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Coercion, Conflict, and Commodities

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Abstract

In this paper, I develop a general equilibrium model of violence to explain observed variation in coercive practices in conflict zones. Armed groups own land in the resource sector and allocate military resources between conflict and coercion, which assigns *de facto* ownership over land and labour respectively. If find that coercion is higher if labour is scare relative to land, if production is labour-intensive, or if one group is dominant relative to others. Furthermore, the impact of the price of the commodity depends on the distribution of military strength: coercion increases with price if one group is dominant, but this effect is potentially reversed if military power is highly decentralised. These results are consistent with historic cases of the rise in serfdom in 16^{th} century Russia, different coercive regimes in the rubber plantations in Amazonia and the Congo Free State 19^{th} century, and also variation in coercion during the Sierra Leonean Civil War and in the eastern provinces of the Democratic Republic of Congo. Results of the model have implications for both trade and military policy. Trade policy aimed at reducing domestic commodity prices could actually lead to an increase in coercion. Similarly, a cease-fire agreement between armed groups can be interpreted as a form of collusion, as military resources are redirected from conflict to coercion.

Key Words: conflict, coercion, slavery, natural resources

JEL: D21, D23, D24, D41, D74, N37, N47, N57, Q34

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"with minor exceptions, the objective of military activity is either to secure access to mining sites or ensure a supply of captive labour"[1]

1 Introduction

Coercion is common in current day conflict areas. Armed groups restrict civilian movements in order to force them to work on their farms and mines. During the protracted civil war in Sierra Leone, for example, whole villages were transformed into forced labour camps: civilians worked in the rice plantations and were killed if they tried to escape (Keen, 2005). A recent survey reveals that a striking 28% of villages were subjected to such conditions at some point during the war.[2] This practice was so pervasive that some claim "more died from starvation whilst working on the rice farms than were killed by combatants" (Keen, 2005:43). Yet, armed groups do not always coerce. In the ongoing conflict in the Kivu provinces in eastern Democratic Republic of Congo, for example, there are many accounts of armed groups taxing and trading with civilians, without restricting their movements (United Nations Security Council, 2009, 2010).

Why do armed groups sometimes coerce labour and sometimes not? If we better understand the economic and institutional forces that potentially explain variation in coercive practices, we can hope to design better policies to influence it. Two policies available to the international community are trade sanctions and military interventions. Human rights groups have successfully lobbied against purchase of commodities from conflict zones, such as the 'blood diamonds' in Sierra Leone and 'blood phones' from the Kivu provinces today. There are currently 16 peacekeeping operations in the world.[3] However, it is unclear how these interventions will impact civilians conditions on the ground. A theoretical model is required to identify the mechanisms through which armed groups respond to changed economic and military conditions.

To answer this question I combine a two-sector general equilibrium trade model, as in Mussa (1974) and Neary (1978), with a model of violence, as depicted in Figure 1. Two armed groups own land in the resource sector and simultaneously decide on the level of employment and the allocation of military resources between coercion and conflict, which captures more labour and land respectively. An asymmetric contest success function, as used by Grossman and Kim (1995) and discussed by Clark and Riis (1998), maps the conflict levels of each armed group to land ownership in the resource sector. Coerced civilians work for free in the resource sector. Free civilians own land in the yeoman sector and decide which sector to work in. Land is specific

[1] The 2002 United Nations Panel of Experts Report on armed group activity in the Kivu provinces, Democratic Republic of Congo

[2] Of 237 villages surveyed, 77 report that the rebels formed a base at their village at some point during the year. Of these villages, 67 claim that they were forced to work for the rebels and were not allowed to leave.

[3] `https://www.un.org/en/peacekeeping/operations/current.shtml`, retrieved 28 March 2013

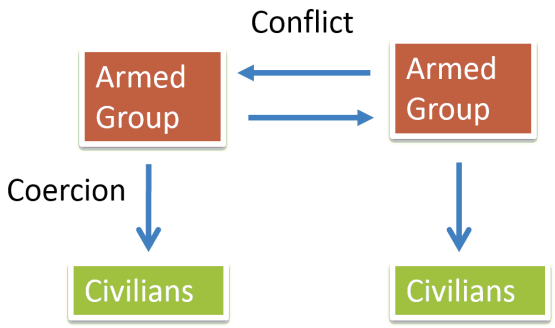

Figure 1: Armed groups can either fight each other for control over land or coerce civilians in resource extraction

to each sector.

Three main results emerge from the model. First, coercion depends on the factor and resource endowments in the economy. Coercion is higher when labour is scarce, or production is more labour intensive. In both cases, free civilians can demand a higher wage, which makes coercion more attractive.

Second, coercion depends on the distribution of military strength. Coercion is higher when one group is dominant relative to others. Armed groups face a social dilemma in their conflict decisions, which is mitigated by a strong group. They would prefer not to fight each other and allocate all their resources to coercion; yet, each group fights in anticipation that the other will do the same. A stronger group is more willing to reduce its own level of conflict, because it is less vulnerable to attack from the weaker group.

Third, coercion depends on the interaction between the economy and the military. Previous work (Acemoglu and Wolitzky, 2011) suggests that coercion is higher if the commodity is more valuable. I find this result holds, but only if one group is sufficiently dominant or production is sufficiently labour intensive. At a higher price both coercion and conflict become more attractive, because the values to both land and labour increase. If production is very land intensive then the rental rate is more responsive to price than the wage rate, so conflict becomes more attractive relative to coercion. If military power is very decentralised then conflict is very responsive to price, thus drawing military resources away from coercion.

Results of this model are consistent with examples where coercion varied due to an exogenous change in factor endowments, military strength, price, or the type of commodity (Table 1). First, economic historians have shown that the use of slavery depended on the relative factor endowments in an economy. Domar (1970) and Nieboer (1910) argued that serfdom reemerged in Russia in the 16th and 17th centuries due to Russian conquests, which lead to abundance of land relative to labour. Similarly, Austin (2005, 2009) and Fenske (2011, 2013) partly attribute the pervasive use of slavery in pre-colonial West Africa to scarcity in labour.

Context	Variation in Coercion
19^{th} century rubber boom	Large increase in the Congo Free State, but mall increase in Amazonia
Sierra Leone Civil War	Coercion in the rice plantations, but not in the diamond mines
Kivu Province, Democratic Republic of Congo	Coercion in the coltan mines before 2002, but none today

Table 1: Variation in Coercive Practices

Second, coercion decreased in the Kivu provinces in the Democratic Republic of Congo (DRC) after the Rwandan Army evacuated the area in 2002. The Rwandan Army was by far the strongest armed group in the area—it had an estimated 20,000 troops. After its departure many smaller groups filled the vacuum of power. Military power thus became more decentralised, with no group strong enough to allocate many resources to coercion.

