The Wages of Violence *

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Abstract

A government forced to confront an insurgency must contend with two critically linked challenges. First, counterinsurgency is costly, and second, membership in an insurgency entails a drain on government resources through lost participation in the economy. I develop a theory focusing on the tactical choice of counterinsurgents to use violence, and how this choice influences insurgent recruitment. Violence, in this framework, has two reinforcing effects. First is a direct effect whereby government violence weakens the insurgency, and second, a novel indirect effect on the economy. I focus on the economic impact of government violence in how it affects individual wages, in equilibrium, through its influence on the potential labor supply. I show that the government uses both discriminate and indiscriminate violence to discourage citizens from joining the insurgency and improve the economic prospects of those who opt to defect. Discriminate violence increases the risk of victimization for insurgents, which improves participation in the economy, whereas indiscriminate violence, by affecting the pool of individuals who participate in the economy, raises the equilibrium wage. However, I find that discriminate and indiscriminate violence are substitutes for counterinsurgents under certain economic conditions. I extend the model to include other effects that civil violence might have on labor markets, and show how the main substitutability I highlight interacts with other market frictions.

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Internal challenges to an incumbent regime are often countered by state violence. A government's decision to use force against opposition within the state's territorial boundaries, taking the form of repression, armed conflict, or civil war, is well studied (Davenport, 2007; Blattman and Miguel, 2010). However, regimes' forceful responses to such provocations take a number of forms. Explanations as to how governments choose the type(s) of violence to carry out against insurgents often rest on abstract concepts like state capacity or strategic effectiveness. This diverges largely from the microfoundational explanations given for why individuals choose to participate in insurgent groups. A common answer for why citizens become insurgents is the low opportunity cost of combating the state (Becker, 1968; Grossman, 1991). That individuals may base their choice to join a rebellion on their prospects in the labor market seems natural. Yet the economic incentives of governments, and their relationship to individuals' economic motives for insurgency, have not received comparable examination.

Consideration of economics in the context of violence is particularly relevant given that the majority of civil conflicts occur in developing nations. Such low capacity states face a particularly acute dilemma in choosing when and how to employ violence. Modest incomes and a struggling economy push citizens out of the labor force. In such circumstances, competition between insurgents and regime over the same pool of resources, the people, intensifies. As the economy worsens and the insurgent group's membership grows, it presents the government with twin challenges: (1) the government must be stronger to overcome the group's gains; (2) the state forgoes revenue that could have been generated were the insurgents participating in the economy.

The diversion of productive labor to participation in an insurgency creates a substantial toll on the overall performance of the economy, in addition to strengthening the insurgents (and thereby increasing political instability). To maintain its hold on power, the regime

cannot countenance these two sources of weakness. Thus, regardless of the insurgency's aims, the threat of future destruction of the government and may be sufficient to prompt preemptive action by the state.

However, counterinsurgency is a taxing exercise requiring substantial resource investment and effort from the state. From a position of relative incapacitation, the government must target the insurgent group directly and persuade the population to shift its support back to the regime. Effective counterinsurgents must anticipate what factors influence citizens' decision to join the insurgency, and how violence can be employed to manipulate their incentives.

Becoming a member of an insurgency is a dangerous venture for civilians, who risk becoming targets of state retaliation. Supporters of an insurgency, then, must have a compelling motive for opposing the government, such as frustration with lack of economic opportunities or resistance to state repression. Individual citizens making the decision whether to join an insurgency must trade off two factors, *ideological preferences* and *economic opportunities*. Ideology, encompassing various social and cultural factors like ethnicity, peer network effects, and anti-state attitudes, captures an individual's view of the insurgency's mission. This is weighed relative to the benefits of participating in the labor force. Joining an insurgent group implies accepting an opportunity cost, namely insurgents must forgo whatever wages and benefits they could earn in the labor market. Citizens trade-off these two incentives, and the risks of rebellion, in anticipation of the state's response.

The government is incentivized to manipulate citizens' trade-off between economic motives and ideological preferences. Some scholars have focused on how states can manipulate individuals' ideological incentives through information or propaganda campaigns (e.g. Little, 2017) or by winning hearts and minds (e.g. Berman, Shapiro and Felter, 2011).[1] However,

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[1]For additional discussion of state media control and repression see Gehlbach, Sonin and Svolik (2016).

such measures require large bureaucratic apparatuses that can manipulate media and provide public goods. This is difficult for low capacity states that struggle to create sufficient economic opportunities or other positive inducements to prevent rebellion. Relatively impoverished governments may only be able to employ coarse instruments like violence to manipulate citizens' economic incentives. In doing so, the regime faces a choice between pursuing discriminate or indiscriminate violence. I develop a model that focuses on the government's trade-off between these two tactics.

I consider the strategic interaction between citizens deciding to join an insurgency or remain in the national economy, and a low capacity government willing to use violence to defeat the insurgency. Citizens have diverse motives that make some portion of the population naturally inclined towards insurgents, while others strongly prefer to participate in the labor force. I represent this heterogeneity parsimoniously with a type. To capture economic incentives, I develop a simple model of the labor market consistent with standard economic frameworks, featuring competition and a wage decreasing in labor force participation. Specifically, the wage individuals who participate in the economy receive is determined in equilibrium and depends on total factor productivity, capital, and most importantly (as will become clear), the overall labor supply.

The government can use discriminating violence to directly counter an insurgency, but doing so is costly. Discriminate violence targets insurgents exclusively, making leaving the labor force riskier. This increases the willingness of citizens to participate in the economy rather than join the insurgency. Alternatively, the state can use indiscriminate violence, which effects both the insurgent group and the civilian population. This type of violence is less expensive for the government and may be preferable when the cost of discriminate violence is too high to bear. Indiscriminate violence has a beneficial indirect effect of manipulating wages, attracting more citizens to the workforce. Higher wages make

supporting the state more appealing to the citizens, reducing the strength of the insurgent group.

While the regime may prefer to avoid violence to avert damage to its resources, particularly the population, doing nothing allows the insurgency to maintain its strength and continue to oppose the state. On the other hand, if the government employs excessive force, although it may destroy the insurgency, discriminate violence also exhausts resources while indiscriminate violence shrinks the prospective labor pool, reducing economic potential. Thus, the government must balance manipulating the citizen's incentives in order to weaken the insurgents with the need to preserve long-term economic potential. This motivation creates a restraint on the level of violence perpetrated by the regime.

The state's use of violence affects how citizens evaluate the labor market relative to the insurgency through two mechanisms, a *participation incentive* and a *wage incentive*. Each of these mechanisms is isolated by considering a particular type of government violence. Discriminate violence increases the likelihood for all insurgents of being a victim of state violence. This threat deters some individuals who are most ambivalent about the insurgency from joining. Instead, these civilians remain in the economy, leading to a higher labor force participation rate.

In contrast, indiscriminate violence does not directly affect the rate of participation in the labor market. Instead, by using violence against its people, the government is able to reduce the potential labor supply which, through market equilibrium, leads to an increase in the wage.[2] Because some types would accept the new equilibrium wage, fewer citizens will join the insurgency, and instead take advantage of the improved economic opportunity. In this way, state violence changes individual incentives and brings a portion of the population back into the national economy.

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[2]As mentioned previously, wages are decreasing in labor supply due to competitive economic forces.

Since discriminate and indiscriminate violence change citizens' preferences for joining the insurgency through two different channels, the government prefers to use both types of violence in equilibrium. Targeting only those citizens who have already joined the insurgent group promotes labor force participation by raising the opportunity cost of insurgency. However, such an approach does not change wages. Using indiscriminate violence raises wages, brining citizens back into the economy. However, discriminate and indiscriminate violence are substitutes for the regime. As targeting the insurgency discriminatingly becomes costlier, the government will rely increasingly on indiscriminate violence. This substitution effect persists in developed and developing economies, though the model shows higher levels of development under most circumstances lead to the overall use of lower levels of indiscriminate violence.

