to more aggressive arming, which can have further negative consequences for the ruler via the effect on his tax base:

Lemma 3 *Suppose bargaining weights are endogenously determined. Then for a given tax rate τ, the ruler will prefer conflict* ex ante *(but not* ex post*) if τ is sufficiently large (specifically, if $\tau > \overline{\tau}$, with $\overline{\tau}$ the tax rate that minimizes the ruler's conflict payoff $\widetilde{U}^1$). Otherwise, he strictly prefers settlement.*

The logic behind Lemma 3 follows from Proposition 1, but requires some further explanation. When bargaining weights are endogenous, one of the effects of "settlement" is to change the relevant value of "A" in the first-order condition for arming (7) from "$(1-\delta_K)rK_0$" (the value of the undestroyed rents) to simply "rK_0" (the full value of rents). Settlement thus is associated with higher overall arming and, by extension, a reduction in the size of the tax base. For lower taxes, the loss of tax revenues due to this distortion is minimal and settlement will dominate. For high enough taxes, however, the option to commit to conflict *ex ante* becomes an appealing way to restrain incentives for arming. In other words, the ruler prefers to destroy rents when they are negatively associated with his payoff. By Proposition 1, this relationship holds when $\tau > \overline{\tau}$.

Clearly, however, the role that taxes play here in incentivizing conflict is different from before. Instead of tax policy being used to influence the outcome from conflict, *ex ante* commitment to

[39] See Skaperdas and Syropoulos (2002) and Anbarci et al. (2002) for similar approaches that rely on the presence of diminishing returns; also see Chang and Luo (2013) for a model that demonstrates similar frictions when destruction is endogenous.

[40] Even if we stayed within the confines of the Nash bargaining model and treated λ^i as constant, the size of the surplus will impact upon arming incentives if the rental rate r in (14) is endogenous (as when either the "small" economy assumption is relaxed or when the economy completely specializes in producing one of the two consumption goods).

[41] See (for example) the section entitled "A Comparison with the Nash Bargaining Solution" in Esteban and Sákovics (2007) for an example of a model analogous to ours with tax revenues removed from the analysis.

conflict is being used to enhance the return to tax collection. Furthermore, unlike the cases outlined above, preferences for conflict only materialize when the value of rents is sufficiently low; under fixed bargaining weights, conflict only emerges when the value of rents is sufficiently high. This sharp distinction between how the value of contested rents relates to conflict decisions with variable bargaining weights and fixed taxes versus with fixed bargaining weights and variable taxes begs the question: what happens when both taxes and bargaining weights are allowed to be endogenous? Proposition 5 explains.

Proposition 5 *When both taxes and bargaining weights are determined endogenously, conflict can emerge under the following scenarios:*

(a) If the incidence of labor destruction (δ_L) is sufficiently small, and the ruler's capacity to tax is sufficiently large (specifically, if $\tau_{max} > \overline{\tau}$), the ruler will prefer conflict ex ante *(but not* ex post*) over settlement for a range of values of contested rents $A \in [0, A_1)$, with $A_1 < \overline{A}$ (where $\overline{A}$ is still defined as the value of rents that minimizes the ruler's conflict payoff U^{1*}).*

(b) If both the relative incidence of labor destruction resulting from conflict ($\frac{\delta_L}{\delta_K}$) and the ruler's capacity to issue subsidies ($|\tau_{min}|$) are sufficiently large, then there will exist a range of values of contested rents $A \in \left(A_D, \check{A}_S\right)$, with $\overline{A} < A_D < \check{A}_S$, for which the ruler will prefer conflict (both ex ante *and* ex post*) even though settlement generates a positive surplus.*

The full details behind Proposition 5 are described in the Appendix. We also defer until the next section a more focused discussion of how state capacity constraints (here, τ_{max} and τ_{min}) may limit the appeal of war. The main point at this juncture is that the two different conditions specified for the emergence of conflict—on labor destruction (δ_L) in part (a) and on relative destruction (δ_L/δ_K) in part (b)—are not mutually exclusive. That is, there can be cases where conflict could be preferred solely *ex ante* (for sufficiently low values of the contested rents) or both *ex ante* and *ex post* (for sufficiently high values). Fig. 4 illustrates such a case.

Overall, the intuition is straightforward given the relationships we have already discussed. First, consider what happens when the value of contested rents is very small (i.e., when $A \to 0$). In this case, there will be virtually no incentive to arm unless there is settlement—in which case $w\delta_L L\tau_S^*$ effectively comes into play in the definition of the surplus. Thus (absent constraints on taxation), the government will never choose settlement in this region unless δ_L is large enough that the damage to its tax base from conflict is too costly to bear. So long as we can identify some point $A_1 > 0$ on the downward-sloping portion of U^{1*} where conflict is preferred, it will always be the case that conflict is preferred everywhere between 0 and A_1, by the continuity of payoffs. The left-hand side of Fig. 4*b* demonstrates such a case.

The logic behind part (b) unsurprisingly flows from our discussion of Proposition 3. As A increases in size, it can be shown that $\tau_S^*(A)$ begins to be strictly larger than $\tau_C^*(A)$, as in the fixed

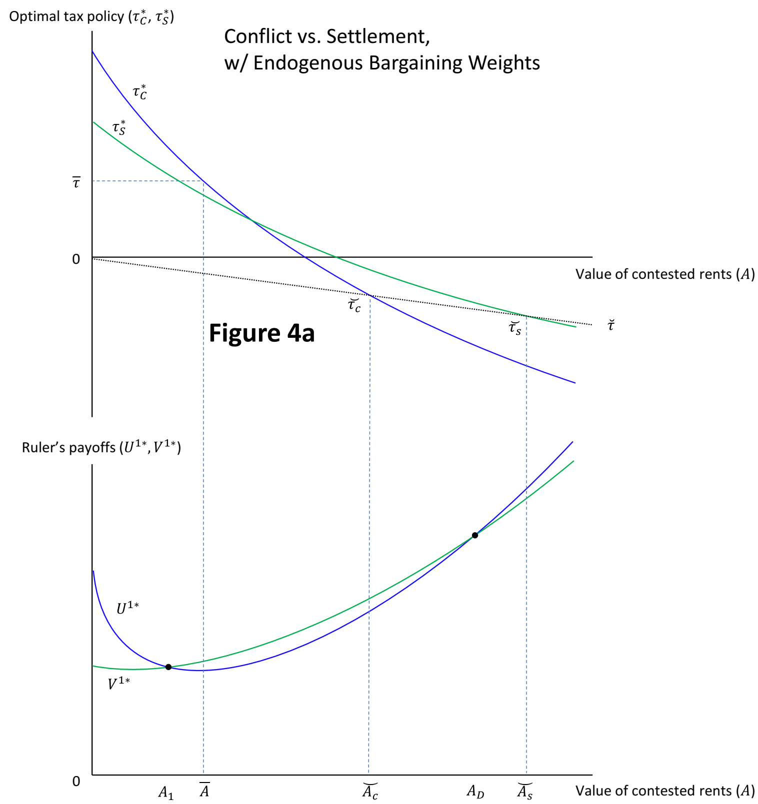

Figure 4a

Figure 4b

bargaining weights case.[42] Then, so long as $\tau_S^*(A)$ and $\tau_C^*(A)$ each cross the $\breve{\tau}(A)$ line, which occurs under familiar restrictions on $\frac{\delta_L}{\delta_K}$ and τ_{min}, the reasoning behind the existence of A_D is the same as before.

The potentially non-monotonic relationship between contested rents and conflict highlighted in this setting illustrates how allowing for an endogenously chosen mode of interaction complicates the analysis of civil war. Much of the empirical literature on rents and civil conflict has looked for straightforward correlations between resource rents and civil war, but our theory suggests rents may affect incentives for peace and incentives for war in different ways. These issues have been touched upon in Le Billon (2003) and Fjelde (2009), but merit further theoretical and empirical investigation.

Finally, one last interesting issue that arises here is the question of how exactly the ruler can credibly "pre-commit" to conflict *ex ante* in situations where settlement is preferred *ex post*.[43] Even if the government announces ahead of time it will not negotiate for peace, the rebels may not necessarily find these promises to be credible.[44] So what can the state in this case do to convince

[42] For proof, see the Appendix.

[43] This is a common issue in game scenarios where one player has the opportunity to "pre-commit". Dixit (1980), for instance, features an analogous situation where an incumbent firm commits to "fight" potential entrants, even though fighting would be suboptimal if entry occurred. Explanations for the emergence of war described in Beviá and Corchón (2010) and Chang and Luo (2013) also require that such pre-commitments are possible.

[44] The U.S. government, for instance, which famously "does not negotiate with terrorists", does in fact negotiate with

its adversary otherwise? It may, for instance, antagonize its rival by stoking political, ethnic, and/or social divisions. Alternatively, if enforcement of settlement is known to be contingent on the efforts of external powers such as the U.N., the ruler may deliberately sabotage those efforts.[45] In sum, even if the exact mechanism for how the ruler might credibly influence the beliefs of its rival is not immediately clear, the model nonetheless indicates that embattled states may have powerful incentives to oppose negotiating for peace.

3.4 The Role of State Capacity

Thus far, we have only minimally commented on the operative roles played by institutional capacity constraints (τ_{max} and τ_{min}) in the emergence of conflict. Proposition 5 highlights two potential roles in particular worth focusing more on. We take this opportunity now to add some further remarks.

We also wish to place these findings within the context of the wider literature on state institutions and civil war. What, for example, might these conditions on τ_{min} and τ_{max} allow us to say more generally about how limits on institutional capacity influence war and peace? And how exactly should these parameters be interpreted? The outbreak of civil war is usually found to be negatively correlated with known measures of "fiscal capacity" (Sobek, 2010; Besley and Persson, 2011), contrary to our findings. Some clarification is required.

We start by focusing on τ_{max}. Fig. 5 shows a simplified scenario from our model, drawing on Proposition 5(b), where bargaining weights are endogenously determined and where only capital is destroyed. Recall from Proposition 2 that the level of τ_{max} relative to $\overline{\tau}$ determines the monotonicity of the ruler's payoff function under conflict (U^{1*}). Fig. 5 illustrates how this logic carries over to the question of conflict vs. settlement. As in Fig. 2b, we show two scenarios: one where $\tau_{max} > \overline{\tau}$ and another where $\tau_{max} < \overline{\tau}$. In both cases, the dotted tangent lines depict the portions of the ruler's payoff curves where his fiscal policy is constrained by τ_{max}. As before, when the optimal tax is allowed to exceed $\overline{\tau}$ (i.e., when $\tau_{max} > \overline{\tau}$), the blue tangent line associated with the ruler's payoff, U^{1*}, is downward sloping, such that U^{1*} is overall non-monotonic in A. The new insight here is that the same is also true for his payoff under settlement, V^{1*} (in green). In this example, "settlement" resembles "conflict", only over a larger pie of rents; that is, $V^{1*}(A) = U^{1*}(A/(1-\delta_K))$. It follows that, for $A < A_1$, conflict not only dominates along the unconstrained (solid) portions of U^{1*} and V^{1*}—by Proposition 5(a)—but the constrained (dotted) portions as well—by Lemma 3.