Third, the rubber boom in the late 19^{th} century lead to a very coercive regime in the Congo Free State (Hochschild, 2011), but to a less extent in Amazonia. In the Congo Free State the Belgian *Forces Publique* was the strongest armed group in the area and therefore did not need to allocate military resource towards defending their land. In contrast, in Amazonia there was a long-standing conflict between Portuguese and Spanish colonies, which intensified during the rubber boom (Barham and Coomes, 1994b). Landlords attempted to restrict movements of labour but were unsuccessful (Barham and Coomes, 1994a), possibly because all military resources were allocated to conflict.

Finally, during the civil war in Sierra Leone there were many accounts of coercion in the rice plantations, but no such evidence in the diamond mines. Bellows and Miguel (2006) find that civilian victimization was actually *less* in the diamond-rich areas compared to the rest of the country, even though number of attacks and battles were higher. Since land was the valuable factor of production in diamond rich areas all military resources were allocated to conflict, not coercion.

These results have implications for both trade and military policy. Peace is not necessarily good for civilians. Cease-fire agreements can interpreted as collusion between armed groups to redirect their resources towards coercion. The presence of peace-keeping forces could make it easier for armed groups to collude by increasing the cost of conflict. A peacekeeping force therefore needs to be combined with a process of disarmament if it wants to contain violence against civilians. Furthermore, a reduction in commodity prices could actually lead to an increase in coercive practices if military power is very decentralised or production is not very labour intensive.

A key contribution of this chapter is to draw a distinction between two substitutes in

violence, conflict and coercion. Previous theoretical research has looked at either conflict or coercion (Acemoglu and Wolitzky, 2011; Lagerlöf, 2009), but none have looked at the interaction between the two. This distinction is important, since it picks up a critical trade-off faced by armed groups in modern day conflict zones. With no strong state to enforce a monopoly over violence, armed groups can prey on unarmed civilians, but they are also always under threat of attack from other groups.

This study is different to previous theoretical work on predation (Garfinkel and Skaperdas, 2007; Grossman, 1991; Skaperdas, 1992), in that violence is aimed at owning the factors of production rather than total output. Two recent papers also incorporate endogenous change in factor prices in a model of violence. Dal Bó and Dal Bó (2011) show that the impact of product price on conflict depends on the relative labour intensities of production, which was empirically confirmed by Dube and Vargas (2013). McLaren (2008) shows how conflict and poverty can reinforce each other: "a shortage of jobs promotes war, but war also creates a shortage of jobs". In contrast, I model violence aimed at two different factors of production, labour and land.

This chapter proceeds as follows. Section two introduces the model. Section three presents results. Section four relates the results back to the case studies. Section five concludes.

2 Model

2.1 Set-up of model

Consider a two commodity three factor economy. Civilians, in the 'yeoman sector', produce a subsistence good, Y. Armed groups in the 'resource sector' produce a natural resource, R. Both sectors have a Cobb-Douglas production function:

$$Y \equiv F\left(T_Y, L_Y, \sigma\right) = T_Y^{1-\sigma} L_Y^{\sigma} \text{ and } R \equiv G\left(T_R, L_R, \beta\right) = T_R^{1-\beta} L_R^{\beta}$$

Armed groups and civilians are endowed with T_R and T_Y units of land respectively. Land is specific to each commodity. Total quantity of labour used in both sectors is equal to the fixed aggregate supply of labour: $L = L_Y + L_R$.[4] The price of R is p_R and the price of Y is normalised to 1. The labour market is perfectly competitive so both armed groups and civilians take the market wage, w, as given.

I lay out the model in two stages. I first discuss a limiting case where there is only one armed group. Next I introduce the full model, where there are two armed groups who also fight each other for ownership over land. The baseline model serves two purposes. First, it helps

[4]Unsurprisingly, conflict zones are characterised by low levels of capital. The economy thus consists mostly of artisanal mining or agricultural production

us separate mechanisms by looking at the incentives for coercion in the absence of conflict. Second, the simpler model is interesting in its own right, as there are many historic cases of coercion that the simpler model can explain.

2.1.1 Baseline Model: One Armed Group

In the baseline model there is only one armed group that owns all land, T_R. The armed group simultaneously chooses the level of employment, L_R, and the level of coercion, c, which provides $L_C(c) = \phi c$ workers, where ϕ is a measure of the 'exportability' of labour. The cost of coercion is $\psi(c) = \psi c^2/2$. Coerced civilians, L_C, work for armed group at zero wages and the remainder, $L_R - L_C$ are paid market wage, w. Free civilians, $L - L_C$, decide between farming for themselves or renting out their labour to armed groups. Equilibrium is thus characterized by the following:

$$\max_{c,L_R} p_R G(T_R, L_R, \beta) - w(L_R - L_C(c)) - \psi c^2/2$$

$$\max_{L_Y} F(T_Y, L_Y, \sigma) + w(L - L_C(c) - L_Y)$$

Subject to $L_C < L_R$[5]

2.1.2 Full Model: Competing armed groups

In the full model there are 2 armed groups who fight each other for ownership over land in the resource sector. Total endowment of land in the resource sector is T_R. Group i decides on the number civilian workers, L_R^i, the level of coercion, c_i, which captures $L_C^i(c_i) = \phi c_i$ workers, and the level of fighting, f_i, which assigns a proportion $\pi(f_i, f_{-i})$ of land to group i, based on the following contest success function:

$$\pi(f_1, f_2) = \frac{\alpha f_1}{\alpha f_1 + (1-\alpha) f_2} \text{ and } \pi(f_2, f_1) = \frac{(1-\alpha) f_2}{\alpha f_1 + (1-\alpha) f_2}$$

α captures the degree of asymmetry in military strength. If $\alpha = 1$ or $\alpha = 0$ then one group has all the strength and we are back in the limiting case of one armed group. The joint cost of conflict and coercion is $\Psi(c_i, f_i) = \psi_i (c_i + f_i)^2/2$. $(c_i + f_i)$ can be interpreted as the total number of soldiers that are allocated to conflict and coercion, where ψ_i indicates the cost of recruiting more soldiers,[6] which could vary due to factors such as external sources of financing. Free civilians, $L - \sum L_C^i(c_i)$, decide which sector to work in. Further define:

[5]This condition means that armed groups cannot sell coerced labour.

[6]Convex costs can be attributed to the difficulty in maintaining control and disciplining soldiers as the size of the army increases.