The remainder of the article proceeds as follows. The next section considers the literature on indiscriminate violence and economic motives for rebellion. I then introduce the model and explicate the participation and wage mechanisms through which discriminate and indiscriminate violence affect citizens' preferences. This is followed by the primary result of the substitutability between discriminate and indiscriminate violence. I then present an extension of the model that considers the effect of conflict perturbing the economy. The final section concludes.

Related Literature

The link between poor economic performance and the onset of insurgency is well-established in both the theoretical literature and in cross- and sub-national empirical studies (Blattman and Miguel, 2010). Overall, the empirical (e.g. Elbadawi and Sambanis, 2002) and theoretic (e.g. Skaperdas, 1992) literatures conclude poorer countries see a higher baseline

risk of internal conflict. Cross-national empirical studies find low GDP per capita or slow economic growth, which proxy for atypically low opportunity cost of rebelling, correlate with the onset of civil conflict (Collier and Hoeffler, 1998, 2004; Collier, Hoeffler and Rohner, 2009).[3] Below average per capita income additionally suggests low state capacity and correlates with conflict onset because low capacity states are incapable of deterring challenges (Fearon and Laitin, 2003).

Low opportunity costs for joining an insurgent group are directly linked to job prospects in the national economy. Negative income shocks are found to reduce the opportunity cost of conflict and make the onset of violence more likely (Chassang and Padro-i Miquel, 2009). Alternatively, Dal Bó and Dal Bó find positive shocks to labor-intensive industries reduce the risk of violence (2011). Shocks that reduce commodity prices for labor-intensive industries (i.e. agriculture) are linked with an increase in violence (Dube and Vargas, 2013). Wage suppression resulting from downward pressure on demand for labor as import prices rise offer an alternative mechanism for lowering opportunity costs of conflict (Besley and Persson, 2008). While the opportunity cost arguments provide strong evidence that low wages or lack of job opportunities increase willingness to rebel, these results typically rest on exogenous income shocks. I contribute to this literature by endogenizing shifts in the equilibrium wage and allowing the state to effect shocks through violence.

Explicit links between economic opportunity and conflict typically focus on onset and recurrence of violence. Research on ongoing conflicts emphasize, instead, questions of war fighting. My findings contribute to the literature on state use of indiscriminate violence, linking this literature with that on the economics of civil conflict.[4] Selective violence

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[3]For a similar argument regarding low opportunity cost of joining an insurgency and the incidence of conflict recurrence, see (Walter, 2004).

[4]Alternative literatures consider insurgent use of indiscriminate violence e.g. (Wood, 2010) or the effect of third-party intervention on the use of indiscriminate violence e.g. (Wood, Kathman and Gent, 2012).

is costly and challenging for low capacity states. Intelligence is needed to discriminate between insurgents and civilians and regimes unable to collect such information may turn to indiscriminate violence (Kalyvas, 2006; Zhukov, 2014). Alternatively, low capacity states that are weaker than their opponents may employ violence indiscriminately to reduce the cost of fighting or prevent fewer casualties for state armed forces (Valentino, 2004; Eck and Hultman, 2007; Downes, 2008). The literature sees indiscriminate violence as a result of some deficiency of the state — a lack of capacity, intelligence, ability to withstand casualties, etc. Implicit in these works is an assumption that discriminate and indiscriminate violence are substitutes. My results make this preference for substituting indiscriminate violence for discriminate explicit, and identifies how it follows from simple economic incentives. Indiscriminate tactics may be adopted, in addition to discriminate violence, because they benefit the state by raising wages. However, when discriminate violence is feasible, regimes prefer to leverage its ability to generate labor force participation without victimizing civilians.

A counterinsurgency strategy that encourages indiscriminate violence represents a break from contemporary best practice. Outlined for practitioners in field manuals like FM 3-24 (2006), counterinsurgents should undermine civilian support for the insurgent but should do so through winning hearts and minds. Indiscriminate violence is supposedly ineffective and counterproductive, inflaming anti-counterinsurgent sentiment and, in the absence of overwhelming force, ineffective at eliminating rebel groups. This narrative assumes indiscriminate violence and a hearts and minds strategy are mutually exclusive options. My framework suggests that limited indiscriminate violence is an effective counterinsurgency strategy, reducing insurgent capacity through both direct and indirect channels while advantaging civilians outside the insurgency group by raising wages.

The Model

I develop a framework in which a government conducts counterinsurgency and citizens choose to participate in the insurgency or support the state through supplying labor to the economy. The citizens' decision is determined by a trade-off between ideological and economic motives. The government cannot prevent the establishment of an insurgent organization but can respond to its existence. In reaction to the insurgent threat, the regime will choose a counterinsurgency strategy designed to manipulate the citizens' incentives. In particular, I focus on a government policy of violence designed to generate direct and indirect effects on citizens' economic incentives. The regime chooses levels of discriminate and indiscriminate violence that maximize participation in the economy while minimizing the proportion of civilians targeted by the state's use of force. In this framework, I constrain the state such that its only available policy tool is violence.

The game proceeds as follows: (1) The citizens are endowed with ideological preferences and observe the wage endogenously generated by the national economy; (2) The government, observing the labor force participation rate and size of the insurgent group, chooses a level of violence (if any) to employ against the population; (3) Citizens decide to participate in the labor force or fight for the insurgent group and the labor market clears; (4) Payoffs are received.

There is a unit mass of citizens normalized to 1 prior to any government violence. Each citizen chooses whether to participate in the economy or to join the insurgent group and fight, a decision determined by the wage and their ideology. Every individual is endowed with an ideology θ_i distributed uniformly from $[\underline{\theta}, \overline{\theta}]$. Higher values of θ indicate a greater degree of sympathy for the insurgent group. Citizens who opt to support the government through working earn a wage, w. A citizen's individual utility difference from working versus

joining the insurgency is $w - \theta_i$. This generates a trade-off between economic and ideological incentives.[5] I denote the choice to rebel as $r = 1$ while $r = 0$ represents a decision to work. Thus, the citizen's choice is represented by

$$r = \begin{cases} 0 & \text{if } w \geq \theta i, \\ 1 & \text{if } w < \theta i. \end{cases} \tag{1}$$

This decision generates a cutoff in θ that represents mobilization for the insurgency. The proportion of citizens who work as part of the labor force is represented by λ.

The wage earned by citizens participating in the national economy is determined endogenously. The economy produces goods according to a production function $f(A, K, L)$ where A represents total factor productivity, K is capital input, and L represents the labor supply. The production technology generates output valued at Y. I assume the economy is characterized by a competitive labor market in which the wage is equal to the marginal product of labor. Further, in this market the wage is decreasing in labor supply. For simplicity, I use a Cobb-Douglas production function, which is strictly concave and represents a competitive labor market (Mas-Colell, Whinston and Green, 1995, 130).

$$Y = AK^\alpha L^\beta$$

Here $\alpha \in (0, 1)$ and $\beta \in (0, 1)$ are positive constants. If $\alpha + \beta < 1$, the production function has decreasing returns to scale.[6] The wage is the marginal product of labor $w = AK^\alpha \beta(L)^{\beta-1}$.

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[5]The citizen's trade-off is not limited to an interpretation of choosing to work or fight. This result would be identical if citizens had some preference for labor or leisure and choose between work and inactivity. In this case, if the state's only method for reducing the idle population is violence, the regime would have the same incentives to use force as when confronting an insurgent group.

[6]Analogously, if $\alpha + \beta = 1$ it has constant returns to scale. If $\alpha + \beta > 1$, which may result from $\alpha > 1$ or $\beta > 1$, then the production function has increasing returns to scale.