On the other hand, when constraints on taxation are sufficiently tight (i.e., when $\tau_{max} < \overline{\tau}$), the ruler lacks the leeway to prey more aggressively on labor when the value of rents would otherwise be too small to be appealing to him (i.e., when $A < \overline{A}$). As shown in Fig. 5 (by the upward-sloping dotted lines in this case), the effect on payoffs is to eliminate the non-monotonicity in both

groups it had previously labeled terrorists on occasion.

[45] Walter (1997) presents evidence that external enforcement often plays a crucial role in securing settlements in civil war scenarios.

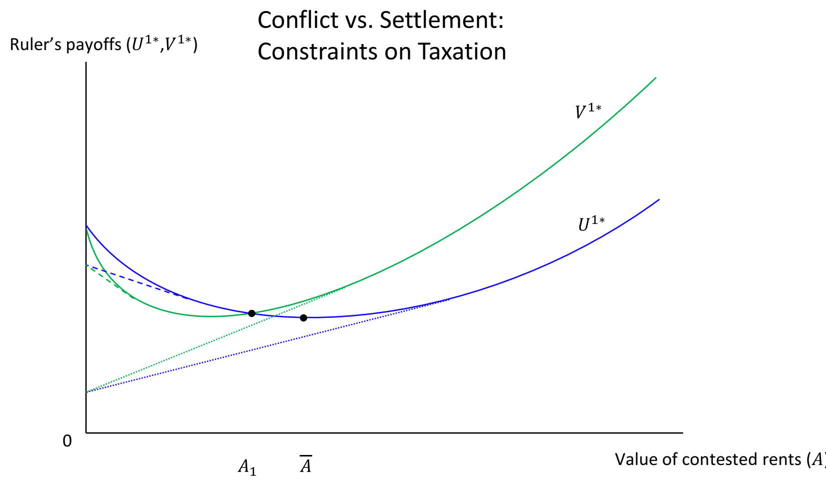

Figure 5

U^{1*} and V^{1*}, such that the payoff to settlement always exceeds the payoff to conflict. This result generalizes further to cases where labor is destroyed (by Lemma 3), but this example is sufficient for illustrating the key mechanisms at work.

The idea that limits on the institutional capacity to tax can promote peace does not attract much support in the literature. Civil wars by far are more prevalent in developing countries with weak formal institutions. Thus, we cannot interpret τ_{max} literally as signifying the presence of a well-functioning professional revenue collection service, as in Besley and Persson (2011). Instead, we take a broader interpretation. The variable τ in our model, while it serves to transfer income that otherwise would go to labor, need not be thought of strictly as a "tax". Rather, it can be thought of in more general terms as "corruption". Le Billon (2003) observes that corrupt practices contribute to civil war by lowering the opportunity cost of abandoning productive work.[46] This argument closely mirrors the role of τ in our model: to the extent that governments internalize the effect their corruption has on labor's income (and to the extent they themselves can constrain it), varying the degree of corruption serves as an instrument for influencing the supply of labor to their opposition. τ_{max} may then be better thought of reflecting the state's effectiveness at extracting value from useful production.

Under this broader interpretation of "fiscal institutions", our model suggests that states that are more effective at corruption, but are not especially wealthy in non-labor resources, should incur a higher risk of civil war. To the extent that observed corruption in the data reflects high capacity for corruption, empirical evidence does support this prediction; see Fjelde (2009). It remains to be seen, however, if (as our model suggests) conflicts meeting this description involve relatively less violence against the population.

Turning to τ_{min}, Fig. 6 adds the remaining details (already previewed in Propositions 3 and 5*a*) for how limits on subsidy policies affect the appeal of conflict. Specifically, it shows how τ_{min}

[46]Le Billon synthesizes prior insights from Mauro (1995, 1998) and Collier (2000).

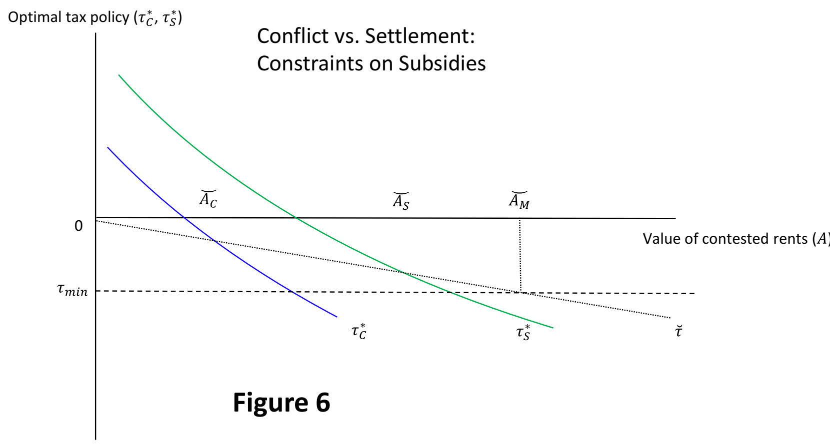

Figure 6

is associated which a particular value of rents $\breve{A}_M$, where τ_{min} intersects with $\breve{\tau}(A)$, the "zero-surplus" line.[47] Conflict then cannot emerge for $A > \breve{A}_M$ because surpluses will be positive when τ is constrained to be greater than $\breve{\tau}(A)$. The point we want to emphasize for our discussion of τ_{min} is that tighter limits on the ability to subsidize labor's welfare erode (and eventually eliminate) the appeal of conflict by shifting $\breve{A}_M$ to the left.

This result too needs to be put in context. In our model, the government uses negative taxes to drive up the rewards to productive labor, in order to restrict the supply of potential recruits to its adversary. We emphasize first that even $\tau < 0$ may be associated with some level of "corruption", since labor receives no rewards from the state's non-labor assets otherwise. But what form do these transfers of non-labor wealth take? Assuming poor formal institutions, it is again unlikely that the government is able to affect workers' incomes through direct income subsidies. And general disbursements of wealth or goods to the population may fail to exclude those who join the rebels.

Instead, we suggest τ_{min}'s interpretation may be expanded to encompass the government's general capability to (non-coercively) influence the loyalties of a "rational peasantry" (Popkin, 1979). Historically, such gestures have taken a variety of different forms, including the provision of food aid and development projects (as in Guatemala during the 1980s), the reform of property rights and other grievances (as in El Salvador), and/or the use of clientelism and civil service patronage (as in several African conflict-prone nations).[48] The key principle is that a threatened ruling elite may prefer to fight a smaller rebellion rather than reach a settlement with a larger one; thus, it has a strong incentive to use every tool at its disposal to influence the strength of its opponent.

The role that "public goods", more narrowly defined, may play in this context is unclear. As

[47] To simplify the analysis, we abstract from the possibility that one or both tax policy functions crosses back above $\breve{\tau}(A)$ before being constrained by τ_{min}. We discuss these possibilities in the Appendix.

[48] Stoll (1993), Schirmer (1998), and Hashimoto (2009) document the strategic pairing of violence and public good provision in the case of Guatemala. Mason (1998) reviews the role that agrarian reform played in intensifying the conflict in El Salvador. Reno (1995, 1996) and Nafziger and Auvinen (2002) discuss how patronage and clientelism were used to isolate opposition groups in Sierra Leone, Liberia, and Zaire.

argued in Moselle and Polak (2001), the production of "localized" public goods (that benefit only the "loyal" population) are an effective means of restraining the size of an appropriation sector.[49] General improvements in social services and/or infrastructure may not necessarily be "localized", however, and may therefore be less valuable to the government. Nonetheless, we could also consider extensions to the model where the rebel leadership internalizes the linkage between its own welfare and the government's provision of public goods. It stands to reason that this linkage may cause them to be less aggressive in interfering with the government's sources of income.

Obviously, there is more that can be said about what other ways "state capacity" may influence incentives for conflict, both within and beyond the context of our framework. Ultimately, the role of the fiscal capacity constraints in our model reflects (and adds to) the argument made by Acemoglu (2010): less accountable states will only use stronger institutions (whatever form they may take) to more efficiently pursue the downfall of their rivals.

4 Peace and Welfare

Characterizing what "welfare" means in this context requires many caveats. To simply call the total utility enjoyed by all agents in the model a measure of total national well-being glosses over the gross inequities implied by the model as well as the (unmodeled) human costs associated with violence and destruction. Nonetheless, accounting for the (otherwise overlooked) inefficiencies that may be associated with "peace" is a primary motivation for exploring a model where the mode of interaction is endogenously determined. We begin our discussion of these costs by directly comparing how equilibrium payoffs under conflict would have differed under settlement and vice versa. We then explore how these potential trade-offs weigh on outcomes from external interventions.

4.1 The Costs of "Armed Peace"

Our framework highlights two main sources of inefficiency to discuss in this context, arming and taxation. The diversion of productive resources into arming directly reduces overall production and therefore total national income. Taxation contributes to this inefficiency by incentivizing more arming.[50] "National income" may not be the appropriate welfare criterion to focus on in this context, however, because it includes rents paid to criminals and kleptocrats. If we instead focus strictly on labor's income to gauge welfare, the negative effects of taxation are obvious.

We have already mentioned in the context of conflict payoffs (in Proposition 2, part (c)) that destroying capital may increase "national welfare". This reasoning in turn extends to the question of conflict vs. settlement, according to the mode of bargaining explored in Section 3.3. However, this increase in welfare is solely due to the non-monotonicity of the ruler's payoff with respect to

[49]Their discussion highlights public celebrations and the building of religious monuments as intuitive examples.
[50]The resources diverted here include not just labor but also rents from (secure) capital used to purchase weapons.

the value of the contested rents. As far as labor is concerned, settlements that preserve primarily capital are (relatively) desirable: destroying capital reduces overall incentives to arm and therefore grants the ruler more freedom to extract higher taxes.[51] The rebel leader is also worse off under conflict (by not having access to as many rents), but the increased channeling of tax revenues to the ruler (reflecting increased overall production) dominates these effects.