$T_R^i(f_i, f_{-i}) = \pi(f_i, f_{-i}) \cdot T_R$. Equilibrium is thus now characterized by the following:

$$\max_{L_i, c_i, f_i} p_R G(T_R^i(f_i, f_{-i}), L_R^i, \beta) - w(L_R^i - L_C(c_i)) - \Psi(c_i, f_i)$$

$$\max_{L_Y} F(T_Y, L_Y, \sigma) + \left(L - \sum L_C^i(c_i) - L_Y\right) w$$

subject to the constraints, $L_C^i(c_i) \leq L_R^i$. I further define total labour in the resource sector as $L_R = \sum L_R^i$ and the marginal rate of transformation between conflict and coercion:

$$\kappa_i(c_i^*, c_{-i}) = \frac{\partial T_R^i(f_i, f_{-i})}{\partial L_C^i(c_i)} \cdot \frac{\partial c_i}{\partial f_i}$$

2.1.3 Motivation of assumption

In this sub-section I further motivate some of the assumptions of the model.

First, I assume there is a trade-off between the two dimensions of violence, conflict and coercion. Coercion requires monitoring of civilians to make sure they don't escape, soldiers and guns that could have been used against opponents. The more guns that are pointed at civilians the less can be pointed at other armed groups. For example, Keen (2005:43) notes that the forced labour camps in Sierra Leone were "kept under close surveillance". Further evidence to this trade-off is in the contested Karen region in Burma, where coercion increased after a cease-fire agreement was signed: "[s]ince an informal cease-fire in January 2004, there has been comparatively little fighting ... [armed groups] have focused their energies more on oppressing the civilian population" (Karen Human Rights Group, 2006)

Second, I assume that armed groups employ labour, although in practice armed groups often tax output in areas under their control (United Nations Security Council, 2009, 2010). In this model there is no distinction between setting a tax rate or choosing a level of employment: taking a share of output is the same as taking all output and then paying a portion of this back to labour.[7] The insight remains that armed groups can only increase tax or decrease wages up to the point where civilians want to leave.

Third, there is no labour market for soldiers. This is a more realistic assumption, because the number of soldiers that a rebel leader can recruit depends on a list of non-market factors such as ethnicity, local grievances, external support, or the charisma of a rebel leader. For example, in a survey of ex-combatants in Sierra Leone, Humphreys and Weinstein (2004) conclude that "voluntary recruits rarely joined for ... financial reasons and received little or no share of the loot".

Fourth, land is specific to each sector. Not all land is endowed with the same natural re-

[7]For example, if $G(T_R, L_R) = L_R$, then a wage rate, w, is the same as a tax rate, $\tau = \frac{p_R - w}{w}$

sources. Furthermore, even if land were fungible between resources, the proliferation of violence restricts the development of a rental market for land.

Fifth, armed groups only operate in one sector. Economic motives will keep armed groups in the more lucrative sector. However, the model also directly applies to settings where both civilians and armed groups produce the same commodity (as for example rice farming in the diamond-poor regions of Sierra Leone). This is still a two sector model, because the production function and prices could vary due to differences in market access and capacity to make use of economies of scale.

3 Analysis

3.1 Baseline Model: Monopoly armed group

I discuss first the results of the baseline model—the limiting case where there is no conflict between armed groups. For exposition purposes I make the further simplifying assumption that both sectors face the same production function, $\sigma = \beta$.

3.1.1 Solution

The equilibrium is best described graphically as in Figure 2. The x axis is total labour in resource sector. At the origin, all labour is in the yeoman sector and no labour in the resource sector. Moving to the right along the x axis labour moves from the yeoman to the resource sector up to point L where all labour is in the resource sector. The downward sloping curve is the marginal value product of labour in the resource sector, $V_R \equiv p_R G_2\left(T_R, L_R, \beta\right)$; and the upward sloping curve is the marginal value product of labour in the yeoman sector, $V_Y \equiv F_2\left(T_Y, L - L_R, \sigma\right)$. V_Y is also the labour supply curve in the resource sector. This is because armed groups need to pay free civilians at least their reservation wage, which is determined by the returns to subsistence farming.

It is useful to first look at equilibrium in absence of coercion. The far left diagram in Figure 2 shows the standard Ricardo-Viner solution. Labour, L_R, enters the resource sector until the point A, where the two marginal value product labour schedules are equalized:

$$p_R G_2(T_R, L_R^*, \beta) = F_2(T_Y, L - L_R^*, \sigma) \tag{1}$$

The equilibrium wage rate, w, is therefore V_Y evaluated at the equilibrium level of employment, L_R^*.

Next, I introduce coercion. The equilibrium depends on whether the constraint, $L_C \leq L_R$, binds or not. I refer to the situation when the constraint does not bind as **Case A** (centre

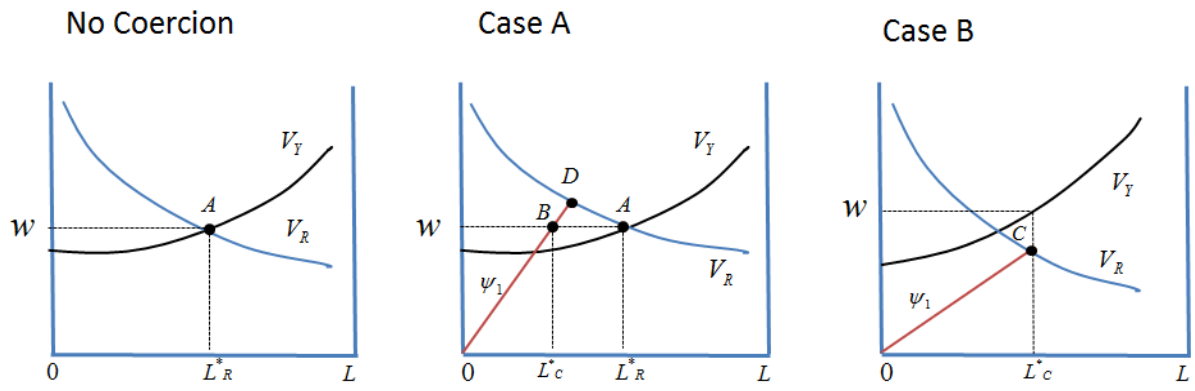

Figure 2: In **Case A**, armed groups coerce up to the point where it becomes cheaper to employ civilians. With **Case B**, it never becomes cheaper to employ civilians.

diagram in Figure 2). In this case there is both forced and free labour in the resource sector. The market wage is determined in equilibrium by Equation (1), just as in the standard model with no coercion. The marginal benefit of coercion is the market wage rate, w: the cost that would have been paid if a civilian were freely employed. Armed groups therefore coerce up to point B where the marginal cost of coercing an additional unit of labour is equal to the market wage rate:

$$c^* = \frac{\phi}{\psi}\beta\left(T_Y/L + p_R^{\frac{1}{1-\beta}}T_R/L\right)^{1-\beta} \tag{2}$$

It is in this sense that we can say that coercion results in the ownership of labour: all rents that would have accrued to labour, w, now accrue to the armed group. Note that armed groups do not coerce up to point D, where the marginal product of labour of coerced labour is equal to the marginal cost of coercion. Point D is not in equilibrium, since armed groups still wish to employ free workers. Civilians freely enter the resource sector up to point A, which determines the equilibrium wage rate. As more enter the resource sector the reservation wage decreases (a movement along the V_R curve), which determines the returns to coercion.