The government is best off when the state flourishes. When the state is strong and stable, the government is more likely to remain in power unchallenged and reap the benefits of office. In economic terms, the regime prefers a productive and growing national economy that employs the maximum possible labor supply. To capture this preference, I represent the government's utility as benefits from economic production, Y. This can be thought of as benefits it can spend or distribute to remain in power, or as spoils of office.

In response to the insurgent group, the regime chooses a level of violence to employ against the population. The government can use two different methods of targeting the insurgency, either discriminate or indiscriminate violence. If the state chooses to target members of the insurgent group using discriminate violence, it destroys some portion v_D of the insurgent group. Discriminate violence costs $c(v_D)$ for the state to carry out — this cost can be thought of as the price of gathering intelligence or identifying insurgents. The cost is strictly increasing in the level of discriminate violence. The insurgent group's strength after the regime has carried out discriminate violence is $1 - v_D$. Using indiscriminate violence has a broader effect and destroys a fraction of the population, including both insurgents and civilians. The level of indiscriminate violence is represented by v_I.

The civilian population after government violence is $1 - v_I$. The labor supply, $(1 - v_I)\lambda$, depends on the size of the potential labor pool and the labor force participation rate. If the regime elects to use discriminate and indiscriminate violence concurrently, the size of the insurgency following the state's use of force is $(1 - v_D)(1 - v_I)$. The state will only engage in counterinsurgent violence if doing so increases the labor supply, giving the state more utility.

The solution concept is subgame perfect Nash equilibrium. An equilibrium in this model has two components. First, a cutoff strategy in θ that determines the portion of citizens participating in the national economy. The marginal citizen who is indifferent between

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supporting the state and the insurgent group has a type that solves

$$\underbrace{(1 - v_I)w(v_D, v_I)}_{\text{economic incentives}} = \underbrace{(1 - v_I)(1 - v_D)\theta^*}_{\text{ideological incentives}}. \tag{2}$$

Second, optimal levels of discriminate and indiscriminate violence that solve the government's problem

$$\max_{v_D, v_I} f((1 - v_I)\lambda(v_D, v_I)) - c(v_D), \tag{3}$$

where $f(\cdot)$ is the production function. An equilibrium is characterized by a triple $(\lambda^*, v_D^*, v_I^*)$, which comprises: (1) an optimal labor force participation rate determined by a θ threshold that gives the equilibrium portion of citizens participating in the economy, (2) a level of discriminate violence v_D, (3) a level of indiscriminate violence v_I.

Assumptions of the Model

Before continuing, I offer a few comments on the model's assumptions. The aim of this model is to isolate the effect of government violence on the decision of citizens to participate in an insurgency. As such, I intentionally restrict the government to exclusively coercive policies. I do not consider a regime that can make investments to improve economic production or expand the labor force, like encouraging immigration, attracting foreign direct investment or increasing technological capacity. In this way, I limit attention to the effect of the use of force.

Allowing the government to make investments instead of just using violence more closely resembles a 'hearts and minds' style counterinsurgency, which aims to raise the opportunity cost of fighting by shifting citizens' ideological preferences to favor the state. To do so, the regime or a third-party backer provides public goods or services (Berman, Shapiro and

Felter, 2011). While I do not discount this method of combating insurgencies, to make the economic mechanisms clear I opt to limit my analysis to other state tactics.

It is important to note I do not explicitly model the insurgent group as an independent player in the model because doing so does not fundamentally alter the results. Were the insurgents to impose a direct cost on the government, the regime would still choose to employ violence to defeat the group and the use of discriminate or indiscriminate violence would remain optimal in equilibrium. Further, I do not incorporate a direct cost to the state of using indiscriminate violence. The implicit cost of losing future productive labor is sufficient to restrain the state. Thus, I choose the more parsimonious model presented here.

Further, I do directly consider the possibility that some citizens become more likely to support the insurgency in response to government violence. This backlash against the state is not modeled explicitly for two reasons. First, since the citizens choose whether to work or fight after the government chooses its levels of discriminate and indiscriminate violence, this response by some citizens is entirely captured by the model as is. While I do not characterize shifts in citizens' ideological preferences after the government's choice, such a response by some individuals is feasible within my framework. Second, and more substantively, it is unclear in extant literature whether we should expect more citizens who respond negatively to regime violence and are mobilized to join the insurgency, or a larger proportion who respond with fear and support the regime in an effort to guarantee their security. If the number of citizens that mobilize is smaller than the number that support the state, any backlash effect would be imperceptible in my model. That is, the shift in the population working, i.e. those supporting the regime, would trump any up-tick in insurgent support. Given the generally small documented size of insurgencies relative to civilian populations, I find it reasonable to assume this will be the case.

Lastly, while the production function used in the model is characterized by a competitive labor market and strict concavity, I choose the Cobb-Douglas function primarily for convenience and familiarity. The results do not rest on the competitive labor market assumption. This merely ensures that the wage is the marginal product of labor and enables explicit characterization of the equilibrium wage and labor supply. Instead, the only necessary feature of the production function is strict concavity. By this characteristic, the wage decreases in labor supply, which is a standard assumption in economics. In an extension of the model, I show that my results hold if I adjust the production technology to capture the idea that conflict may create inefficiencies in the labor market.

Waging War or Earning Wage

To capture how economic incentives shape citizens' choices in the context of government violence, and how the state manipulates such incentives, I consider in turn the citizen's decision of which side — the insurgents or the regime — to support, and the government's policy of violence. In this framework, the citizens make their choice last, and thus I consider the population response to violence first.

The population's response to the regime's counterinsurgency is represented by the marginal citizen who is indifferent between supporting the regime and joining the insurgent group. This individual gives the proportion of citizens who choose to work versus fight, and establishes the ideological characteristics and preferences of these two groups. Moreover, this marginal individual characterizes the equilibrium labor force participation rate, which endogenously generates the wage offered to individuals participating in the economy. This relationship between the equilibrium cutoff and the production technology allows for the

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characterization of the citizens' optimal choice by more interesting and interpretable parameters, namely the labor force participation rate.

Lemma 1 *For a fixed v_D and v_I, the marginal citizen θ^* is characterized by a unique λ^*, the equilibrium labor force participation rate.*

The threshold above which citizens join the insurgency and below which they participate in the economy is represented by the marginal ideological type θ^* that solves 2. It is worth noting the way government violence impacts an individual's decision of which side of the conflict to support. First, discriminate violence only appears on the right hand side of this equation. The potential of being the victim of discriminate violence reduces the ideological benefit of participating in the insurgency, making supporting the state more appealing. Second, indiscriminate violence appears on both sides of this equation. In fact, the citizen's choice can be reduced such that the effect of indiscriminate violence drops out of this equation. Because indiscriminate violence targets both insurgents and civilians, the additional risk of victimization for an individual citizen is equal regardless of which side she chooses to support. A state policy of indiscriminate violence thus not enter her calculus when determining whether to work or fight. Discriminate violence, by asymmetrically increasing the risk of victimization, remains a part of the calculus.

Rearranging 2, the marginal type is $\theta^* = \frac{w(v_D,v_I)}{(1-v_D)}$. The unique labor force participation rate, then, is given by the proportion of citizens whose ideological preference for the insurgency is equivalent to or less than this threshold. Given that ideological types are distributed uniformly over $[\underline{\theta}, \bar{\theta}]$, the labor force participation rate solves

$$\lambda^* = \frac{\frac{w(v_D,v_I)}{(1-v_D)} - \underline{\theta}}{\bar{\theta} - \underline{\theta}}. \tag{4}$$

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At this labor force participation rate, the regime would prefer a violent counterinsurgency policy if doing so can increase λ. It this case to which I restrict attention for the remainder of the analysis.