When we turn to the case where conflict destroys primarily labor, we observe a more fundamental tension: some labor is destroyed, but the remainder is awarded a higher standard of living. As we show in the Supplementary Appendix, it is indeed possible that overall labor income will be higher under conflict than under settlement in these cases.[52] Furthermore, our risk-neutrality assumption permits an even more striking statement: there exist cases where all labor will prefer conflict *ex ante*, even though *ex post* a share δ_L of them will be destroyed. That is to say, labor would "vote" for conflict if they felt the increased subsidy income associated with conflict compensated them for the risk of losing their homes and/or lives.

Clearly, discussing the brutality of conflict in this way abstracts from important considerations that should be discussed in this context. For example, we do not model how citizens who are fortunate enough to avoid destruction may feel about the suffering of those who are not. We also do not model how eliminating some of the population limits an economy's growth trajectory by affecting productivity and/or and the functioning of formal institutions. Likewise, it is limiting to assume that agents can perceive with perfect foresight what shares of the population will suffer violence, or that they cannot predict what parts of the population will suffer the most. In short, we identify important incentives that may exist for both violence and war, but do not claim these incentives are justified on the basis of "welfare". Nonetheless, governments have been known to utilize violence for reasons similar to those we describe.[53]

Instead, what we can say is the unconditional pursuit of "peace" may entail important social costs. The following subsection examines how these confounding trade-offs weigh on possible instruments the outside world might use to influence the contest towards settlement.

4.2 External Interventions

There are many ways to model how external agents may wish to influence peace and/or welfare in this context. To take advantage of the small open economy structure of the model, we focus on two in particular: general sanctions on imported goods and sanctions on imported weapons specifically.[54] For the sake of brevity, we focus on specific examples rather than try to fully characterize how each of these interventions impacts the different conflict scenarios we have discussed. Generally, we again find that what is best for peace may not be what is best for overall welfare, nor for the welfare of ordinary citizens.

[51]Our proof of Proposition $5(a)$ in the Appendix includes this result.

[52]We also show that overall efficiency may be higher in these cases as well.

[53]See Valentino et al. (2004); Besley and Persson (2011).

[54]We could also explore, for example, lending technological support to either side's military.

Consider trade sanctions. The small open economy perspective we use provides an intuitive linkage between changes in international prices of tradable commodities and incentives for arming, via the effect of international prices on relative factor rewards. To add specificity, assume the capital-intensive sector is the country's export sector. Also assume the effect of trade sanctions is to lower the domestic price of exports relative to that of imports. It follows that sanctions reduce the reward to capital (r) relative to the reward to labor (w) and thereby (all else equal) mitigate the wasteful diversion of resources towards arming.[55] However, because our framework allows both tax policy and the nature of interaction to be endogenously chosen, the full implications for both conflict and welfare are more complicated. We use the fixed bargaining weights case (Fig. 3) for illustration. It is easily seen from Fig. 3 that trade sanctions in this case may promote settlement, by lowering the reward to contested capital (embedded in $A = (1 - \delta_K)\, rK_0$). However, as noted in our discussion of conflict payoffs, higher taxes associated with lower values of A themselves generate more intensive diversion of resources towards arming and away from useful production. Furthermore, this increase in taxes in response to the reduction in A is only amplified by the discrete jump in tax policy from τ_C^* to τ_S^* that occurs under settlement. These negative welfare effects not only come largely at the expense of labor (through the increases in taxes) but may dominate any overall positive effects from preserving resources from destruction.

We also want to consider how equilibria might response to external influences on the prices of imported weapons (q).[56] Is it necessarily the case, for instance, that withholding cheap imports of weapons will ward against the risk of conflict in a contested state?

The answer depends on the technology that converts weapons and labor into military strength. If soldiers and weapons are substitutable in the production of strength, then there are two clear channels of effects to consider. First, higher prices on weapons will make acquiring strength generally more expensive and there will tend to be less overall diversion of resources towards arming. Second, however, higher weapon prices will also make hiring soldiers more attractive. Consequently, labor markets will only become more sensitive to the ruler's fiscal policies and he will be more reluctant to use higher taxes. This downward pressure on taxes also tends to reduce overall arming, but what are the implications for conflict?

Actually, sanctions on imported guns in this setting would have the (surprising) effect of promoting conflict. The reasoning is as follows. Because the value of q does not affect $B'(\tau) = w\delta_L L$ (i.e the marginal effect of taxation on the size of the surplus), the difference between the $\tau_C^*(A)$ and $\tau_S^*(A)$ curves in Fig. 3 is the same regardless of q. Therefore, the downward pressure on taxes from the increased use of soldiers shifts the critical values $\breve{A}_C$, A_D, and $\breve{A}_S$ in Fig. 3 to the left. In this case where guns and soldiers exhibit substitutability, we thus observe a noteworthy paradox:

[55] See Garfinkel et al. (2008), Dal Bó and Dal Bó (2011), and Garfinkel and Syropoulos (2015) for examples of other work that has studied this linkage.

[56] It is also possible to consider separate weapons prices for the two players. The price of imported weapons for the rebel leader is the more interesting of the two in terms of conflict vs. settlement because of how it affects the labor market.

trade liberalization in weapons may actually reduce the likelihood of conflict.[57] We offer this last result as a fitting note to end on. It is only when we separate the means of violence from the use of it that we can better understand the terms of peace against which conflict can be compared.

5 Concluding Remarks

To summarize our main message, accounting for the central presence of state institutions in civil conflict generates novel strategic scenarios that may help explain the emergence of conflict itself. Specifically, the interdependence between the exercise of fiscal policy and the incentive to acquire arms may lead to situations where policy may make violence more effective (and vice versa).

While we establish these results within a static political economy model under admittedly stylized assumptions—that both state and rebel groups care exclusively about rents, for instance—the features of our model nonetheless resemble conditions commonly cited as potential causes for the origination and continuation of civil conflicts. We may summarize some of the empirically relevant distinctions made possible by our analysis as follows. First, conflict in corrupt states is more likely to occur when the value of "rents" (broadly defined) is either very high or very low. When the value of rents is low, we would expect to see conflicts that are less deadly in nature. When it is high, our model predicts the opposite. Importantly, the outbreak of conflict is conditional on different dimensions of state capacity in either case, which may be difficult to separate in the data. We also do not take a stand on whether or model should be applied empirically to studies of civil war "onset" or "duration", since we take as given the existence of an armed opposition group.

Another relevant avenue we abstract from here is the inter-temporal dimension of civil conflict, highlighted in Besley and Persson (2011). Further work might more explicitly consider civil war as a political competition over future control over the privileges of power. Just like in our static model, the nature of the chosen form of political competition—destructive violence versus political deal-making—should still depend on the realization of an endogenous tax base. What could prove especially interesting in such a setting might be the state's potential investments in fiscal capacity. Will the ruling party incur the cost of improving its fiscal institutions knowing that such improvements might reduce its prospects for peaceful deals in the future should it find itself in opposition?

In addition to these questions surrounding civil conflict specifically, this framework more generally raises the issue of how natural interdependencies between players can generate endogenous shifts in the balance of power which in turn can lead to the emergence of conflict. Our focus here has been on how one side's discretion over policy affects the dynamics of power within a common economy. Other forms of interdependency that might also be explored in the context of conflict in related work might include trading relationships between countries, complementarities in pro-

[57] Under the assumption that the elasticity of substitution equals 1 (the Cobb-Douglas case), varying q has no effect on conflict versus settlement. It is straightforward to show increasing q promotes settlement when this elasticity is less than 1 (when guns and labor are gross complements) and promotes conflict when it is greater than 1 (when they are gross substitutes).

duction, and common external threats.

References

Acemoglu, Daron, "Institutions, Factor Prices and Taxation: Virtues of Strong States?," Working Paper 15693, National Bureau of Economic Research January 2010.

— **and James A. Robinson**, "A Theory of Political Transitions," *The American Economic Review*, September 2001, *91* (4), 938–963.

— **and** — , *Economic Origins of Dictatorship and Democracy*, New York: Cambridge University Press, 2006.

Anbarci, Nejat, Stergios Skaperdas, and Constantinos Syropoulos, "Comparing Bargaining Solutions in the Shadow of Conflict: How Norms against Threats Can Have Real Effects," *Journal of Economic Theory*, September 2002, *106* (1), 1–16.

Anderson, James E. and Douglas Marcouiller, "Anarchy and Autarky: Endogenous Predation as a Barrier to Trade," *International Economic Review*, 2005, pp. 189–213.

Besley, Timothy and Torsten Persson, *Pillars of Prosperity: The Political Economics of Development Clusters: The Political Economics of Development Clusters*, Princeton University Press, August 2011.

Beviá, Carmen and Luis C. Corchón, "Peace Agreements without Commitment," *Games and Economic Behavior*, March 2010, *68* (2), 469–487.

Bhagwati, Jagdish, "Immiserizing Growth: A Geometrical Note," *The Review of Economic Studies*, June 1958, *25* (3), 201–205.

Bhattacharya, Sourav, Joyee Deb, and Tapas Kundu, "Mobility and Conflict," *American Economic Journal: Microeconomics*, 2015, *7* (1), 281–319.

Blattman, Christopher and Edward Miguel, "Civil War," *Journal of Economic Literature*, March 2010, *48* (1), 3–57.

Byman, Daniel, *Keeping the Peace: Lasting Solutions to Ethnic Conflicts*, JHU Press, January 2002.

Chang, Yang-Ming and Zijun Luo, "War or Settlement: An Economic Analysis of Conflict with Endogenous and Increasing Destruction," *Defence and Peace Economics*, February 2013, *24* (1), 23–46.

Collier, Paul, *Economic Causes of Civil Conflict and their Implications for Policy*, Washington, DC: World Bank, 2000.

— **and Anke Hoeffler**, "Greed and Grievance in Civil War," *Oxford Economic Papers*, October 2004, *56* (4), 563–595.

Dal Bó, Ernesto and Pedro Dal Bó, "Workers, Warriors, and Criminals: Social Conflict in General Equilibrium," *Journal of the European Economic Association*, August 2011, *9* (4), 646–677.

De Luca, Giacomo, Petros G. Sekeris, and Juan F. Vargas, "Beyond Divide-and-Rule: Kleptocracy and Civil War," Working Paper 1102, Center for Research in the Economics of Development 2011.

Dixit, Avinash, "The Role of Investment in Entry-Deterrence," *The Economic Journal*, March 1980, *90* (357), 95–106.

Dube, Oeindrila and Juan F. Vargas, "Commodity Price Shocks and Civil Conflict: Evidence from Colombia," *Review of Economic Studies*, October 2013, *80* (4), 1384–1421.

Eck, Kristine and Lisa Hultman, "One-Sided Violence Against Civilians in War Insights from New Fatality Data," *Journal of Peace Research*, March 2007, *44* (2), 233–246.