Consider next **Case B** (far right in Figure 2) when the constraint $L_C \leq L_R$ binds. In this case it is never cheaper for armed groups to employ civilians and all labour in the resource sector is coerced. Armed groups coerce up to point C, where the marginal cost of coercion is equal to the marginal revenue product of labour: $c^* = p_R G_2\left(T_R, L_C\left(c^*\right)\right)$, which simplifies to:

$$c^* = \left(\frac{\phi}{\psi}p_R T_R^{1-\beta}\right)^{\frac{1}{2-\beta}}.$$

Under **Case B**, the marginal benefit of coercion is no longer the cost of labour, w, since there is no longer a market for free labour. The marginal benefit of coercion is now the productivity of labour in the resource sector, V_R. Note that production is inefficient under **Case B**, since total

labour in the resource sector is above the optimal level of employment in a perfectly competitive equilibrium without coercion. Total output would therefore be higher in the absence of coercion. Yet, armed groups still find coercion more profitable. The efficient outcome is not realised, since prices are distorted: armed groups pay a price, ψ/ϕ, for labour, which is lower than the market wage. As a result, there is over-production in the resource sector.

From Figure 2, it is easy to see that **Case B** occurs when the marginal cost of coercion remains low, or when the yeoman sector is very productive, relative to resource sector.

3.1.2 Results

Comparative statics depend on whether the constraint $L_C \leq L_R$, binds or not.

Proposition 1 *Coercion depends on the* ***nature of the economy****. In Case A, coercion is higher if:*

1. *Labour is scarce, relative to land*
2. *Production in either sector is more labour intensive*
3. *The price of either commodity, p_R or p_Y, increases.*

In Case B, coercion is higher if p_R increase or if production in the resource section is more labour intensive.

Proof. All proofs are in the appendix, unless otherwise stated. ■

With **Case A** (Figure 3), the marginal benefit of coercion is wage rate, w, since the armed group trades off paying for labour or coercing labour. Coercion is more attractive when labour is more expensive. Civilians can earn a higher wage if labour in the yeoman sector is more valuable (left-hand side of Figure 3), either due to more productive labour, F_2, or more valuable produce, p_Y. Labour is more productive when it is scarce relative to land, or if production is more labour intensive. I define production as more "labour intensive", if labour contributes to a larger share of production given factor utilisation. In the case of a Cobb-Douglass production function this would mean a higher β.

Furthermore, the equilibrium wage is also higher when the price or endowment of land in the resource sector increases (right-hand side of Figure 3). This is because a more lucrative resource sector will attract labour away from the yeoman sector. As labour enters the resource sector the remaining labour in the yeoman sector becomes more productive due to a lower labour/land ratio.

In **Case B** (Figure 4, on the following page), coercion no longer increases with w. Coercion now depends on the productivity of labour, V_R, not the cost of labour. In this case, a change

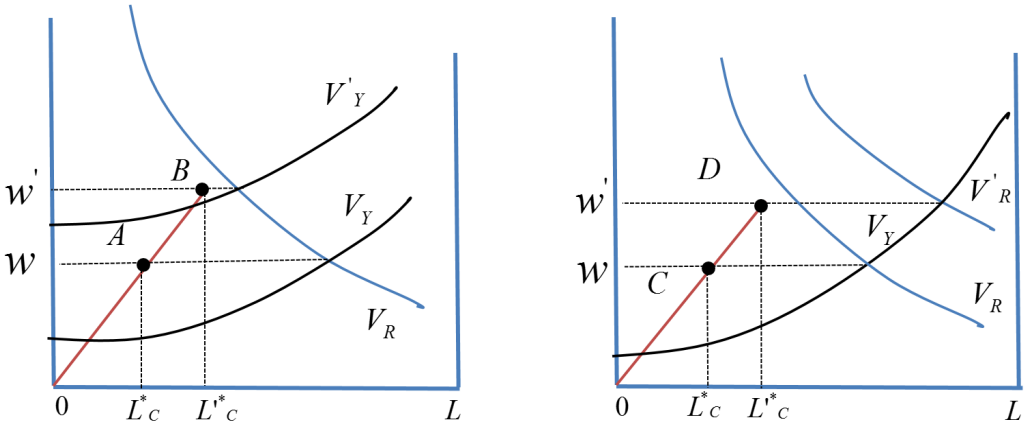

Figure 3: In the **Case A**, the level of coercion increases with the wage rate. The wage rate increase if either V_R or V_Y shift up

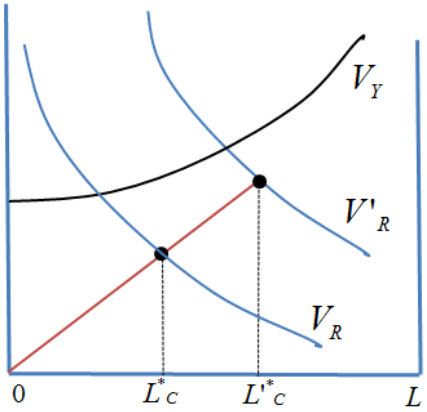

Figure 4: In **Case B**, coercion increases when V_R shifts up, but not with V_Y.

in the value to labour in the yeoman sector will have no impact on the level of coercion. The total supply of labour, L, and endowment of land in the yeoman sector, T_Y, therefore has no impact on the level of coercion.

3.2 Full Model Competing Armed groups

I now move to the full model where each armed group decides on both the level coercion, c_i, and conflict, f_i, at a joint cost $\Psi(c_i, f_i)$. I restrict discussion to the interior solution, where the constraints, $L_C^i(c_i) \leq L_R^i$, hold. I no longer assume that $\sigma = \beta$.

3.2.1 Solution

The only difference to the baseline model is that armed groups now also fight each other for control over land. Since there is a trade-off between conflict and coercion, the cost of coercion

is now the opportunity cost of not fighting.

I first determine equilibrium factor prices. Both armed groups face the same wage rate, w, which is the value marginal product of labour in every sector, evaluated at the equilibrium level of total employment in the resource sector, L_R^* (as before defined by Equation (1)). Furthermore, both armed groups face the same implicit rental rate, $r = p_R G\left(T_R, L_R^*\right)$, the equilibrium marginal revenue product of land in the resource sector. r is the value to owning land, since the total revenue that accrues to each armed group, in absence of any coercion, is $T_R^i r$.[8] Note that w and r are independent of each armed group's decision to fight or coerce, because employment by each group adjusts to equalize the marginal revenue products of labour. This significantly simplifies analysis, since we can look at the choice of violence in absence of its impact on factor prices.