Equation 4 can be rearranged to give the equilibrium wage that corresponds with this level of labor force participation,

$$w^*(v_D, v_I) = \lambda^*(\bar{\theta} - \underline{\theta})(1 - v_D) + \underline{\theta}(1 - v_D). \tag{5}$$

Recall the wage is decreasing in labor supply. However, this feature of the economy should not be thought of as a comparative static result. The endogeneity of the wage implies that the labor force participation rate and the wage earned by all citizen who elect to work are co-determined in equilibrium. Instead, the relationship between a shift in labor force participation and a change in wages can be thought of as the wage automatically responding to whatever level of labor force participation occurs in equilibrium. When this rate is high, wages are lower than when labor force participation is low. It is precisely this relationship between wages and participation that the state exploits to manipulate citizens' incentives. Both labor force participation and wages are affected by violence.

Participation and Wage Incentives

In this model, discriminate and indiscriminate violence operate through separate channels. To isolate their effect on citizens' incentives, I consider the regime's use of each type of violence independently. Instead of holding the levels of discriminate and indiscriminate violence fixed, assessing how the citizens' choice changes under varying government targeting strategies serves to capture the mechanisms by which each type of violence individually impacts their incentives. Formally, these mechanisms are given by the effect of v_D and v_I

on the labor force participation rate which, since it is only representative of the citizen's sub-game, I refer to as $\lambda^\dagger$. Such results can be considered intermediate comparative statics of the citizens' sub-game since, in the limited context of the citizens' choice, the levels of discriminate and indiscriminate violence are exogenous.

Discriminate violence has a direct effect of encouraging participation in the economy. The choice of the citizen to remain in the workforce or join the insurgency still rests on each individual's trade-off between wages and ideology. Added to this calculus now is the risk of being targeted by the government only if one joins the insurgency. Since I assume discriminate violence perfectly targets only those individuals who elect to join the insurgency, increasing the level of v_D lowers the expected payoff for any individual citizen choosing to fight. This will induce a shift in the labor force participation rate.

Remark 1 *Labor force participation is increasing in the level of discriminate violence.*

By reducing the payoff for participation in the insurgency, the regime, in using only discriminate violence, increases $\theta^\dagger$ such that the marginal type indifferent between working and fighting must be ex-ante more supportive of the insurgency. In the context of the model, this is represented by a change in the size of the labor force. By the implicit function theorem,

$$\frac{\partial \lambda^\dagger}{\partial v_D} = -\frac{w^*}{(1-v_d)AK^\alpha\beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2} - (1-v_d)^2(\overline{\theta} - \underline{\theta})} > 0, \qquad (6)$$

using Cobb-Douglas as the production function. As the level of discriminate violence increases, labor force participation rises because more citizens prefer receiving the equilibrium wage (here, of the sub-game) compared to their ideological benefit. However, discriminate violence also has a countervailing effect. As more citizens prefer to work, the wage will decrease. This will, for some proportion of the citizens, render the effect of discriminate violence moot and they will join the insurgency. Thus, in isolation, discriminate violence generates

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a participation incentive that reduces the size of the insurgent group but is insufficient to cause all citizens whose types are near indifferent to sort back into the labor market.

Indiscriminate violence affects the citizen's trade-off indirectly, through wages. When the government pursues a strategy of indiscriminate violence, it targets both civilians and insurgents, meaning the expected payoff for any individual reduces to the same trade-off she would make in the absence of regime violence. However, indiscriminate violence has both a direct and an indirect effect on the labor force participation rate, the relative magnitudes of which determine the overall effect of an increase of the level of v_I.

Remark 2 *Labor force participation is increasing in the level of indiscriminate violence.*

The direct effect of indiscriminate violence on the labor market is negative — indiscriminate violence reduces the overall population of potential laborers. In addition, indiscriminate violence has a countervailing indirect effect that is driven by the wage. Because wages are increasing as the labor pool shrinks, the wage offered to all citizens who participate in the economy is higher as the government increases indiscriminate violence. This will induce a shift in the marginal type $\theta^\dagger$ and some citizens will sort into the labor market that otherwise would have been insurgents. Formally,

$$\frac{d\lambda^\dagger}{dv_I} = -\frac{\frac{1}{(1-v_D)(\bar{\theta}-\underline{\theta})}AK^\alpha\beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2}(-\lambda^*)}{\frac{1}{(1-v_D)(\bar{\theta}-\underline{\theta})}AK^\alpha\beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2}(1-v_I)-1} > 0. \tag{7}$$

The indirect effect dominates the direct effect such that overall, the labor force participation rate increases with indiscriminate violence. The wage rises sufficiently that some citizens prefer to sort into the labor market. Key in this case is that indiscriminate violence achieves an increase in the labor pool without directly incentivizing participation. The wage incentive is sufficiently powerful to make additional citizens prefer joining the labor market to joining the insurgent group.

The participation and wage incentives enable the government to use violence to manipulate the labor market. By selecting levels of discriminate and indiscriminate violence that induce the type of sorting generated by these mechanisms, the government both reduces the size of the insurgency and increases its own economic output.

Economic Motives for Counterinsurgency

For the regime, the participation and wage incentives that push citizens to sort out of the insurgency and into the labor market make violence worthwhile. To illustrate, consider the government's choice of violence in the absence of these mechanism. This can be thought of as assessing the effect of v_D and v_I for a fixed λ that does not depend on violence. The government's problem is to maximize output

$$\max_{v_D, v_I} \ Y((1 - v_I)\lambda) - c(v_D),$$

where $Y(\cdot)$ represents the Cobb-Douglas production function. The regime will choose violence, here $v_D^\dagger$ and $v_I^\dagger$ since these choices only represent a strategy for the government's sub-game, to solve the following system of equations:

$$v_D^\dagger = AK^\alpha \beta((1 - v_I)\lambda)^{\beta - 1} - c'(v_D) = 0,$$

$$v_I^\dagger = AK^\alpha \beta((1 - v_I)\lambda)^{\beta - 1}(-\lambda) = 0.$$

When discriminate violence has no effect on labor force participation, the regime gains no utility to offset the direct cost of using targeted violence. Since the government's benefits

are constant but its costs are increasing in the level of discriminate violence the regime will choose $v_D^\dagger = 0$ such that the cost is perfectly offset. Indiscriminate violence provides no benefits for the regime in the absence of the wage mechanism. If the labor force participation rate is unresponsive to violence, indiscriminate violence only has the direct effect of reducing the labor pool without the indirect effect of attracting citizens. Therefore, the government will always choose $v_I^\dagger = 0$.

Violence arises, in this model, exclusively through its effect on the labor market. There is no added benefit to the government of using violence without the participation and wage incentives, even if pursuing either or both types of violence may, with some probability, reduce the size and strength of the insurgent group. For regimes primarily concerned with their own economic prospects, a perpetual insurgency is preferable to paying the costs of using violence.

Optimal Violence

The government's choice of violence is characterized by an optimization problem that accounts for the expected response of the citizenry to its decision to use force. Because the government benefits from high levels of economic output, the regime chooses levels of discriminate and indiscriminate violence to maximize production. The government's problem depends indirectly on the citizens' choice through the labor force participation rate, that appears in the state's problem

$$\max_{v_D, v_I} Y((1 - v_I)\lambda^*(v_D, v_I)) - c(v_D), \tag{8}$$

where $Y(\cdot)$ again represents the Cobb-Douglas production function, rather than the generalized production function $f(\cdot)$.