Esteban, Joan and József Sákovics, "A Theory of Agreements in the Shadow of Conflict: The Genesis of Bargaining Power," *Theory and Decision*, December 2007, *65* (3), 227–252.

Fearon, James D., "Rationalist Explanations for War," *International Organization*, June 1995, *49* (03), 379–414.

Fjelde, Hanne, "Buying Peace? Oil Wealth, Corruption and Civil War, 1985—99," *Journal of Peace Research*, March 2009, *46* (2), 199–218.

Garfinkel, Michelle R. and Constantinos Syropoulos, "Trade Openness and the Settlement of Domestic Disputes in the Shadow of the Future," *Research in Economics*, June 2015, *69* (2), 191–213.

_ and Stergios Skaperdas, "Conflict without Misperceptions or Incomplete Information: How the Future Matters," *Journal of Conflict Resolution*, December 2000, *44* (6), 793–807.

_ , _ , and Constantinos Syropoulos, "Globalization and Domestic Conflict," *Journal of International Economics*, December 2008, *76* (2), 296–308.

Hashimoto, Barry, "The Political Economy of Counterinsurgency Violence," in "2009 Annual Meeting of the American Political Science Association" American Political Science Association Toronto, CA 2009.

Hirshleifer, Jack, "Conflict and Rent-seeking Success Functions: Ratio vs. Difference Models of Relative Success," *Public Choice*, November 1989, *63* (2), 101–112.

Le Billon, Philippe, "Buying Peace or Fuelling War: The Role of Corruption in Armed Conflicts," *Journal of International Development*, May 2003, *15* (4), 413–426.

Lowi, Miriam R., "Algeria, 1992-2002: Anatomy of a Civil War," in Paul Collier and Nicholas Sambanis, eds., *Understanding Civil War: Evidence and Analysis, The World Bank*, Wash: The World Bank, 2005, pp. 221–246.

Marcouiller, Douglas and Leslie Young, "The Black Hole of Graft: The Predatory State and the Informal Economy," *The American Economic Review*, June 1995, *85* (3), 630–646.

Mason, T. David, ""Take Two Acres and Call Me in the Morning": Is Land Reform a Prescription for Peasant Unrest?," *The Journal of Politics*, February 1998, *60* (01), 199–230.

Mauro, Paolo, "Corruption and Growth," *The Quarterly Journal of Economics*, August 1995, *110* (3), 681–712.

_ , "Corruption and the Composition of Government Expenditure," *Journal of Public Economics*, June 1998, *69* (2), 263–279.

McBride, Michael and Stergios Skaperdas, "Explaining Conflict in Low-Income Countries: Incomplete Contracting in the Shadow of the Future," *Institutions and Norms in Economic Development*, 2006, pp. 141–161.

Mehlum, Halvor, Karl Moene, and Ragnar Torvik, "Institutions and the Resource Curse*," *The Economic Journal*, January 2006, *116* (508), 1–20.

Moselle, Boaz and Benjamin Polak, "A Model of a Predatory State," *Journal of Law, Economics, and Organization*, April 2001, *17* (1), 1–33.

Nafziger, E. Wayne and Juha Auvinen, "Economic Development, Inequality, War, and State Violence," *World Development*, February 2002, *30* (2), 153–163.

Popkin, Samuel L., *The Rational Peasant: The Political Economy of Rural Society in Vietnam*, Berkeley: University of California Press, 1979.

Powell, Robert, "War as a Commitment Problem," *International Organization*, January 2006, *60* (01), 169–203.

_ , "Monopolizing Violence and Consolidating Power," *The Quarterly Journal of Economics*, May 2013, *128* (2), 807–859.

Reno, William, "Reinvention of an African Patrimonial State: Charles Taylor's Liberia," *Third World Quarterly*, March 1995, *16* (1), 109–120.

_ , "Ironies of Post-Cold War Structural Adjustment in Sierra Leone," *Review of African Political Economy*, March 1996, *23* (67), 7–18.

Robinson, James A., Ragnar Torvik, and Thierry Verdier, "Political foundations of the resource curse," *Journal of Development Economics*, April 2006, *79* (2), 447–468.

Ross, Michael L., "The Natural Resource Curse: How Wealth can make you Poor," in Ian Bannon and Paul Collier, eds., *Natural Resources and Violent Conflict: Options and Actions*, Washington, DC: The World Bank, 2003, pp. 17–42.

Sachs, Jeffrey D. and Andrew M. Warner, "Natural Resource Abundance and Economic Growth," Working Paper 5398, National Bureau of Economic Research December 1995.

Schirmer, Jennifer G., *The Guatemalan Military Project: A Violence Called Democracy*, University of Pennsylvania Press, 1998.

Skaperdas, Stergios, "Contest Success Functions," *Economic Theory*, June 1996, *7* (2), 283–290.

_ **and Constantinos Syropoulos**, "Insecure Property and the Efficiency of Exchange," *The Economic Journal*, January 2002, *112* (476), 133–146.

Sobek, David, "Masters of their Domains: The Role of State Capacity in Civil Wars," *Journal of Peace Research*, May 2010, *47* (3), 267–271.

Stoll, David, *Between Two Armies in the Ixil Towns of Guatemala*, Columbia University Press, 1993.

Stolper, Wolfgang F. and Paul A. Samuelson, "Protection and Real Wages," *The Review of Economic Studies*, November 1941, *9* (1), 58–73.

Torvik, Ragnar, "Natural Resources, Rent Seeking and Welfare," *Journal of Development Economics*, April 2002, *67* (2), 455–470.

Tullock, Gordon, "Efficient Rent Seeking," in James M. Buchanan, Robert D. Tollison, and Gordon Tullock, eds., *Toward a Theory of the Rent-seeking Society*, Vol. 4, College Station: Texas A&M University Press, 1980.

U.N. Refugee Agency, "Syria Regional Refugee Response - Regional Overview," Inter-agency Information Sharing Portal, UNHCR 2015.

Valentino, Benjamin, Paul Huth, and Dylan Balch-Lindsay, "'Draining the Sea': Mass Killing and Guerrilla Warfare," *International Organization*, April 2004, *58* (02), 375–407.

Walter, Barbara F., "The Critical Barrier to Civil War Settlement," *International Organization*, June 1997, *51* (03), 335–364.

Wennmann, Achim, "The Political Economy of Conflict Financing: A Comprehensive Approach Beyond Natural Resources," *Global Governance: A Review of Multilateralism and International Organizations*, August 2007, *13* (3), 427–444.

Appendix

Proof of Proposition 1: Once again, we adopt the normalization $\mu = 1$. Moreover, to avoid cluttering, we occasionally omit the tilde "~" from functions.

Part (a): Differentiating (6a) with respect to A, invoking the envelope theorem, and simplifying the resulting expression gives

$$\widetilde{U}_A^1 \equiv \frac{d\widetilde{U}^1}{dA} = \phi^1 + \left(\phi_{S_2}^1 - \tau w \psi_w^2 / A\right)\left(A\widetilde{S}_A^2\right) = \phi^1\left[1 - m\phi^2\left(1 + \frac{\tau}{1-\tau}\theta^2\right)\right], \tag{A.1}$$

where, again, $\theta^i \equiv w_i \psi_w^i / \psi^i$. Observe that none of the variables on the right-hand side of the above expression depend on A. However, the sign of $d\widetilde{U}^1/dA$ does depend on labor taxes. Evaluating the expression at $\tau \leq 0$ readily implies $d\widetilde{U}^1/dA|_{\tau \leq 0} > 0$. By continuity, the positive sign also arises when τ is not too big. Thus, increases in the value of the prize always raise the ruler's equilibrium payoff when the tax is sufficiently low or negative. Now suppose τ is large. The extreme case of $\tau \to 1$ helps to establish a general condition for the existence of $\overline{\tau}$: note that $\lim_{\tau \to 1}(d\widetilde{U}^1/dA) < 0$, so long as $\lim_{\tau \to 1} \theta^2 > \underline{\theta}^2$, as noted in the text.[58] By the continuity of $\widetilde{U}_A^1$ in τ, there will exist a $\overline{\tau} \in (0,1)$ such that $d\widetilde{U}^1/dA \gtreqless 0$ if $\tau \lesseqgtr \overline{\tau}$.

In light of the centrality of $\overline{\tau}$ in the subsequent analysis, a couple of comments on its determinants are warranted here. Substituting for the value of ϕ^2 from (8) in (A.1) and solving the resulting equation gives

$$\overline{\tau} = \frac{1 + (1-m)\gamma}{1 + (1-m)\gamma + m\gamma\theta^2} \in (0,1). \tag{A.2}$$

The right-hand side of this expression also depends on the tax rate (through the dependence of γ on τ), so $\overline{\tau}$ is the implicit solution to this equation. Taking this feedback effect of τ into account, one can prove the following relationships:

$$\partial\overline{\tau}/\partial\xi < 0, \;\; \partial\overline{\tau}/\partial\psi^1 < 0, \;\; \partial\overline{\tau}/\partial\psi^2 > 0, \;\; \partial\overline{\tau}/\partial\theta^2 < 0. \tag{A.3}$$

In general, the sign of $\partial\overline{\tau}/\partial m$ is ambiguous (because the dependence of γ on m is ambiguous).

Part (b): Differentiating (6b) with respect to A, invoking the envelope theorem, and utilizing the fact that $\phi_{S_j}^i = -m\phi^i(1-\phi^i)/S_j$ ($i \neq j = 1,2$) gives

$$\widetilde{U}_A^2 \equiv \frac{d\widetilde{U}^2}{dA} = \phi^2 + \phi_{S_1}^2\left(A\widetilde{S}_A^1\right) = \phi^2\left(1 - m\phi^1\right) > 0. \tag{A.4}$$

[58] Allowing $\tau \to 1$ here is artificial because (i) it may violate the institutional capacity limit $\tau_{\max}$ or (ii) induce specialization in production. Still, this is a valuable abstraction because it helps identify conditions on parameters that imply $d\widetilde{U}^1/dA < 0$ at some value of τ and, moreover, because it also helps illustrate how (i) and (ii) determine the relationship between $\widetilde{U}^1$ and A when the tax is optimally determined.