As before, the marginal benefit of coercion is the wage rate, w. Furthermore, fighting secures ownership over land so the marginal cost of coercion is: $\kappa\left(c_i^*, f_i, f_{-i}\right) \cdot r$, where κ is the total land that an armed group can capture if it foregoes one unit of coerced labour. The equilibrium level of coercion is therefore succinctly defined by the following equations:

$$w - \kappa\left(c_i^*, c_{-i}\right) \cdot r = 0 \tag{3}$$

which yields the following lemma.

Lemma 1 *Equilibrium level of coercion for each armed group, c_i^*, is:*

$$c_i^* = \left(\frac{\psi_1 + \psi_2}{\psi_1 \psi_2}\right) \phi w - \alpha\left(1 - \alpha\right) \left(\frac{1}{\phi}\right) \left(\frac{r}{w}\right) T_R \tag{4}$$

3.2.2 Results

It is evident from Equation (3) that the decision to coerce depends on the nature of the economy, the technologies of violence, and the distribution of military strength. I discuss first the impact of the distribution of military strength on the level of coercion, then the impact of the interaction between the economy and the military.

Proposition 2 *Coercion depends on the **distribution of military strength**: coercion is higher if one group is dominant relative to the other*

Proof. Inspection of Equation (4) ■

Equation 4 shows that coercion is smaller if the groups are of equal strength. Due to strategic fighting, armed groups resemble oligopolist producers of violence. They would prefer not to fight each other and allocate all their military resources to coercion. However, this is

[8] $T_R^i r = p_R G\left(T_R^i, L_R^i\right) - w L_R^i$

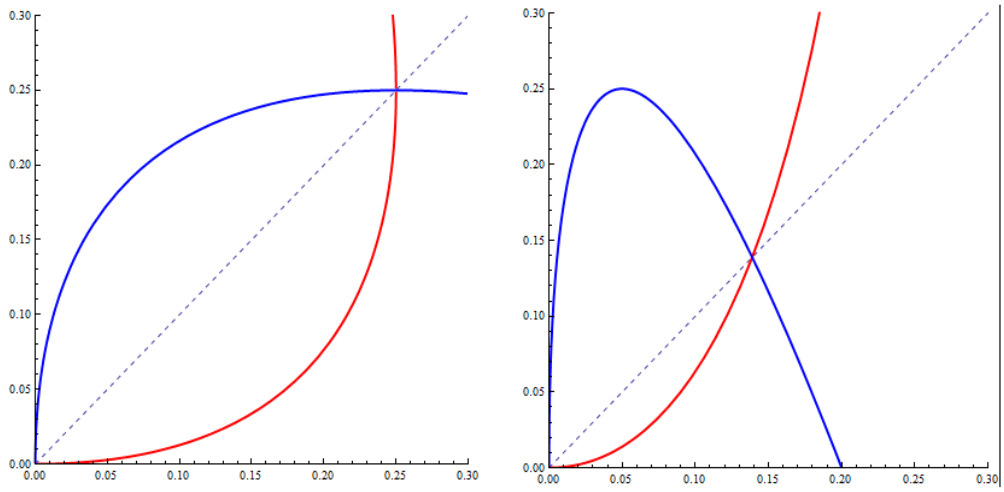

Figure 5: Reaction functions in conflict. In the left hand side, the groups are of equal strength. In the right hand side, one group—the red line at the bottom—is stronger relative to the other

not in equilibrium. Each group wants to fight if the other does not, but needs to fight by more in anticipation that the other will do the same.

If there is one strong armed group it has more 'market power' in the production of violence. The strong group need not increase its fighting by much, as it less vulnerable to the other group's decision to fight. Total coercion in the economy is therefore higher if military power is centralised in one group.

Graphically, the left-hand-side and right-hand-side graphs in Figure 5 show the reaction functions if two groups have symmetric and asymmetric strength respectively. Two forces at play. Armed groups' conflict decisions are strategic compliments at low levels of conflict, but strategic substitutes at high levels. Both these effects are dampened for the stronger group (bottom line). He is less responsive to the weak group's level of conflict, because it has less influence on his own ability to capture land. For the same reason the weaker group (top line) is more responsive. Furthermore, the switch from compliments to substitutes also happens at a lower level of fighting for the weaker group, because he is more responsive. The net effect is that total conflict in the economy is lower.

A more intuitive way is to interpret the strategic element of conflict as defensive fighting. Imagine that each group has to at least match the other group's level of conflict if it wants to defend its land. If military power is concentrated in one group, the strong group needs fewer resources to defend its land and can allocate the remainder to coercion. Furthermore, since the strong group allocates fewer resources to conflict, the weaker group can do the same. However, if the groups are of equal strength then each group has to allocate more resources to conflict to defend itself.

Proposition 3 *Coercion depends on the* ***interaction between the economy and military****.*

Coercion increases with price if:

- *Production is very labour intensive or*
- *Military power is centralised in one group*
- *Labour is easily exploitable*

Next, I discuss the impact of the economy on coercion. Comparative statics with regards to factor endowments and the labour intensity of production remain the same as in the baseline model. A higher endowment of land relative to labour or more labour intensive production leads to an increase in w, at the expense of r, shifting military resource to coercion.

The key difference to baseline model is that the impact of the resource price, p_R, on coercion is now ambiguous. This is because, as price increases, both the value to land and labour, w and r, increase, so coercion becomes both more attractive and expensive. The net effect depends on how responsive the factor prices are to a change in price and the relative effectiveness of conflict relative to coercion.

First, coercion decreases (increases) with price if production is sufficiently land (labour) intensive. This is because the rental (wage) rate is more responsive to a change in price, if the marginal product of land (labour) is higher.

Figure 6 shows this result graphically. The diagram on the top right-hand side shows the marginal value product curves of labour, similar to Figure 2. The bottom graph on the right-hand side shows the marginal revenue product of land. At a higher price, both the marginal value product of labour and the marginal revenue product of land in the resource sector (V_R and r) shift up, labour moves into the resource sector, and the equilibrium wage and rental rates are higher. The dotted curve on the right-hand side indicates a large increase in the marginal revenue product of land, as would be the case if production is very land intensive. The left-hand side shows the equilibrium level of coercion, as defined by Equation (3). The purple line indicates a scenario where coercion decreased resulting from a large increase in the rental rate. The red line indicates a scenario where coercion increased, due to a small increase in the rental rate.