The government's problem does not immediately suggest the regime will prefer to use positive levels of either discriminate or indiscriminate violence. In fact, both types of violence are costly — discriminate violence carries an explicit cost represented by $c(\cdot)$ while indiscriminate violence generates indirect costs by reducing the size of the potential labor pool, creating a ceiling for the state's utility. Positive levels of violence are only optimal for the regime if their indirect effect on production exceeds their costs. The optimal levels of discriminate and indiscriminate violence solve the following system of equations.

$$
\begin{aligned}
\frac{\partial}{\partial v_D} &= AK^\alpha \beta((1-v_I)\lambda^*))^{\beta-1}((1-v_I)\lambda^*_{v_D}) - c'(v_D) = 0 \\
\frac{\partial}{\partial v_I} &= AK^\alpha \beta((1-v_I)\lambda^*))^{\beta-1}((1-v_I)\lambda^*_{v_I} - \lambda^*) = 0
\end{aligned}
\tag{9}
$$

The amounts of discriminate and indiscriminate violence employed by the state depend on the equilibrium wage in the economy, the direct and indirect effects of employing each type of violence on the regime's utility, and their costs.

It is clear from the first order conditions that the state will never choose $v_D = 1$ or $v_1 = 1$. That is, the government has no incentive to pursue violence in such a manner that it will eliminate its entire population. The direct cost of discriminate violence restrains the regime such that the benefits of violence can never compensate. This trade-off between the high costs of discriminate violence and its clear benefits mirrors the view of much of the literature on state violence in civil conflict (Kalyvas, 2006; Zhukov, 2014). Regimes would prefer to use more discriminate violence but cannot afford to do so due to the expense associated with gathering intelligence or executing targeted strikes. The state further will avoid using the full amount of possible indiscriminate violence because doing so would eliminate the labor pool that generates its utility. Formally, $v_I = 1$ cannot solve the first order condition as the left-hand side would equal infinity. Thus, while the cost of indiscriminate violence is

only indirect, reducing the government's utility through its effect on the size of the potential labor pool, no additional direct cost is necessary to restrain the state.

While the government is unwilling to use full violence, avoiding either type of violence is also not optimal. The government's utility is increasing in both discriminate and indiscriminate violence, for sufficiently low $c(\cdot)$, and therefore the regime will always prefer to increase the level of v_D and v_I above zero. Violence increases the regime's utility because of its effect on the labor force participation rate. As the state uses more violence, short of a strategy of total annihilation, the proportion of citizens that prefers working to fighting for the insurgency increases. Again, discriminate violence has an indirect effect on the participation rate by making economic activity more appealing relative to fighting. Indiscriminate violence has both a direct effect on participation and an indirect effect on wages that generate an increase in labor force participation.

The government's best response to the citizens' choice is an interior optimum where both $v_D^*, v_I^* \in (0, 1)$ and are implicitly defined by the first order conditions. In equilibrium, the state will employ positive levels, perhaps levels that would be legally considered genocide, of both discriminate and indiscriminate violence.

Proposition 1 *There exists a unique equilibrium characterized by $(\lambda^*, v_D^*, v_I^*)$ where the regime employs both discriminate and indiscriminate violence and citizens choose to work or fight such that λ^* represents the labor force participation rate.*

The equilibrium suggests a few immediate challenges for empirical research design. First, the model highlights the endogenous relationship between wages and government violence. Because the state's use of force affects the proportion of the population willing to participate in the economy, and because indiscriminate violence has a direct effect on the potential labor pool, the level of violence in equilibrium determines simultaneously the citizens' best response and the wage. This reverse, or simultaneous, causal relationship suggests that wages should

not be employed as a control in regression models predicting state violence. In addition, this result complicates two widely cited mechanisms for why individual citizens choose to join insurgencies. On the one hand, the economic opportunity cost argument suggests wages determine insurgent recruitment. However, on the other hand, an argument suggesting citizens join insurgencies as a response to state repression would point towards government violence as increasing the willingness of disaffected citizens to rebel.[7] In equilibrium, my model shows that these two motives for insurgent participation are not independent since wages and violence are inextricably associated. In this case, both economic opportunity and the desire to respond to state repression work through the same channel — labor force participation — but have countervailing effects, meaning treatment of both motives as unrelated, and testing empirically the relative magnitude of each, may be problematic.

Trading Off Discriminate and Indiscriminate Violence

In equilibrium, the regime pursuing counterinsurgency will choose to employ both discriminate and indiscriminate violence, but not necessarily the same levels of each. This begs the question of whether the government, for strategic but not necessarily ethical reasons, finds discriminate violence sufficiently effective to adopt a policy of targeted violence, or if a coarse method of targeting like indiscriminate violence brings about swifter or more certain victory. The choice to employ more or less discriminate violence depends on its cost. As the direct expense incurred by increasing the level of discriminate violence rises, the government will reduce the amount of targeted violence directed at the insurgency. However, it will continue to use comparable levels of violence overall, substituting more indiscriminate violence for discriminating force.

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[7]Both arguments are summarized in Collier, Hoeffler and Rohner (2009) and Blattman and Miguel (2010).

Proposition 2 *Indiscriminate violence is increasing in the cost of discriminate violence. If production exhibits decreasing returns to scale for labor, discriminate and indiscriminate violence are gross substitutes for the government.*

The government's objective function has strict decreasing difference in v_D and v_I, which is equivalent to a strictly negative cross partial derivate $\frac{\partial^2}{\partial v_D \partial v_I} < 0$.[8] Thus, in equilibrium, the benefit to the regime of increasing the amount of discriminate violence it applies to the insurgency is decreasing in the level of indiscriminate violence. Because the level of discriminate violence that is optimal for the regime decreases as costs rise, this relationship allows the state to trade discriminate violence for indiscriminate violence, and vice versa, and still receive non-negative utility.

Substitutability of discriminate and indiscriminate violence is driven by the two effects of indiscriminate violence on labor force participation. Recall, using indiscriminate violence has a costly direct effect for the regime. Non-targeted force directly reduces the overall population, and by consequence the potential labor pool. However, in equilibrium, this negative effect of indiscriminate violence is outweighed by its indirect effect on labor force participation. Because wages increase as the number of possible workers in the economy decreases, participating in the economy becomes more appealing for both civilians and insurgents alike as the level of indiscriminate violence increases. Therefore, labor force participation is increasing in indiscriminate violence, which generates an outsized benefit for the government. The indirect effects of indiscriminate violence make the regime willing to accept its costs, and allow the government to avoid some of the costs of pursuing discriminate violence.

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[8]This equivalence follows from observing the objective function is twice continuously differentiable in both v_D and v_I.

Viewed differently, this result aligns with an argument in the literature that contends states use indiscriminate violence because they are incapable of pursuing more discriminating tactics. As the cost of discriminate violence increases, the regime will find indiscriminate violence preferable. Merely identifying this substitution result in a theoretical model suffices a contribution to this literature. Moreover, the model elucidates clearly why this result holds, and perhaps more importantly the conditions under which this hypothesis is supported. For the regime, discriminate and indiscriminate violence are substitutes not simply because discriminate violence is more expensive. The trade-off is subtler. Both types of violence achieve similar objectives for the government — both reduce the size of the insurgency through encouraging, in the sense of increasing utility, participation in the labor force. When discriminate violence is too expensive for the regime, it is willing to shift to using indiscriminate violence instead because it is achieving the same outcomes, through similar channels, with lower costs.

A key feature of the model that generates the substitutability between discriminate and indiscriminate violence is the returns to scale for the government of labor. If returns to scale of labor are decreasing, then the increase in output generated by increasing the labor supply is proportionally less than the absolute increase in labor. For example, considering an increase in the labor supply from $v_I^* = (1-v_I)\lambda^*$ to $\hat{v}_I = 2((1-v_I)\lambda^*)$. Then, with decreasing returns to scale, output would shift from Y^* to $\hat{Y} < 2Y^*$. It is only under this condition that the regime's optimal choice of violence exhibits substitutability between discriminate and indiscriminate violence. Because the benefit of a marginal increase in the labor force participation rate instigated by indiscriminate violence is mitigated, in this model, by a commensurate decrease in the overall population of potential laborers, the benefit in terms of output will be less valuable. This induces substitution by the government in favor of discriminate violence.