Part (c): Since, by its definition in (6c), $\widetilde{U}_A = \widetilde{U}_A^1 + \widetilde{U}_A^2$ and, as we have seen in part (a), $\widetilde{U}_A^1 \geq 0$ for all $\tau \leq \overline{\tau}$—whereas $\widetilde{U}_A^2 > 0$ for all τ—the possibility that $\widetilde{U}_A < 0$ may arise if $\tau \in (\overline{\tau}, 1)$. To see this, utilize (A.1) and (A.4) to obtain

$$\widetilde{U}_A \equiv \frac{d\widetilde{U}}{dA} = 1 + \phi_{S_1}^2 \left(A\widetilde{S}_A^1 \right) + \phi_{S_2}^1 \left(A\widetilde{S}_A^2 \right) - \tau w \psi_w^2 \widetilde{S}_A^2 = 1 - m\phi^1\phi^2 \left(2 + \frac{\tau}{1-\tau}\theta^2 \right)$$

and, once again, repeat the procedure adopted in the proof of part (a). ||

Proof of Corollary 1: Suppose $\tau \leq \overline{\tau}$. Then, by parts (a) and (b) of Proposition 1, both the ruler and the rebel leader will benefit from an increase in A. Moreover, labor's welfare does not change because τ remains fixed. ||

Proof of Lemma 1: For compactness, the proof will assume that the production technology for strength combines labor (soldiers) and imported weapons according to a Cobb-Douglas production function. Under the Cobb-Douglas assumption, the labor share in the cost of building strength, $\theta^i \equiv \psi_w^i w_i / \psi^i \geq \underline{\theta}^i \in (0, 1]$, can be treated as a parameter.[59] Accordingly, we drop the "i" subscript on "θ^i" in what follows and define $\theta \equiv \theta^i$ as the resulting parameter for each player's labor share. We also add comments below on how the details behind Lemma 1 differ for more general cases where labor and weapons may be either substitutes or complements in production.

We need to verify if (i) $\widetilde{U}_{\tau\tau}^1 < 0$, and (ii) $\widetilde{U}_{\tau A}^1 < 0$. As we will show, $\widetilde{U}_{\tau A}^1 < 0$ always, but obtaining an unambiguous sign for $\widetilde{U}_{\tau\tau}^1$ will require a restriction on the labor share parameter, θ. Specifically, $\widetilde{U}_{\tau\tau}^1 < 0$ always if $\theta \geq \underline{\theta}^*$, where

$$\underline{\theta}^* \equiv \max \left\{ \frac{|\tau_{min}| - 1}{2|\tau_{min}|}, 0 \right\}. \tag{A.5}$$

To derive analytical expressions for both $\widetilde{U}_{\tau\tau}^1$ and $\widetilde{U}_{\tau A}^1$, we start by working from the first-order condition for tax policy shown in the text:

$$\widetilde{U}_\tau^1 = w \left[(1 - \delta_L) L - \psi_w^2 \widetilde{S}^2 \right] + \tau w^2 \psi_{ww}^2 \widetilde{S}^2 + \left(A\phi_{S^2}^1 - \tau w \psi_w^2 \right) \widetilde{S}_\tau^2.$$

Note that, by 2's first-order condition for arming—and by $\widetilde{\phi}_{S^2}^1 = -\widetilde{\phi}_{S^2}^2$—we have that $A\widetilde{\phi}_{S^2}^1 = -A\widetilde{\phi}_{S^2}^2 = -\psi^2$. In addition, the following expressions regarding 2's arming behavior are helpful to keep in mind:

$$\frac{\partial \psi^2}{\partial \tau} = -\psi_w^2 w = -\frac{\theta}{1-\tau}\psi^2, \quad \frac{\partial^2 \psi^2}{\partial \tau^2} = \psi_{ww}^2 w^2 = -\frac{\theta (1-\theta) \psi^2}{(1-\tau)^2}.$$

[59] As previously noted, assuming that $\theta^2 > \underline{\theta}^2$ ensures the existence of $\overline{\tau} < 1$.

The ruler's first-order condition for τ simplifies to

$$\begin{aligned}\widetilde{U}^1_\tau &= w\left(1-\delta_L\right)L + \left(-\frac{\theta}{1-\tau}\psi^2 - \tau\frac{(1-\theta)}{(1-\tau)^2}\theta\psi^2\right)\widetilde{S}^2 + \left(-\psi^2 - \frac{\tau}{1-\tau}\theta\psi^2\right)\widetilde{S}^2_\tau \\ &= w\left(1-\delta_L\right)L + \left(-\frac{1-\theta\tau}{(1-\tau)^2}\right)\theta\psi^2\widetilde{S}^2 + \left(-\frac{1-(1-\theta)\,\tau}{1-\tau}\right)\psi^2\widetilde{S}^2_\tau.\end{aligned}$$

It follows immediately that

$$\widetilde{U}^1_{\tau A} = -\frac{1-\theta\tau}{(1-\tau)^2}\theta\psi^2\widetilde{S}^2_A - \frac{1-(1-\theta)\tau}{1-\tau}\psi^2\widetilde{S}^2_{\tau A}. \tag{A.6}$$

Upon inspection, the coefficients on $\widetilde{S}^2_A$ and $\widetilde{S}^2_{\tau A}$ are < 0. Since $\widetilde{S}^2_A > 0$ and $\widetilde{S}^2_{\tau A} > 0$, we then have that $\widetilde{U}^1_{\tau A} < 0$ always. Verifying the sign of $\widetilde{U}^1_{\tau\tau}$ requires several additional steps, however.

Explicitly, $\widetilde{U}^1_{\tau\tau}$ can be written as

$$\widetilde{U}^1_{\tau\tau} = -\frac{(1-\theta)\,(2-\theta\tau)}{(1-\tau)^3}\theta\psi^2\widetilde{S}^2 - \frac{1+(1-2\theta)\tau}{(1-\tau)^2}\theta\psi^2\widetilde{S}^2_\tau - \frac{1-(1-\theta)\tau}{1-\tau}\psi^2\widetilde{S}^2_{\tau\tau}. \tag{A.7}$$

We have already noted that $\widetilde{S}^2_\tau > 0$. We will also show momentarily that $\widetilde{S}^2_{\tau\tau}$ is likewise > 0. Therefore, $\widetilde{U}^1_{\tau\tau} < 0$ holds unambiguously if the coefficients on $\widetilde{S}^2$, $\widetilde{S}^2_\tau$, and $\widetilde{S}^2_{\tau\tau}$ are all ≤ 0. By inspection, the coefficients on $\widetilde{S}^2$ and $\widetilde{S}^2_{\tau\tau}$ are indeed < 0 always. The coefficient on $\widetilde{S}^2_\tau$ may be positive, however, if θ is sufficiently small and if the capacity constraint on negative taxes, τ_{min}, is large in absolute magnitude. To rule out this possibility, we stipulate that $\theta \geq \underline{\theta}^*$, with $\underline{\theta}^*$ defined as in (A.5), noting that this restriction is only needed if $\tau_{min} < -1$.

To complete the proof, all that remains to be verified is the sign of $\widetilde{S}^2_{\tau\tau}$, the second derivative of the rebel leader's arming choice with respect to taxation. Under the noted assumptions, if $\widetilde{S}^2_{\tau\tau} > 0$, $\widetilde{U}^1_{\tau\tau} < 0$ is guaranteed. Recall from the text that

$$\widetilde{S}^2 = \frac{Am\gamma/\psi^2}{(1+\gamma)^2}.$$

Using the definitions of γ and ψ^2, we can re-write $\widetilde{S}^2$ to suit our current purposes as

$$\widetilde{S}^2 = \kappa \cdot \frac{\left(\psi^2\right)^{-m-1}}{(1+\gamma)^2}, \tag{A.8}$$

where $\kappa \equiv Am\xi/(\psi^1)^{-m}$ is a combined parameter which collects elements which do not vary with

τ. Note that $\partial\gamma/\partial\tau = m\theta\gamma/(1-\tau)$. Differentiating (A.8) with respect to τ, we obtain

$$\begin{aligned}\widetilde{S}^2_\tau &= \kappa\cdot\frac{(m+1)(1+\gamma)\left(\psi^2\right)^{-m-1}\theta(1-\tau)^{-1} - 2m\gamma\left(\psi^2\right)^{-m-1}\theta(1-\tau)^{-1}}{(1+\gamma)^3}\\ &= \kappa\cdot\frac{\theta}{1-\tau}\cdot\left(\psi^2\right)^{-m-1}\cdot\frac{(m+1)+(1-m)\gamma}{(1+\gamma)^3}\\ &> 0\end{aligned} \tag{A.9}$$

To characterize $\widetilde{S}^2_{\tau\tau}$, note that $\widetilde{S}^2_{\tau\tau}/\widetilde{S}^2_\tau = d\ln\widetilde{S}^2_\tau/d\tau$. Since we already have that $\widetilde{S}^2_\tau > 0$, it follows that $\widetilde{S}^2_{\tau\tau} > 0$ iff $d\ln\widetilde{S}^2_\tau/d\tau > 0$. Taking logs on (A.9) and differentiating with respect to τ, this latter condition can be written out as

$$\frac{1}{1-\tau}\left[(m+1)\theta + 1 + \frac{(1-m)\theta\gamma}{(m+1)+(1-m)\gamma} - \frac{3m\theta\gamma}{1+\gamma}\right] > 0 \tag{A.10}$$

Because $0 < m \leq 1$ and $0 < \theta \leq 1$, the term in brackets is strictly positive. In other words, $\widetilde{S}^2_{\tau\tau} > 0$ for all $\tau < 1$. ||

To comment briefly on how the details behind Lemma 1 differ for more general production technologies: Let the production technology be CES, with "σ" denoting the elasticity of substitution between guns and labor. Accordingly, $\sigma > 1$ ($\sigma < 1$) implies that they are gross substitutes (gross complements). In general, ensuring $\widetilde{U}^1_{\tau\tau} < 0$ in the CES case requires a condition similar to (A.5) on the lower bound of the rebel leader's labor share (i.e., that $\theta^2 \geq \underline{\theta}^2$, as we have required throughout the paper) as well as some additional conditions on the elasticity of substitution (i.e., that σ be neither too small nor too large). We have also verified numerically that $\widetilde{U}^1_{\tau\tau} < 0$ generally holds even when these conditions are not met. Full details for the CES case can be made available on request.

Comments on Proposition 4: As noted, we take as given that the ratio $\frac{\delta_L}{\delta_K}$ is large enough that it is possible for both optimal tax curves to intersect the zero surplus line $\breve{\tau}(A) \equiv -\frac{r\delta_K K_0}{w\delta_L L}$ and, furthermore, that τ_{min} is sufficiently less than zero. For added simplicity, we also assume that once each tax policy curve crosses below $\breve{\tau}$ it does not cross back above it until it is constrained by τ_{min}. These conditions are sufficient for ensuring the existence of equilibria where the ruler chooses conflict even though settlement would have resulted in a positive surplus. They should not be considered necessary, however, and we discuss more general cases below.

First, consider what happens when neither τ^*_S nor τ^*_C intersect $\breve{\tau}$ in Fig. 4, either because $\frac{\delta_L}{\delta_K}$ is too small or the τ_{min} constraint is too tight. Because $\tau^*_C > \breve{\tau}$ always in this case, $\breve{A}_C$ is effectively infinite. Therefore, settlement is always preferred to conflict, for all values of A.