Second, coercion decreases with price if military power is sufficiently decentralised, because conflict is more responsive to the rental rate. The intuition follows from the discussion of Proposition 2. If the price increases both groups want to fight more both because fighting is more profitable, and in anticipation that the other group will do the same. Strategic fighting thus amplifies the impact of price on conflict. However, a more powerful group is less responsive to the other group's increase in conflict, because it is less vulnerable to attack from a weaker group. It is thus able to keep the total level of conflict down. This is result is perhaps best

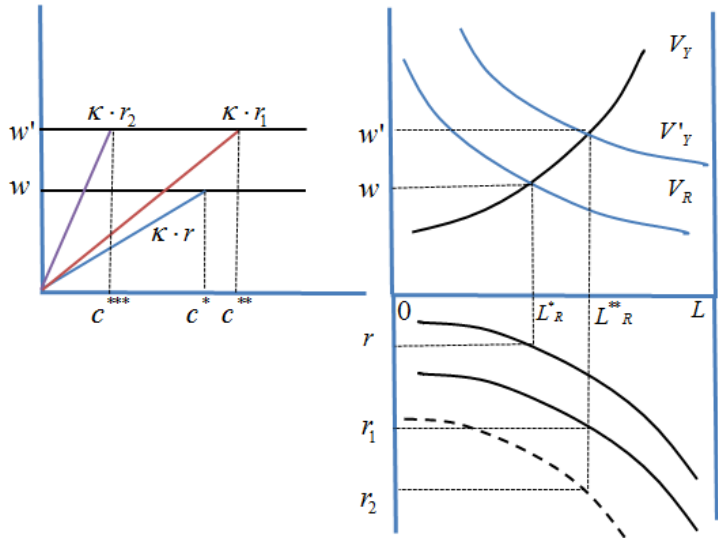

Figure 6: A higher price shifts up both the marginal value product of labour, V_R, and the marginal revenue product of land in the resource sector, r. Both the marginal cost and benefit of coercion thus increase. Coercion decreases with price, if there is a large increase in r, relative to w.

understood in the limiting case, where $\alpha \to 1$ or $\alpha \to 0$. We are again in a situation with only one armed group and coercion then depends only on wage rate, w.

Third, the comparative statics also depends on the technologies of violence. Coercion is higher and conflict lower if labour is more exploitable (high ϕ). Furthermore, conflict is also less responsive to price if labour is more exploitable, because conflict is less effective relative to coercion. As a result, an increase in price can only lead to an increase in total coercion if labour is sufficiently exploitable.

4 Case Studies

In this section I discuss case studies that relate to the three propositions of the model.

Proposition one (coercion depends on factor endowments) is supported by historical accounts of slavery. According to Domar (1970) and Nieboer (1910) serfdom reemerged in Russia during 16^{th} and 17^{th} centuries, due to a scarcity of labour relative to land brought on by foreign conquests. Civilians' marginal product of labour was higher and as a result they started demanding higher wages. It was thus in the interest of landlords to forcibly restrict the movements of peasants. Similarly, Austin (2005) and Fenske (2011, 2013) argue that low population densities explain the prevalence of coercive labour markets in pre-colonial West Africa.

Proposition two (coercion is higher if one group is stronger relative others) provides an explanation for the reduction in coercion in the Kivu provinces in the Democratic Republic of Congo. According to the UN Panel of Expert Reports (2002), "a variety of forced labour

regimes are found at sites that have been managed by [Rwandan Army] mining détachés". Yet, a detailed reading of all UN Panel of Expert Reports in the past decade (the most credible source of information on armed group activity in the area) does not reveal any accounts of such coercion today. A possible reason for the reduction in coercion is the evacuation of the Rwandan Army in 2002, due to peace agreement between the Democratic Republic of Congo and Rwanda.[9] The Rwandan Army was stronger than any other group in the area: it had an estimated 20,000 troupes. It was thus able to allocate a higher proportion of military resources to coercion, since the threat of conflict from other groups was low. When the Rwandan Army departed, there was a proliferation of smaller armed groups. These groups were more vulnerable to attack from each other and thus had to allocate a larger share of resources to conflict.

As for proposition 3, two case studies demonstrate how the impact of the price of the commodity depends on the military landscape. First, the sharp increase in the global price of rubber in the late 19^{th} century provides a useful natural experiment for how an increase in price can have a different impact on coercion depending on underlying institutional factors. The rubber price boom in 1890 was caused by a surge demand after to the invention of the tire. Supply responded slowly since rubber plantations take decades to cultivate. As such, the areas in the world that had a supply of wild rubber—in particular, Amazonia in South America and the Congo Free State in central Africa—profited immensely from tapping rubber. However, the coercive regimes that developed in the two regions differed dramatically.

In the Congo Free State a brutal coercive system of "unexampled horror and brutality" emerged (Doyle, 1909). According to a testimony by a young officer in the area, "formerly the natives were well treated, but now expeditions have been sent in every direction, forcing natives to make rubber and to bring it to the stations." Belgian officials were posted throughout the colony. They would dispatch a local Congolese who has received some military training to the neighbouring villages, who requests a quota of rubber from each able villager. If the local does not bring in the required amount of rubber he gets killed; if he flees, his family gets killed.

In contrast, the labour relationships that developed in Amazonia were not nearly as coercive. There was a famous case of coercion in the Putumayo district, in current Peru (Hardenburg, 1912). However, Barham and Coomes (1994a) argue that this was a very rare case and that tapping of rubber actually "provided substantial surplus to local participants", due to low supply and high mobility of labour. The landlords wanted to coerce more labour: they passed legislation to place restrictions on labour. However, this was never adequately enforced.

A possible reason for the highly coercive regime in the Congo Free State, in contrast to Amazonia, is the difference in the distribution of military powers in the two regions. In the Congo Free State, the Belgian army was the only viable military force. In Amazonia, there was a long-standing conflict between the Spanish and Portuguese colonies, which intensified during

[9]UN Nations Security Council Press Release, 2002, SC/7479

the rubber boom. This conflict required "extraordinary expenditures of state funds" (Barham and Coomes, 1994b:96), so less military resources remained for coercion.

As a second example, during the Civil War in Sierra Leone, armed groups created forced labour camps in the rice plantations.[10] However, there are no such accounts of systematic coercion in the diamond mines. Bellows and Miguel (2006) find that the chiefdoms with more diamond mines experienced more attacks and battles, even though civilian was lower in diamond-rich areas. A possible interpretation for this is that military resources were allocated to conflict and not coercion, because land is the valuable factor in diamond rich areas and not labour.