Poverty-Violence Trap

For a regime motivated by economic incentives, the size of the labor force is not the only aspect of the economy worthy of consideration. The government's production function includes capital and a measure of technology of production. These other components of the government's utility function, by changing the value of economic output exogenously, affect the levels of discriminate and indiscriminate violence selected by the regime. Understanding how a state's technology of production and capital endowment relate to the government's use of force against an insurgency is of interest for two reasons. First, this type of analysis generates predictions of what types of countries are likely to experience various government strategies of violence, where low capital and technology of production indicate a developing economy. The model's comparative static predictions can be compared empirically to the actual levels of discriminate and indiscriminate violence in such states. Second, because civil conflict often has a depressing effect on a nation's economy, understanding the relationship between capital, technology of production, and violence generates empirical implications of conflict-generated inefficiency in the economy or capital flight prompted by the insurgency.

While technology of production and capital are conceptually distinct factors that enter the regime's production function, they affect the choice of violence in the same way. An increase in either gives the government more utility for two reasons — increasing A or K provides a direct benefit of making the economy more efficient and output more valuable and an indirect benefit of increasing the labor supply. Higher levels of capital and a more efficient economy generate higher wages. By making participation in the economy more lucrative, economic development reduces the size of the insurgency independent of government intervention. These two effects lead the government to be more discriminating in its use of violence, avoiding the disutility of reducing the potential labor pool.

Proposition 3 *For some range of parameters, improvements in technology of production and capital endowment increase the level of discriminate violence.*

It is notable that increasing the efficiency of the economy, or its endowment of capital, does not create sufficient economic incentives for the government to forgo violence. That higher levels of economic development increase the level of any form of violence is somewhat surprising, but considered in context such predictions follow naturally from the substitutability of discriminate and indiscriminate violence. The government's preference for substituting discriminate for indiscriminate violence means that at higher levels of economic development, regimes will be more targeted in their violence against insurgents. This suggests that for those interested in reducing violence against civilians perpetrated by the state itself, a policy of economic assistance may be fruitful.

This flip-side of this prediction serves perhaps as a warning — if more developed economies are able to practice highly discriminating counterinsurgency then developing nations, the types of states extant research suggests are more conflict prone, are likely to experience higher levels of indiscriminate violence. The negative economic impacts of conflict, ranging from capital flight to increased difficulty transporting goods, make indiscriminate violence more likely. This empirical implication of the model is in line with existing research on commodity shocks and civil conflict (Chassang and Padro-i Miquel, 2009; Dube and Vargas, 2013) and the broader opportunity cost argument for individual participation in insurgency (Collier, Hoeffler and Rohner, 2009). However, whereas these results are largely based on models employing exogenous shocks to the economy, my framework suggests a specific interaction effect between exogenous changes to the economy, endogenous shifts in wages, and a substitution between discriminate and indiscriminate violence.

It is not universally true that higher level of economic development prompt counterinsurgent governments to use more discriminating violence. Under some circumstances, more economic prosperity leads to regimes using more indiscriminate violence.

Remark 3 *For some range of parameters, economic improvements make indiscriminate violence more appealing for the government.*

The proof of this remark is embedded in the proof for Proposition 3. This relationship between developed economies and indiscriminate violence arises specifically when increasing the level of either technology or production or capital does not generate complementarities between discriminate violence and economic improvements. If economic development does little to affect the participation incentive, then diminishing marginal returns to labor make discriminating violence less appealing than indiscriminate violence.

Conclusion

Discriminate and indiscriminate violence serve two distinct purposes and, when employed in concert, can help a government effectively defeat an insurgency. Regimes with economic interests that are willing to use violence against their own populations to manipulate the opportunity cost of rebellion will employ policies of both discriminate and indiscriminate violence. However, for the counterinsurgent, these two types of violence are substitutes. Regimes able to afford more discriminate violence will employ less indiscriminate violence. Violence manipulates economic incentives, providing dual benefits of weakening the insurgent group through using force and incentivizing some group members to return to the economic sector to take advantage of improved opportunities. Discriminate violence encourages labor force participation by increasing the likelihood of victimization for insurgents. Indiscriminate violence operates through a wage incentive where the resulting decrease in population following

indiscriminate violence indirectly raises wages, encouraging citizens to sort back into the labor pool.

Identifying these economic motives provides an alternative rationale for indiscriminate violence beyond the idea that such tactics are a response to weak intelligence gathering or low state capacity. Specifically, indiscriminate violence is a convenient substitute for particularly low capacity states, but also serves its own purpose by raising wages in the economy which induces some citizens to shift their allegiances and support the regime. The model generates several implications for empirical study and research design. My framework shows that the interaction between state policies of violence and economic opportunity indicators like wages should be accounted for in empirical models. Further, the model predicts that low levels of capital, inefficient economies, and states facing particularly high costs to discriminate violence should experience higher levels of indiscriminate violence against civilians. However, this holds only when labor exhibits diminishing marginal returns. The relationship between economies of scale and counterinsurgency tactics warrants further study.

Appendix A

Proof of Lemma 1: First, assume a fixed v_D and v_I. This allows for focus on the relationship between θ and λ while bracketing out their mutual dependency on violence.

Consider the individual citizen's trade-off $(1 - v_I)w(v_D, v_I) \stackrel{?}{=} (1 - v_D)(1 - v_I)\theta_i$. She will choose to join the insurgency if the left-hand side is smaller than the right-hand side. This reduces to the comparison

$$w(v_D, v_I) \stackrel{?}{=} (1 - v_D)\theta_i.$$

The marginal citizen that is indifferent between joining the insurgency or the economy is the citizen for which this equation is satisfied with equality.

Rearranging the pay-off comparison for the marginal type

$$\theta^* = \frac{w}{(1 - v_D),}$$

gives a threshold in the type space above which all types will join the insurgency. Since types are distributed uniform from $[\underline{\theta}, \overline{\theta}]$, the labor force participation rate (i.e. the proportion of citizens who opt to participate i the economy) is derived from the CDF of the continuous uniform distribution.

$$\lambda^* = \begin{cases} 0 & \text{if } \theta^* < \underline{\theta} \\ \frac{\frac{w(v_D, v_I)}{(1 - v_D)} - \underline{\theta}}{\overline{\theta} - \underline{\theta}} & \text{if } \theta^* \in [\underline{\theta}, \overline{\theta}) \\ 1 & \text{if } \theta^* \geq \overline{\theta}. \end{cases}$$

Thus λ^* is uniquely determined by θ^* and λ^* can be used to characterize the equilibrium labor force participation threshold strategy for the citizens. ∎

Proof of Proposition 1:

Uniqueness of λ^* follows from Lemma 1. By construction, the choice of v_D^* and v_I^* that solve the government's optimization problem are sequentially rational. Thus any solution to this problem, with λ^*, characterize an equilibrium.

The regime's problem is

$$\max_{v_D \in [0,1], v_I \in [0,1]} AK^\alpha((1-v_I)\lambda^*)^\beta - c(v_D).$$

Since the production function is continuous in v_D and v_I and $[0,1]$ is compact, a solution exists by the Extreme Value Theorem.