However, if only the τ^*_C curve (i.e., not the τ^*_S curve) intersects $\breve{\tau}$, $\breve{A}_C$ is clearly finite, but $\breve{A}_S$ is not. Accordingly, there still may exist a "switching point" A_D where the ruler's preferences switch from settlement to conflict as A increases beyond A_D. However, we cannot guarantee A_D's existence in this case. If such a point does exist, it follows that there may also exist an additional switching point A'_D—with $\breve{A}_M > A'_D > A_D$—such that the ruler prefers conflict for $A \in (A_D, A'_D)$, but prefers settlement for all $A > A'_D$.

In addition, because tax policy functions are non-linear in A, whereas $\breve{\tau}$ is strictly linear, it may be the case that τ^*_S climbs back above $\breve{\tau}$ before it reaches the τ_{min} constraint. Call the point where this occurs $\breve{A}'_S$, noting that $\breve{A}'_S > \breve{A}_S$. Once again, it would seem possible for there to exist a switching point, $A''_D > \breve{A}'_S$, where the ruler's preferences switch from conflict back to settlement for all $A > A'_D$. For $A \in (\breve{A}_S, \breve{A}'_S)$, both players prefer conflict as before, but for $A \in (\breve{A}'_S, A''_D)$ the rebel leader will change his preference to settlement, while the ruler maintains his preference for conflict.

Lastly, yet another possibility that may come into play as A increases in size is that the residual tax base (net of arming) shrinks to the point where the economy completely specializes in the production of the capital-intensive good. In this case, because the relative reward to capital, r/w, becomes endogenous, the relationships between A, τ^*_C, τ^*_S , and $\breve{\tau}$ would be harder to pin down. There are two straightforward reasons why complete specialization would tend to work in favor of settlement, however. First, r/w should fall as K_0 increases beyond the point of complete specialization, thereby increasing incentives for taxing labor and curbing incentives for conflict (by decreasing the value of A). Second, the destruction of labor associated with conflict would tend to reduce r/w even further. As we have noted in the text, however, it is relatively straightforward to choose parameters such that we can focus on cases where production remains diversified.

Proof of Lemma 3: When bargaining weights are endogenous, it is useful to express the ruler's payoff function under settlement as follows:

$$\widetilde{V}^1(A,\tau) = \widetilde{U}^1(A + B(A,\tau), \tau), \tag{A.11}$$

where $\widetilde{U}^1(A,\tau)$ is the payoff function under conflict—with $\widetilde{U}^1_{\tau A} < 0$, $\widetilde{U}^1_{\tau\tau} < 0$ and $\widetilde{U}^1_{AA} = 0$—and $B(A,\tau) = [\delta_K/(1-\delta_K)]A + w\delta_L L\tau$ is the (linear) surplus function—with $B_A > 0$ and $B_\tau > 0$.

The proof follows directly from the definition of $\overline{\tau}$ in Proposition 1: $\widetilde{U}^1_A \gtreqless 0$ if $\tau \lesseqgtr \overline{\tau}$. When $\tau > \overline{\tau}$, we can use (A.11) to demonstrate that $\widetilde{V}^1(A,\tau) = \widetilde{U}^1(A + B(A,\tau), \tau) < \widetilde{U}^1(A,\tau)$, by simply noting that $\widetilde{U}^1_A < 0$ and $A + B(A,\tau) > A$. ||

Here, it is important to emphasize that $\widetilde{U}^1(A,\tau)$ is the ruler's "*ex ante*" payoff from conflict: it is only achievable if he is able to convince his rival before arming decisions are made that there will be conflict in the last stage of the game. *Ex post*, however—i.e., once arming decisions are made—settlement is always a dominant strategy for fixed $\tau > \overline{\tau}$, since $\tau > \overline{\tau} > 0 > \breve{\tau}$ implies the surplus from avoiding conflict, $B(A,\tau)$, will always be positive. The *ex post* payoff under conflict in such cases is $\widetilde{U}^1(A + B(A,\tau), \tau) - \phi^1 B(A,\tau) < \widetilde{V}^1(A,\tau)$.

Proof of Proposition 5, part (a): For the proof for part (a), it is first useful to note that conflict and settlement are always equivalent in the special limiting case where $A = 0$ and $\delta_L = 0$. Because there is nothing to fight over under conflict and—likewise–no surplus created when there is settlement, U^{1*} and V^{1*} should both simply be given by $wL\tau_{max}$, the maximum tax revenue 1 can extract when he is unopposed and when the labor force stays whole. It is clear in this special case that conflict is weakly preferred to settlement.

Generalizing to allow for $\delta_L > 0$ requires that we answer several questions about the nature of preferences for conflict over the region $A \in [0, \overline{A})$. First, how do payoffs for both conflict and settlement at the point $A = 0$ change when we introduce small, positive values for δ_L? Second, what is the optimal tax policy associated with settlement under this alternative bargaining protocol? Third, what can we say about preferences for conflict as $A \to \overline{A}$? Lastly, what do preferences for conflict look like in this region when δ_L becomes large and/or when τ_{max} becomes small? We address these outstanding questions using a series of additional lemmas.

Lemma A.1 *When $A = 0$, the ruler will prefer conflict to settlement* ex ante *for sufficiently small values of $\delta_L > 0$ if $\tau_{max} > \overline{\tau}$.*

Proof: Since we already have that conflict is weakly preferred when $A = 0$ and $\delta_L = 0$ (which imply $B = 0$), we can say that conflict will generally be *ex ante* preferred to settlement in the neighborhood of $A = 0$ for at least some small values of $\delta_L > 0$ if we have that $dV^{1*}/d\delta_L|_{A=0,\delta_L=0} \leq dU^{1*}/d\delta_L|_{A=0,\delta_L=0}$. Note that this comparison is made easier by the fact that $\tau_S^* = \tau_C^* = \tau_{max}$ for $A = 0$ and $\delta_L = 0$ as noted above. This observation, together with the envelope theorem, allows us to write the following:

$$\begin{aligned}
\left.\frac{dV^{1*}}{d\delta_L}\right|_{A=0,\delta_L=0} &= \left.\frac{d\widetilde{V}^1\left(0,\tau_{max}\right)}{d\delta_L}\right|_{\delta_L=0} \\
&= \left.\frac{\partial\widetilde{U}^1\left(0,\tau_{max}\right)}{\partial\delta_L}\right|_{\delta_L=0} + \widetilde{U}_A^1 \left.\frac{\partial B\left(0,\tau_{max}\right)}{\partial\delta_L}\right|_{\delta_L=0} \\
&= \left.\frac{dU^{1*}}{d\delta_L}\right|_{A=0,\delta_L=0} + \widetilde{U}_A^1 \left.\frac{\partial B\left(0,\tau_{max}\right)}{\partial\delta_L}\right|_{\delta_L=0},
\end{aligned}$$

where again we specify the relationship between the ruler's payoff functions as in (A.11), with $\widetilde{U}^1\left(A,\tau\right)$ again denoting the ruler's (*ex ante*) conflict payoff for a given (A,τ).

Since $\frac{\partial B}{\partial\delta_L} > 0$, it follows that $\frac{dV^{1*}}{d\delta_L}|_{A=0,\delta_L=0} < \frac{dU^{1*}}{d\delta_L}|_{A=0,\delta_L=0}$ if $\widetilde{U}_A^1 < 0$. By Proposition 1, $\widetilde{U}_A^1(0,\tau_{max}) < 0$ iff $\tau_{max} > \overline{\tau}$, as stated in Lemma A.1. ||

Lemma A.2 *When bargaining weights are endogenous, the ruler's optimal tax policy under settlement $\tau_S^*\left(A\right)$ is:*

(a) unique for any value of contested rents A;

(b) decreasing as the value of contested rents increases (i.e., $d\tau_S^*/dA < 0$).

(b) smaller than the ruler's optimal tax policy under conflict $\tau_C^*(A)$ for sufficiently small A; in particular, it falls below $\tau_C^*(A)$ for all $A \leq \overline{A}$.

Proof: Again, let the relationship between the ruler's (*ex ante*) payoff functions $\widetilde{V}^1$ and $\widetilde{U}^1$ be expressed as in (A.11). In addition, recall that $\widetilde{U}^1_{\tau\tau} < 0$, $\widetilde{U}^1_{\tau A} < 0$, $\widetilde{U}^1_{AA} = 0$, $B_\tau > 0$, and $B_{\tau\tau} = 0$. For part (a), the uniqueness of $\tau^*_S(A)$ follows from $\widetilde{V}^1_{\tau\tau} = \widetilde{U}^1_{\tau\tau} + \widetilde{U}^1_A B_{\tau\tau} + \widetilde{U}^1_{\tau A} B_\tau < \widetilde{U}^1_{\tau\tau} < 0$. For part (b), we have that $\widetilde{V}^1_{\tau A} = U^1_{\tau A} + U^1_{AA} B_\tau = U^1_{\tau A} < 0$, which implies $d\tau^*_S / dA = -\widetilde{V}_{\tau A} / \widetilde{V}_{\tau\tau} < 0$.