Although suggestive, none of these case studies can be considered conclusive proof. There were a lot of other differences between Amazonia and Congo Free State, and not only military strength. In Sierra Leone the commodities—rice and diamonds—also differ in the technology of production. Coercion might be higher in rice plantation because production is more labour intensive or the resource more diffuse. In the Kivu provinces, the accounts of coercion also coincided with the spike in the price of coltan in 2000 and 2001. Since the evacuation of the Rwandan army coincided closely with the drop in the coltan price, it is hard to discern between the two effects.

However, the combination of all these examples tell a convincing story that armed groups make strategic decisions between conflict and coercion, and this decision is driven, in part, by a change in factor prices and the anticipation of other armed groups' use of violence.

5 Conclusion

In this chapter I combined a simple two-sector trade model with a model of violence to explain variation in coercive practices employed by armed groups. Armed groups operate in the resource sector and decide how to allocate military resources between conflict and coercion, to capture land and labour respectively. I showed how coercion depends on both the nature of the economy and the distribution of military strength. First, coercion is higher if production is labour intensive or labour is scarce relative to land. Second, coercion is higher if one group is dominant relative to the others. Third, the impact of the price of the resource on coercion is ambiguous. Contrary to other studies, I show that coercion could actually decrease with price if military strength is very decentralised, or production is very land intensive. These results are supported by anecdotal evidence of variation in coercive practices.

[10] "Villagers were seized and subject to forced labour on stolen farms." Bangura (1997:129-130), as quoted in Keen (2005:43) "Once the rebels had established control, they forc[ed] people to work in the fields...people were too frightened to escape, knowing the consequences for their family members left behind." Atkinson *et al* (1991), as quoted in Keen (2005:43)

The results of this paper provide two insights to policy makers. First, the impact of trade policy on violence against civilians depends on the type of commodity and military conditions on the ground. Trade sanctions aimed at reducing domestic commodity prices could lead to an increase in coercion and reduction in conflict if one group is dominant relative to others, or if production is very labour intensive. The same policy could have opposite effect if military power is decentralised or production not that labour intensive.

Second, peace is not necessarily good for civilians. For example, in the contested Karen province in Burma coercion increased after a cease-fire agreement was signed (Karen Human Rights Group, 2006). Cease-fire agreements could thus be seen as a form of collusion between armed groups and peace-keeping forces might make it easier to collude by increasing the cost of conflict. For example, Hultman (2010) finds that violence by rebels against civilians is higher when there are peace operations in an area. An effective peacekeeping force therefore needs to be combined with a process of disarmament. Similarly, centralization of power, although necessary for peace, could lead to an increase in the exploitation of civilians. Things could get worse before they get better.

Very little is known about armed groups' use of violence in civil conflicts. Yet, this is where the development challenges are most acute and civilian suffering most severe. Characterising armed groups as "firms with a gun"—economic agents who use violence to control the factors of production—can provide some insights into their behaviour. Theoretical contributions to the question of armed groups' use of violence against civilians have so far been limited. This paper is thus an important contribution to a question which has received little attention from economic theorists up to now.

6 Appendix

6.1 Extension - Many armed groups

I extend the model to many armed groups, but make the simplifying assumption that each group has equal strength and equal cost of recruiting soldiers.

6.1.1 Model

There are n armed groups, who fight each other for ownership over land in the resource sector, T_R. Group i decides on the number civilian workers L_R^i, the level of coercion, c_i, which captures $L_C^i(c_i) = \phi c_i$ workers, and the level of fighting, f_i, which assigns a proportion $\pi(f_i, f_{-i})$ of land T_R to group i, where:

$$\pi\left(f_i, f_{-i}\right) = \left(\frac{f_i}{\sum f_j}\right)$$

Equilibrium is thus characterized by the following:

$$\max_{L_i, c_i, f_i} p_R G(\pi\left(f_i, f_{-i}\right) \cdot T_R, L_R^i) - w(L_R^i - L_C\left(c_i\right)) - \psi \frac{1}{2}\left(c_i + f_i\right)^2$$

$$\max_{L_Y} F(T_Y, L_Y) + \left(L - \sum L_C^i\left(c_i\right) - L_Y\right) w$$

subject to the following constraints

$$L_C^i\left(c_i\right) \leq L_R^i$$

Total labour in the resource sector is defined as $L_R = \sum L_R^i$.

6.1.2 Results

Proposition 4 *1. Each group's individual level of coercion, c^*, decreases with the number of armed groups, n.*

2. The total level of coercion, $\sum c^*$, decreases with the number of armed groups, provided that:

$$n^2 < \frac{\psi r T_R}{\left(\phi w\right)^2}$$

3. Total coercion decreases with price, p_R, provided that the number of armed groups is sufficiently large.

The existence of many armed groups is analogous to the case where groups have symmetric strength. In both cases, military power is decentralised and no armed group has 'market power' in the production of violence. As competition for land become more intense due to a proliferation of armed groups, then groups are less able to allocate of resources towards coercion. Furthermore, conflict is more responsive to the rental rate, because groups are more responsive to each others' levels of fighting.

6.2 Proofs

Proof. Of proposition 1

When the constraint $L_C \leq L_R$, does not bind, then equilibrium level of coercion, c, is:

$$c^* \left(T_Y, T_R, L, \beta, \sigma, p_R, \psi\right) = \frac{\phi}{\psi} F_2 \left(T_Y, L - L_R^*, \sigma\right)$$

where L_R^* is defined by:

$$V_R \left(T_R, L_R^*, \beta, p_R\right) - V_Y (T_Y, L - L_R^*, \sigma) = 0 \tag{5}$$

Comparative statics with respect to any exogenous variable, X, is:

$$\frac{\partial c^*}{\partial X} = \frac{1}{\psi} \left[\frac{\partial V_Y}{\partial X} + \frac{1}{\Delta} \left(\frac{\partial V_Y}{\partial L} \right) \left(\frac{\partial V_R}{\partial X} + \frac{\partial V_Y}{\partial X} \right) \right]$$

where

$$\Delta = p_R G_{22} + F_{22} < 0$$

Coercion therefore increases if the marginal value product in either sector increases. It is clear that coercion increases with p_R, T_R, β, and σ, and decreases with L.

When the constraint, $L_C \leq L_R$, binds then coercion, c^*, is defined by:

$$c^* = \frac{\phi}{\psi} p_R G_2 (T_R, L_C \left(c^*\right), \beta) \tag{6}$$

Total differentiating Equation (6):

$$\begin{aligned} \frac{\partial c^{**}}{\partial p_R} &= -\frac{G_2}{p_R G_{22}} > 0 \\ \frac{\partial c^{**}}{\partial T_R} &= -\frac{p_R G_{12}}{p_R G_{22}} > 0 \\ \frac{\partial c^{**}}{\partial \beta} &= -\frac{p_R G_{23}}{\Phi} > 0 \end{aligned}$$

■

Proof. Of lemma 1

Restrict solution to the case where $\sum L_C^i(c_i) \leq L_R$.