The objective function is strictly concave in both v_D and v_I, therefore the solution is unique and characterized by the first order conditions

$$\frac{\partial}{\partial v_D} = AK^\alpha \beta((1-v_I)\lambda^*))^{\beta-1}((1-v_I)\lambda_{v_D}^*) - c'(v_D) = 0$$

$$\frac{\partial}{\partial v_I} = AK^\alpha \beta((1-v_I)\lambda^*))^{\beta-1}((1-v_I)\lambda_{v_I}^* - \lambda^*) = 0. \tag{10}$$

Strict concavity is established by ensuring $\frac{\partial^2}{\partial v_D^2} < 0$ and $\frac{\partial^2}{\partial v_I^2} < 0$. By differentiation,

$$\frac{\partial^2}{\partial v_D^2} = AK^\alpha \beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2}((1-v_I)\lambda_{v_D}^*)^2 + AK^\alpha \beta((1-v_I)\lambda^*)^{\beta-1}(1-v_I)\lambda_{v_D v_D}^* - c''(v_D) < 0,$$

where $\lambda_{v_D}^* > 0$ from 6 and

$$\frac{d^2\lambda^*}{dv_D^2} = -\frac{\frac{2AK^\alpha \beta((1-v_I)\lambda^*)^{\beta-1}}{(1-v_D)^3(\bar{\theta}-\underline{\theta})}}{\frac{1}{(1-v_d)(\bar{\theta}-\underline{\theta})}AK^\alpha \beta(\beta-1)(\beta-2)((1-v_I)\lambda^*)^{\beta-3}(1-v_I)^2}$$

$$= -\frac{2(\lambda^*)^2}{(\beta-1)(\beta-2)(1-v_D)^2} < 0. \tag{11}$$

Further,

$$\frac{\partial^2}{\partial v_I^2} = AK^\alpha \beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2}((1-v_I)\lambda^*_{v_I}-\lambda^*)^2 + AK^\alpha \beta((1-v_I)\lambda^*)^{\beta-1}((1-v_I)\lambda^*_{v_I v_I}-2\lambda^*_{v_I}) < 0.$$

That $\lambda_{v_I} > 0$ is established by 7 and

$$\frac{d^2\lambda^*}{dv_I^2} = -\frac{\frac{1}{(1-v_D)(\bar{\theta}-\underline{\theta})}AK^\alpha \beta(\beta-1)(\beta-2)((1-v_I)\lambda^*)^{\beta-3}(\lambda^*)^2}{\frac{1}{(1-v_d)(\bar{\theta}-\underline{\theta})}AK^\alpha \beta(\beta-1)(\beta-2)((1-v_I)\lambda^*)^{\beta-3}(1-v_I)^2}$$

$$= -\frac{(\lambda^*)^2}{(1-v_I)^2} < 0.$$

(12)

■

Proof of Proposition 2:

For simplicity of the argument, assume the cost function is linear in v_D. Thus cost is still strictly increasing in the level of discriminate violence. Of interest is $\frac{dv_I^*}{dc}$, the relationship between the cost of discriminate violence and the level of indiscriminate violence. By the chain rule, this is

$$\frac{dv_I^*}{dc} = \frac{dv_I^*}{dv_D^*}\left(\frac{dv_D^*}{dc}\right).$$

Since v_D^* is characterized by the first order condition for the regime with respect to v_D, for linear costs, v_D^* can be rewritten as

$$AK^\alpha \beta((1-v_I)\lambda^*)^{\beta-1}(1-v_I)\lambda^*_{v_D} - c = 0.$$

(13)

By the implicit function theorem,

$$\frac{dv_D^*}{dc} = -\frac{-1}{AK^\alpha \beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2}((1-v_I)\lambda^*_{v_D})^2 + AK^\alpha \beta((1-v_I)\lambda^*)^{\beta-1}(1-v_I)\lambda^*_{v_D v_D}} < 0. \quad (14)$$

From 11, $\lambda^*_{v_D v_D} < 0$ and $\lambda^*_{v_D} > 0$ from 6. For $\beta < 1$, which gives decreasing returns to scale for labor, indiscriminate violence is decreasing in its cost.

Since the first order conditions for the government also characterize v_I^*, $\frac{dv_I^*}{dv_D^*}$ is equivalent to $\frac{\partial^2}{\partial v_I \partial v_D} Y(v_D, v_I)$ where $Y(\cdot)$ represents the regimes problem. The cross-partial of the regime's objective function both signs the relationship between discriminate and indiscriminate violence and, since the government's problem is twice continuously differentiable in both v_D and v_I, establishes that the regime has strict decreasing difference in v_D and v_I.

The objective function for the regime has strict decreasing differences in v_D and v_I if, for all $\overline{v_D} > \underline{v_D}$ and $\overline{v_I} > \underline{v_I}$, then representing the objective function by Y

$$Y(\overline{v_D}, \overline{v_I}) - Y(\underline{v_D}, \overline{v_I}) < Y(\overline{v_D}, \underline{v_I}) - Y(\underline{v_D}, \underline{v_I}).$$

Since the government's problem is twice continuously differentiable in both v_D and v_I then the objective has strictly decreasing differences if and only if $\frac{\partial^2}{\partial v_I \partial v_D} Y(v_D, v_I) < 0$ and/or $\frac{\partial^2}{\partial v_D \partial v_I} Y(v_D, v_I) < 0$.

By differentiation,

$$\frac{\partial^2}{\partial v_I \partial v_D} Y(v_D, v_I) = AK^\alpha \beta(\beta - 1)((1 - v_I)\lambda^*)^{\beta-2}((1 - v_I)\lambda^*_{v_D})((1 - v_I)\lambda^*_{v_I} - \lambda^*)$$

$$ + AK^\alpha \beta((1 - v_I)\lambda^*)^{\beta-1}((1 - v_I)\lambda^*_{v_I v_D} - \lambda^*_{v_D}) < 0,$$

(15)

where $\lambda^*_{v_D} > 0$, $\lambda^*_{v_I} > 0$ and

$$\lambda^*_{v_I v_D} = -\frac{\left[\left(\frac{1}{(1-v_D)(\overline{\theta}-\underline{\theta})}AK^\alpha\beta(\beta-1)\right)^2(1-v_I)(\beta-2)((1-v_I)\lambda^*)^{\beta-2}((1-v_I)\lambda^*)^{\beta-3}((1-v_I)\lambda^*_{v_I}-\lambda^*)\right](-\lambda^*_{v_I}-\lambda^*)}{\left(\frac{1}{(1-v_D)(\overline{\theta}-\underline{\theta})}AK^\alpha\beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2}(1-v_I)-1\right)^2}$$

$$-\frac{\frac{1}{(1-v_D)(\overline{\theta}-\underline{\theta})}AK^\alpha\beta(\beta-1)(\beta-2)((1-v_I)\lambda^*)^{\beta-3}((1-v_I)\lambda^*_{v_I}-\lambda^*)(-\lambda^*)}{\left(\frac{1}{(1-v_D)(\overline{\theta}-\underline{\theta})}AK^\alpha\beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2}(1-v_I)-1\right)^2} < 0$$

In addition,

$$\frac{\partial^2}{\partial v_D \partial v_I}Y(v_D, v_I) = AK^\alpha\beta((1-v_I)\lambda^*)^{\beta-1}(\lambda^*_{v_D v_I}) - AK^\alpha\beta((1-v_I)\lambda^*)^{\beta-1}(\lambda^*_{v_D})$$

$$+ AK^\alpha\beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2}((1-v_I)\lambda^*_{v_D})((1-v_I)\lambda^*_{v_I}-\lambda^*) < 0,$$

where

$$\lambda^*_{v_D v_I} = -\frac{\left[AK^\alpha\beta(\beta-1)(1-v_D)((1-v_I)\lambda^*_{v_I}-\lambda^*)\right]\left(AK^\alpha\beta(\beta-1)[((1-v_I)\lambda^*)^{\beta-2}]^2-(1-v_D)(\overline{\theta}-\underline{\theta})((1-v_I)\lambda^*)^{\beta-2}\right)}{\left((1-v_D)AK^\alpha\beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2}-(1-v_D)^2(\overline{\theta}-\underline{\theta})\right)^2}$$

$$-\frac{\left[AK^\alpha\beta(\beta-1)(1-v_D)((1-v_I)\lambda^*_{v_I}-\lambda^*)\right]\left(AK^\alpha\beta(\beta-2)((1-v_I)\lambda^*)^{\beta-1}((1-v_I)\lambda^*)^{\beta-3}\right)}{\left((1-v_D)AK^\alpha\beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2}-(1-v_D)^2(\overline{\theta}-\underline{\theta})\right)^2} < 0.$$