For part (c), recall that $\tau^*_C(A)$ and $\tau^*_S(A)$ are, respectively, the tax policy functions that solve $\widetilde{U}^1_\tau(A, \tau) = 0$ and $\widetilde{V}^1_\tau(A, \tau) = 0$. $\tau^*_C(A) > \tau^*_S(A)$ follows if

$$\widetilde{V}_\tau\left(A, \tau^*_C(A)\right) = \widetilde{U}_\tau\left(A + B, \tau^*_C(A)\right) + \widetilde{U}_A\left(A + B, \tau^*_C(A)\right) \cdot B_\tau < \widetilde{U}^1_\tau\left(A, \tau^*_C(A)\right) = 0.$$

Consider what happens for $A \leq \overline{A}$, where $\overline{A}$ is the value of contested rents that minimizes the ruler's payoff function under conflict. For $A \leq \overline{A}$, $\tau^*_C(A) \geq \overline{\tau}$ implies that $U_A(\cdot, \tau^*_C(A)) \leq 0$, by Proposition $1(a)$. Therefore, $U_{\tau A} < 0$ implies that $\widetilde{V}_\tau(A, \tau^*_C(A)) \leq \widetilde{U}_\tau(A + B, \tau^*_C(A)) < \widetilde{U}^1_\tau(A, \tau^*_C(A))$ for $A \leq \overline{A}$. ||

Fig. 4*a* provides a useful depiction of the behavior of the $\tau^*_S(A)$ function when bargaining weights are endogenous: as stated in Lemma A.2, the $\tau^*_S(A)$ curve in Fig. 4*a* initially lies below $\tau^*_C(A)$ and only begins to exceed $\tau^*_C(A)$ at some point to the right of $\overline{A}$. The existence of this latter switching point is not needed to prove the first part of Proposition 5; thus, we defer further discussion until our proof of Proposition $5(b)$ below. We do, however, make use of the fact that $\tau^*_S(\overline{A}) < \tau^*_C(\overline{A})$ in establishing the following:

Lemma A.3 *The ruler always prefers settlement to conflict at the value of contested rents that minimizes his payoff under conflict (i.e., at $A = \overline{A}$), for any $\delta_L \geq 0$.*

Proof: We know from Lemma $1(b)$ that $\tau^*_C(\overline{A}) = \overline{\tau}$. Thus, the ruler's payoff under conflict at $\overline{A}$ is: $U^{1*}(\overline{A}) = \widetilde{U}^1(\overline{A}, \tau^*_C(\overline{A})) = \widetilde{U}^1(\overline{A}, \overline{\tau})$. To show $U^{1*}(\overline{A})$ is less than $V^{1*}(\overline{A})$, his payoff under settlement at $\overline{A}$, we first invoke Proposition $1(a)$ to note that $\widetilde{V}^1(\overline{A}, \overline{\tau}) = \widetilde{U}^1(\overline{A} + B, \overline{\tau}) = \widetilde{U}^1(\overline{A}, \overline{\tau}) = U^{1*}(\overline{A})$. Since $\tau^*_S(\overline{A}) < \tau^*_C(\overline{A})$—as stated in Lemma A.2—the definition of the optimal tax implies that $V^{1*}(\overline{A}) = \widetilde{V}^1(\overline{A}, \tau^*_S(\overline{A})) > \widetilde{V}^1(\overline{A}, \tau^*_C(\overline{A})) = \widetilde{V}^1(\overline{A}, \overline{\tau}) = U^{1*}(\overline{A})$. ||

By the continuity of payoffs, it must be the case that, if the ruler strictly strictly prefers conflict *ex ante* at $A = 0$, but prefers settlement at $A = \overline{A}$, conflict will be preferred *ex ante* to settlement for values of A between 0 and some value $A_1 < \overline{A}$ as stated in the original Proposition. All that remains to be shown is:

Lemma A.4 *Settlement may be preferred to conflict at $A = 0$ for large enough values of δ_L and will always be preferred if $\tau_{max} < \overline{\tau}$.*

Proof: Noting again that settlement will be preferred in the neighborhood of $A = \overline{A}$, we first need to establish how the location of $\overline{A}$ in Fig. 4 depends on the value of δ_L. Note first that $\overline{A}$ can be defined as the point in Figs. 2-4 where the optimal tax policy under conflict, $\tau^*_C(A)$, intersects

$\overline{\tau}$, the tax rate which solves $U_{\tau}^{1*}(\overline{A}) = 0$. As (A.2) shows, $\overline{\tau}$ is not affected by changes in δ_L. Nonetheless, the location of $\overline{A}$ still depends on δ_L via δ_L's effect on $\tau_C^*(A)$.

To see this, we again repeat the expression for $\widetilde{U}_{\tau}^1$ from our discussion of optimal tax policies

$$\widetilde{U}_{\tau}^1 = w\left[(1-\delta_L)L - \psi_w^2 \widetilde{S}^2\right] + \tau w^2 \psi_{ww}^2 \widetilde{S}^2 + \left(A\phi_{S^2}^1 - \tau w \psi_w^2\right)\widetilde{S}_{\tau}^2.$$

Note that $\widetilde{U}_{\tau\delta_L}^1$ is strictly less than zero. At the same time, however, $\widetilde{U}_{\tau A}^1$ and $\widetilde{U}_{\tau\tau}^1$ do not depend on δ_L. Thus, while δ_L is negatively associated with the level of the tax policy function $\tau_C^*(A)$, it does not affect its slope with respect to A (i.e., $d\tau_C^*/dA$ is invariant with respect to δ_L.) Furthermore, if an increase in δ_L causes $\tau_C^*(A)$ to fall such that $\tau_C^*(A)$ is unconstrained by τ_{max} in the neighborhood of $A = 0$, the fact that $\lim_{A\to 0}\widetilde{U}_{\tau\tau}^1 = 0$ (and $\lim_{A\to 0}\widetilde{U}_{\tau A}^1 < 0$) implies that $\lim_{A\to 0} d\tau_C^*/dA = -\infty$.

Because $\tau_C^*(A)$ shifts downwards with δ_L, and because $\overline{\tau}$ does not depend on δ_L, it follows that increases in δ_L also cause $\overline{A}$ to move to the left. It also follows that it is possible that $\overline{A} \to 0$ as δ_L gets sufficiently large, since the slope of $\tau_C^*(A) \to -\infty$ as $A \to 0$. Since $V^{1*}(\overline{A}) > U^{1*}(\overline{A})$ always (by Lemma A.3), the movement of $\overline{A}$ closer to the origin makes it possible that settlement will be preferred to conflict in the neighborhood of $A = 0$. Note, however, that we do not try to characterize what happens when δ_L becomes large (i.e., the limiting case where $\delta_L \to 1$), since our requirement that production remains diversified will be violated for sufficiently large δ_L.

Finally, suppose $\tau_{max} < \overline{\tau}$, such that tax policy under conflict is constrained by τ_{max} at $A = 0$. There are two scenarios to consider, depending on whether tax policy under settlement is similarly constrained by τ_{max}. If the constraint binds, Lemma 3 applies and we know the ruler prefers settlement at $A = 0$. If not, we simply note that

$$V^{1*}(0) = \widetilde{V}^1(0, \tau_S^*(0)) > \widetilde{V}^1(0, \tau_{max}) > \widetilde{U}^1(0, \tau_{max}) = U^{1*}(0),$$

where the first inequality follows from the definition of the optimal tax policy and the second follows from Lemma 3. ||

Synthesizing the insights of Lemmas A.1-A.4, we have that conflict will be *ex ante* preferred to settlement in the region $A \in [0, A_1)$, with $0 < A_1 < \overline{A}$, for at least some sufficiently small positive values of δ_L so long as $\tau_{max} > \overline{\tau}$. On the other hand, settlement will always be preferred at the point $A = 0$ if $\tau_{max} < \overline{\tau}$ and may also be preferred in this region if labor destruction is sufficiently large. ||

Proof of Proposition 5, part (b): The reasoning behind Proposition **5**(b) unsurprisingly resembles the earlier proof given for Proposition 4. Again, we take as given that δ_L/δ_K is sufficiently large and τ_{min} sufficiently negative such that it is possible for both tax policy functions ($\tau_C^*(A)$ and $\tau_S^*(A)$) to intersect the zero-surplus line $\check{\tau}(A)$. Furthermore, we require that both curves only cross $\check{\tau}(A)$ once before they become constrained by τ_{min}.

The endogenous bargaining weights case differs from the earlier fixed bargaining weights case in one important respect. As we have discussed in our proof of Lemma A.2 (and as shown in Fig. 4*a*), the optimal tax policy under settlement is not always greater than the optimal tax policy under conflict when bargaining weights are endogenous. Specifically, Lemma A.2 states that $\tau_S^*(A) < \tau_C^*(A)$ for $A \leq \overline{A}$. We now need to show that $\tau_S^*(A) > \tau_C^*(A)$ for $A \geq \breve{A}_C$, with $\breve{A}_C$ defined as in our discussion of Proposition 4 as the level of A where the ruler's optimal tax policy under conflict is associated with a zero surplus. By extension, it will also follow that $\tau_S^*(A)$ must cross above $\tau_C^*(A)$ at some point between $\overline{A}$ and $\breve{A}_C$ and remain above $\tau_C^*(A)$ thereafter (again as shown in Fig. 4*a*).

As noted, the surplus associated with the optimal tax under conflict is zero at $\breve{A}_C$ and becomes negative for values of A greater than $\breve{A}_C$. That is, $B(A, \tau_C^*(A)) \leq 0$ for $A \geq \breve{A}_C$. Therefore, in a reversal of our earlier result from Lemma A.2 (which considered values of $A \leq \overline{A}$), we now have that

$$\widetilde{V}_\tau^1(A, \tau_C^*(A)) = \widetilde{U}_\tau^1(A + B, \tau_C^*(A)) + \widetilde{U}_A^1(A + B, \tau_C^*(A)) \cdot B_\tau > 0, \text{ for } A \geq \breve{A}_C.$$

Understanding this result requires a familiar reasoning from Lemma A.2, only this time in reverse. Recall that $\widetilde{U}_{\tau A}^1 < 0$ and note that $A \geq \breve{A}_C > \overline{A}$ implies—by Proposition 1(*a*)—that $\widetilde{U}_A^1 > 0$. Since $B(A, \breve{\tau}_C) \leq 0$ for $A \geq \breve{A}_C$, it follows that $\widetilde{U}_\tau^1(A + B, \tau_C^*(A)) > \widetilde{U}_\tau^1(A, \tau_C^*(A)) = 0$. $\widetilde{U}_A^1 > 0$ then ensures the inequality. Finally, note that $\widetilde{V}_\tau^1(A, \tau_C^*(A)) > 0$ if and only if $\tau_S^*(A) > \tau_C^*(A)$.

To complete the proof, we note that $B(A, \tau_S^*(A)) > 0$ and $\tau_S^*(A) < \overline{\tau}$ everywhere between $\overline{A}$ and $\breve{A}_C$. Thus, settlement should be preferred to conflict both *ex post* and *ex ante* everywhere between A_1 and $\breve{A}_C$, provided that both A_1 and $\breve{A}_C$ exist. If A_1 does not exist (perhaps because δ_L is too large), then settlement is preferred for $A \in [0, \breve{A}_C)$. The remainder follows the same "continuity of payoffs" argument we have noted in the text: there again must be some point $A_D \in (\breve{A}_C, \breve{A}_S)$ such that the ruler's preferences switch from "settlement" to "conflict" at the point A_D, with $\breve{A}_S$ defined by $\tau_S^*(\breve{A}_S) = \breve{\tau}(\breve{A}_S) > \tau_C^*(\breve{A}_S)$. The role of τ_{min} in this context is the same as before. ||

Supplementary Appendix (not for publication)

Both players can tax labor

For the sake of precision, we want to make it clear what it is about this environment that limits the appeal of surplus sharing. It is not necessarily the inherent asymmetric nature of the game (i.e., that the ruler has an additional strategic instrument) that generates incentives for conflict. Rather, it is the fact that the two players are interdependent via the effects of fiscal policy. We show here that, even if players are symmetric in every single way—including the ability to tax the labor force—preferences for conflict still emerge, because each player will internalize how his use of taxes affects the other player's supply of soldiers.