Given that the cross partial derivatives of λ^* with respect to v_D and v_I are negative and that the government's problem has strict decreasing differences, for $\beta < 1$, i.e. the production function exhibits decreasing returns to scale for labor, indiscriminate violence and discriminate violence are substitutes. Equations 14 and 15 establish that the level of indiscriminate violence is increasing in the regime's cost for discriminate violence. ∎

Proof of Proposition 3: For ease of readability, because capital and technology of production are both positive constants and therefore effect output and, by extension the government's utility, in the same direction, I group them before proceeding with the

comparative static results. Therefore,

$$X \equiv AK^\alpha.$$

Of interest if the relationship between v_D and X. Since v_D and v_I are substitutes, and increasing X cannot change the direction of the cross partials of λ^* with respect to both types of violence, determining the effect of X on one form of violence is sufficient. By the implicit function theorem,

$$\frac{dv_D^*}{dX} = -\frac{\beta((1-v_I)\lambda^*)^{\beta-1}((1-v_I)\lambda_{v_D}^*) + X\beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2}((1-v_I)\lambda_{v_D}^*)((1-v_I)\lambda_{v_A}^*)}{X\beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2}((1-v_I)\lambda_{v_D}^*)^2 + X\beta((1-v_I)\lambda^*)^{\beta-1}(1-v_I)\lambda_{v_D v_D}^* - c''(v_D)}$$

$$+ \frac{X\beta((1-v_I)\lambda^*)^{\beta-1}((1-v_I)\lambda_{v_D A}^*)}{X\beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2}((1-v_I)\lambda_{v_D}^*)^2 + X\beta((1-v_I)\lambda^*)^{\beta-1}(1-v_I)\lambda_{v_D v_D}^* - c''(v_D)}. \tag{16}$$

To sign this effect, I first sign λ_X^* and $\lambda_{v_D X}^*$. Again, by the implicit function theorem,

$$\frac{d\lambda^*}{dX} = -\frac{\frac{1}{(1-v_D)(\overline{\theta}-\underline{\theta})}((1-v_I)\lambda^*)^{\beta-1}}{\frac{1}{(1-v_D)(\overline{\theta}-\underline{\theta})}X\beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2}(1-v_I) - 1} < 0. \tag{17}$$

For $\lambda_{v_D X}^*$, by the quotient rule,

$$\lambda^*_{v_D X} = -\frac{\left((1-v_D)X\beta^2((1-v_I)\lambda^*)^{\beta-1}((1-v_I)\lambda^*)^{\beta-2}\right)(1-(\beta-1))}{\left(\frac{1}{(1-v_D)(\overline{\theta}-\underline{\theta})}X\beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2}(1-v_I)-1\right)^2}$$

$$+\frac{((1-v_D)\beta)\left[X\beta(\beta-1)^2\left(((1-v_I)\lambda^*)^{\beta-1}\right)^2((1-v_I)\lambda^*_X)\right]}{\left(\frac{1}{(1-v_D)(\overline{\theta}-\underline{\theta})}X\beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2}(1-v_I)-1\right)^2}$$

$$-\frac{((1-v_D)^2(\overline{\theta}-\underline{\theta})\beta)\left[((1-v_I)\lambda^*)^{\beta-1}+X(\beta-1)((1-v_I)\lambda^*)^{\beta-2}(1-v_I)\lambda^*_X\right]}{\left(\frac{1}{(1-v_D)(\overline{\theta}-\underline{\theta})}X\beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2}(1-v_I)-1\right)^2}$$

$$+\frac{((1-v_D)\beta)X\beta(\beta-1)(\beta-2)((1-v_I)\lambda^*)^{\beta-3}((1-v_I)\lambda^*_X)}{\left(\frac{1}{(1-v_D)(\overline{\theta}-\underline{\theta})}X\beta(\beta-1)((1-v_I)\lambda^*)^{\beta-2}(1-v_I)-1\right)^2}.$$

$$(18)$$

The sign of $\lambda^*_{v_D X}$ is ambiguous. Further, for a given $\lambda^*_{v_D X}$, the sign of $\frac{dv^*_D}{dX}$ is still unclear. Therefore, consider the following cases:

Case 1: $\lambda^*_{v_D X} > 0$ and $\frac{dv^*_D}{dX} > 0$.

For $\lambda^*_{v_D X} > 0$ to hold, $(1-v_D)^2(\overline{\theta}-\underline{\theta})\beta((1-v_I)\lambda^*)^{\beta-1}$ must be sufficiently small. This term carries the only negative sign in 18. Since the sign of $\lambda^*_{v_D X}$ relies on the magnitude of the terms summed in the numerator, if the negative effect of this term is dwarfed by the others, then $\lambda^*_{v_D X} > 0$. This gives some indication about how the scale upon which ideology is measured might affect the results of the model. For ideology normalized $[0, 1]$, then the sign of $\lambda^*_{v_D X}$ depends on the level of discriminate violence and the marginal product of labor.

For $\frac{dv_D^*}{dX} > 0$, the numerator of 16 must be positive. Given $\lambda_{v_D X}^* > 0$, the numerator of $\frac{dv_D^*}{dX}$ will be positive when

$$((1 - v_I)\lambda^*)^{\beta-1}\lambda_{v_D}^* + X((1 - v_I)\lambda^*)^{\beta-1}\lambda_{v_D X}^* > X(\beta - 1)((1 - v_I)\lambda^*)^{\beta-2}(1 - v_I)\lambda_{v_D}^*\lambda_X^*. \quad (19)$$

In this case, discriminate violence and improvements to the economy have a complementary effect on labor supply. That is, the labor for participation rate is increasing faster in the level of discriminate violence for a more developed economy. Overall, higher levels of economic development increase the level of discriminate violence.

Case 2: $\lambda_{v_D X}^* > 0$ and $\frac{dv_D^*}{dX} < 0$.

The argument for $\lambda_{v_D X}^* > 0$ is the same as above. For $\frac{dv_D^*}{dX} < 0$, the numerator of 16 must be negative, which holds when 19 is not satisfied. In this case, the complementarity between discriminate violence and economic development does not have a sufficient effect on the labor supply to make discriminate violence increase in X. In these parameter regions, economic development increases the level of indiscriminate violence.

Case 3: $\lambda_{v_D X}^* < 0$ and $\frac{dv_D^*}{dX} > 0$.

In this case $(1 - v_D)^2(\overline{\theta} - \underline{\theta})\beta((1 - v_I)\lambda^*)^{\beta-1}$ is large enough to change the sign of $\lambda_{v_D X}^*$, which changes the conditions under which $\frac{dv_D^*}{dX} > 0$. This only holds when

$$((1 - v_I)\lambda^*)^{\beta-1}\lambda_{v_D}^* > X((1 - v_I)\lambda^*)^{\beta-1}\lambda_{v_D X}^* + X(\beta - 1)((1 - v_I)\lambda^*)^{\beta-2}(1 - v_I)\lambda_{v_D}^*\lambda_X^*. \quad (20)$$

In this range of parameters, the effect of discriminate violence on labor force participation is reduced in developed economies, but higher levels of development still prompt the regime to employ higher levels of discriminate violence.

Case 4: $\lambda^*_{v_D X} < 0$ and $\frac{dv^*_D}{dX} < 0$.

In this case, $(1 - v_D)^2(\overline{\theta} - \underline{\theta})\beta((1 - v_I)\lambda^*)^{\beta-1}$ is large and 20 is not satisfied. Higher levels of development not only diminishes the effect of discriminate violence on labor force participation, it also prompts a government to rely more on indiscriminate violence. ∎

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