This particular extension—where both players collect taxes—is also appealing to study since rebel groups themselves have been known to prey on economic activity to finance their operations (Wennmann, 2007). How does it change things? Assume the players are completely symmetric, such that each player i extracts an (endogenous) share τ_i of the economy's total wage bill $(1-\delta_L)wL$. The key insights are familiar. Player i's cost of arming ψ^i will be given by $\psi^i = \psi(q, w_i)$. The crucial point here is that $w_i = w(1-\tau_{-i})$, such that i will internalize the fact that increasing his own tax will make arming less expensive for the other player, but not for himself. This follows since, for every soldier he himself hires—at a cost $w(1-\sum \tau_i)$—he misses out on the tax revenue that soldier would have produced for him had he been employed in production.

In this case, payoffs under conflict for each player are given by

$$U^i = \mu\left[rK_i + A\phi^i - \psi^i S_i + \tau_i(w(1-\delta_L)L - w\psi_w^{-i} S_{-i})\right]$$

This expression is no different than the ruler's payoff function from before and needs no further interpretation. Consider then the incentives for taxation:

$$\widetilde{U}^i_{\tau_i} = w\left[(1-\delta_L)L - \psi_w^{-i}\widetilde{S}^{-i}\right] + \tau_i w^2 \psi_{ww}^{-i}\widetilde{S}^{-i} + \left(A\phi^i_{S_{-i}} - \tau_i w \psi_w^{-i}\right)\widetilde{S}^{-i}_{\tau_i}.$$

Again, the analysis is effectively the same as what we've seen. Without loss of generality, we can re-use earlier proofs to state that $d\tau_i^*/dA < 0$, by $\widetilde{U}^i_{\tau_i\tau_i} < 0$ and $\widetilde{U}^i_{\tau_i A} < 0$ (since $\widetilde{S}^i$'s dependence on both τ_i and A is also effectively the same as before, holding τ_{-i} constant). Furthermore, as A gets sufficiently large, each player i will find it optimal to use negative values of τ_i. And, crucially, both players will still have an incentive to use higher taxes under settlement than under conflict (for $\delta_L > 0$), since (again) taxes enter the surplus that is created by avoiding destruction. That is to say, the marginal benefit of driving up the other player's cost of arming using negative taxes becomes so large (as the contested rents become sufficiently valuable) that the each player finds it beneficial to destroy some of the labor force in order to make negative taxes less expensive. Notably, by the symmetry of this example, neither player actually gains on the other in the balance of power by employing this tactic.[60]

In addition, it is possible to show that an analogous result to the one stated in Proposition 5(a)—where bargaining weights are endogenously determined and where predominantly capital is destroyed—also holds under symmetry. Again, the logic is familiar. If the value of contested rents is sufficiently small, and if other conditions specified in Proposition 5(a) are similarly met, each player will have an incentive to commit to conflict *ex ante*, in order to preserve the size of his tax base.[61]

Collectively, these examples suggest that our main results are not necessarily driven by any fundamental asymmetry between players. Rather, in most cases, the key source of bargaining

[60]More precisely, $\widetilde{\phi}^i = \frac{1}{1+(\psi^i/\psi^{-i})^m}$. The marginal benefit of increasing ψ^{-i} (by decreasing τ_i) is increasing as ψ^i increases (i.e., as τ_{-i} itself decreases). $\psi^i = \psi^{-i}$ in equilibrium, therefore $\widetilde{\phi}^i = 1/2$ always.

[61]A similar result to the one stated in Proposition 5(b), when predominantly labor is destroyed, also can hold under symmetry, but this case requires no further exposition.

frictions is how the endogenous allocation of labor creates an additional layer of strategic interdependence between players, symmetric or otherwise. When does asymmetry make an important difference? Consider again the alternate timing discussed in Section 3.2 where tax policies are decided at the same time as arming decisions. In the asymmetric game, we found that the ruler might find it optimal to commit to conflict (*ex ante*) in such cases because his commitment signals to the other player that he will be choosing the lower tax rate associated with conflict, which would thereby ensure lower rebel arming. Note, however, that the ruler's preference for this option derives from the belief that the lower tax under conflict will grant him a larger share of the contested rents in equilibrium. That cannot be the case under symmetry!

In the end, we maintain that focusing on scenarios where only one player sets fiscal policies is worthwhile because the adherence to symmetry is limiting in this context. Furthermore, it seems reasonable to assume that controlling the official institutions of the state grants the ruler a significant advantage in this area. By virtue of comparison, this discussion of symmetric cases then helps clarify the key channels at work in our results.

Labor benefits from conflict

Overall income for labor increases from conflict whenever a decrease in taxes associated with conflict (from τ_S^* to τ_C^*) exceeds the share of labor that would be destroyed in conflict (δ_L). That is to say, labor prefers conflict *ex ante* if

$$(1-\delta_L)\left(1-\tau_C^*\right) > \left(1-\tau_S^*\right)$$

We show this can occur for small enough values of δ_L (and relative destruction δ_K/δ_L) using a stylized example.

Assume the following: (i) no capital is destroyed ($\delta_K = 0$); (ii) only an arbitrarily small share ($\varepsilon > 0$) of labor is destroyed ($\delta_L = \varepsilon$); (iii) producing S_i uses only labor, such that $\psi^i = w^i$; (iv) A is in the neighborhood of A_0, which is defined in Lemma 1 as the value of rents at which τ_C^* crosses 0; (v) the ruler's "bargaining weight" λ^1 is given by $\lambda^1 = 1$, such that he claims the entirety of any surplus. This scenario guarantees, among other things, that $\breve{\tau}(A) = 0$. We also note that the surplus here, $\delta_L wL\tau_S^*$, is arbitrarily small as well. It follows that $\tau_C^*(A)$ and $\tau_S^*(A)$ are each arbitrarily close to zero, for all values of A. When we introduce some labor destruction at this point, we will see that: (i) conflict becomes preferred to settlement at $A = A_0$; (ii) labor may prefer conflict; (iii) overall "welfare" (as we have defined it) may be higher under conflict.

Without capital destruction, outcomes under conflict and settlement are equivalent for $\delta_L = 0$. For $\delta_L = \varepsilon$, overall labor income is higher under conflict if

$$-\left(1-\tau_C^*\right) - (1-\delta_L)\frac{d\tau_C^*}{d\delta_L} > -\frac{d\tau_S^*}{d\delta_L},$$

which simplifies down to

$$-\left(\frac{d\tau_C^*}{d\delta_L}-\frac{d\tau_S^*}{d\delta_L}\right)>1,$$

using the arbitrary smallness of ε. Note that, in this case, $\widetilde{V}^1_{\tau\tau}=\widetilde{U}^1_{\tau\tau}<0$. The above inequality holds if

$$\frac{\widetilde{U}^1_{\tau\delta_L}-\widetilde{V}^1_{\tau\delta_L}}{\widetilde{U}^1_{\tau\tau}}>1.$$

Considering the ruler's first-order conditions for τ under conflict (10), we have that $\widetilde{U}^1_{\tau\delta_L}=-wL$. Usefully, the assumption that $\lambda^1=1$ implies that $\widetilde{V}^1_{\tau\delta_L}=0$. We also note that when $\tau=0$, and with only labor used in production of arms, $\widetilde{U}^1_{\tau\tau}$ is given by:

$$\widetilde{U}^1_{\tau\tau}=-w\widetilde{S}^2_\tau-w\widetilde{S}^2_{\tau\tau}.$$

We then need to verify if $L<\widetilde{S}^2_\tau+\widetilde{S}^2_{\tau\tau}$. Note, however, that—given τ—$\widetilde{S}^2$ is not otherwise a function of L. In addition, inspection of (10) reveals that, when $A=A_0$, it must be the case that $L=\widetilde{S}^2+\widetilde{S}^2_\tau$ (in order for the ruler to optimally choose $\tau=0$). The inequality $L<\widetilde{S}^2_\tau+\widetilde{S}^2_{\tau\tau}$ is then satisfied for $A=A_0$ whenever $\widetilde{S}^2_{\tau\tau}>\widetilde{S}^2$. Turning to this latter inequality, $\widetilde{S}^2_{\tau\tau}>\widetilde{S}^2$ for $\tau=0$ if

$$(m+2)\,(1-m)+4\left(m^2+1\right)\xi+(2-m)\,(m+1)\xi^2>(1+\xi)^2. \tag{A.12}$$

which always holds when ξ, the parameter governing the rebel leader's (relative) military capacity, is sufficiently large and/or when m, the return to arming, is sufficiently small.

Since $\widetilde{V}^1_{\tau\delta_L}=0$ in this example, it follows that, for arbitrarily small δ_L, and in the absence of capital destruction,

$$\tau_S^*\left(A_0\right)=\check{\tau}\left(A_0\right);\quad \tau_C^*\left(A_0\right)<\check{\tau}\left(A_0\right).$$

As we know from our discussion of Fig. 3, the value of rents where $\tau_S^*(A)$ and $\check{\tau}(A)$ intersect is the point $\check{A}_S$. Conflict is strictly preferred at $\check{A}_S$ if $\tau_C^*(\check{A}_S)<\tau_S^*(\check{A}_S)$. In this case, $\check{A}_S=A_0$ implies conflict will be preferred at A_0. Furthermore, if (A.12) holds, labor will be better off under conflict.

It remains to be seen what will happen for total welfare. Note that the ruler's payoff is clearly higher under conflict (otherwise, he would not have chosen it.) The question then is whether the potential increase in labor's payoff plus the ruler's payoff offsets the decrease in the rebel leader's payoff.

Another way of examining the same issue is to ask whether the total amount of arming decreases by more than the amount of labor destruction. Capital is not destroyed, therefore total income in the economy is rK_0 (unaffected) plus w times the amount of labor used in production.

We verify if:

$$-\left(\widetilde{S}_{\tau}^{1}+\widetilde{S}_{\tau}^{2}\right)\frac{d\tau_{C}^{*}}{d\delta_{L}}>1$$

where we have already shown (by assumption) that $\frac{d\tau_{C}^{*}}{d\delta_{L}} < -1$. The inequality is ensured if $\widetilde{S}_{\tau}^{1} + \widetilde{S}_{\tau}^{2} > 1$. Again, we are free to make assumptions. For $A = A_0$, it can be shown that $\widetilde{S}_{\tau}^{1} + \widetilde{S}_{\tau}^{2} > 1$ is guaranteed so long as the labor endowment, L, is sufficiently large. This result occurs because the critical point A_0 is itself increasing in L, by our discussion of Proposition 3.