Equilibrium is characterized by the following:

$$\max_{L_i, c_i, f_i} p_R G(T_R(f_i, f_{-i}), L_i, \beta) - w(L_R^i - L_C^i(c_i)) - \psi(c_i + f_i)^2$$

$$\max_{L_Y} F(T_Y, L_Y, \sigma) + w(L - \sum L_C^i(c) - L_Y)$$

The first order conditions are:

$$f_i : p_R G_1(T_R \cdot \pi(f_i, f_{-i}), L_R^i, \beta) \cdot T_R \cdot \pi_1(f_i, f_{-i}) = \psi_i(c_i + f_i) \tag{7}$$

$$c_i : \phi w = \psi_i(c_i + f_i) \tag{8}$$

$$L_R^i : p_R G_2(T_R(f_i, f_{-i}), L_R^{i*}, \beta) - w = 0 \tag{9}$$

$$L_Y : F_2(T_Y, L_Y, \sigma) - w = 0 \tag{10}$$

Given constant returns to scale, we know from Equation (9) that the factor ratio's for armed groups in the resource sector are the same:

$$\frac{T_R^i}{L_R^{i*}} = \frac{T_R}{L_R^*} = \frac{T_R}{L_R^*}$$

As a result, the marginal products are also the same:

$$G_2\left(T_R^i, L_R^i, \beta\right) = G_2\left(T_R^{-i}, L_R^{-i}, \beta\right) = G_2(T_R, L_R, \beta)$$

$$G_1(T_R^i, L_R^i, \beta) = G_1\left(T_R^{-i}, L_R^{-i}, \beta\right) = G_1(T_R, L_R, \beta)$$

Now we can compute total level of employment in the resource sector, L_R, which equalises the marginal value products between sectors. Substituting Equation (9) into Equation (10) we get:

$$p_R G_2(T_R, L_R^*, \beta) = F_2(T_Y, L - L_R^*, \sigma)$$

The factor prices, w and r, are thus uniquely determined in equilibrium by the level of employment in the resource sector, L_R^*:

$$r = p_R G_1(T_R, L_R^*, \beta) \text{ and } w = p_R G_1(T_R, L_R^*, \beta)$$

Since each armed group faces the same factor prices, and factor prices are independent of f_i,

the first order conditions from Equation (7) are significantly simplified. Combining Equations (7) and (8) yield:

$$f_1 : T_R r \frac{\alpha (1-\alpha) f_2}{\left(\alpha f_1 + (1-\alpha) f_2\right)^2} = \phi w \tag{11}$$

$$f_2 : T_R r \frac{\alpha (1-\alpha) f_1}{\left(\alpha f_1 + (1-\alpha) f_2\right)^2} = \phi w \tag{12}$$

Combining equations 11 and 12 yields $f_1 = f_2$. Total fighting for each group is therefore:

$$f_i = \alpha (1-\alpha) \left(\frac{1}{\phi}\right) \left(\frac{r}{w}\right) T_R \tag{13}$$

Substituting Equation 13 into Equation (8):

$$c_i = \phi \left(\frac{\psi_1 + \psi_2}{\psi_1 \psi_2}\right) w - \alpha (1-\alpha) \left(\frac{1}{\phi}\right) \left(\frac{r}{w}\right) T_R \tag{14}$$

■

Proof. of proposition 3

Equation (14) can also be written as:

$$C^* = 2 \left(\frac{\psi_1 + \psi_2}{\psi_1 \psi_2}\right) \phi w - 2\alpha (1-\alpha) \left(\frac{1}{\phi}\right) \left(\frac{1-\beta}{\beta}\right) L_R^* \tag{15}$$

The first term always increases with price, whereas the second term always decreases with price, since $\partial L_R^* / \partial p_R > 0$.

Total differentiating Equation (15) yields:

$$\frac{\partial C^*}{\partial p_R} = \frac{\partial L_R}{\partial p_R} \left(\left(\frac{\psi_1 + \psi_2}{\psi_1 \psi_2}\right) \phi \frac{\partial V_Y}{\partial L} - \alpha (1-\alpha) \left(\frac{1}{\phi}\right) \left(\frac{1-\beta}{\beta}\right) \right)$$

Which is positive provided that

$$\frac{\psi_1 + \psi_2}{\psi_1 \psi_2} \phi \frac{\partial V_Y}{\partial L} > \alpha (1-\alpha) \left(\frac{1}{\phi}\right) \left(\frac{1-\beta}{\beta}\right)$$

It is easy that this is true if β is small, ϕ is large, or α is close to $\frac{1}{2}$. ■

Proof. Of proposition 4

The first order conditions in the use of violence are:

$$\frac{\partial \pi (f_i, f_{-i})}{\partial f_i} T_R r = \psi (c_i + f_i) \tag{16}$$

$$\frac{\partial L_C}{\partial c_i} w = \psi \left(c_i + f_i \right) \tag{17}$$

where, as before $r = p_R G_1(T_R, L_R^*, \beta)$ and $w = p_R G_1(T_R, L_R^*, \beta)$ and L_R^* is defined by Equation 1

Due to symmetry, $f_i = f_{-i} = f$. Solving Equation (16) yields:

$$f = T_R \frac{r}{\phi w} \left(\frac{n-1}{n^2} \right)$$

Substituting into Equation (17), each group's level of coercion, c^*, is:

$$c^* = \frac{\phi}{\psi} w - T_R \left(\frac{r}{\phi w} \right) \left(\frac{n-1}{n^2} \right) \tag{18}$$

Each group's level of coercion decreases with the number of armed groups, provided that $n > 2$, since:

$$\frac{\partial c}{\partial n} = -\frac{(n-2)}{n^3} \left(\frac{r}{\phi w} \right) T_R < 0$$

I further define total level of coercion, $C^* = \sum c^*$, as:

$$C^* = \frac{\phi}{\psi} n w - T_R \left(\frac{r}{\phi w} \right) \left(\frac{n-1}{n} \right)$$

so

$$\frac{\partial C^*}{\partial n} = \frac{\phi}{\psi} w - T_R \left(\frac{r}{\phi w} \right) \left(\frac{1}{n^2} \right)$$

Total coercion, C^*, therefore decreases with number of armed groups, n, if:

$$n^2 < \frac{\psi r T_R}{(\phi w)^2}$$

Equation (18) can also be written as:

$$C^* = n \frac{\phi}{\psi} w - L_R^* \left(\frac{1}{\phi} \right) \left(\frac{n-1}{n} \right)$$

$$\frac{\partial c^*}{\partial p_R} = n \frac{\partial L_R}{\partial p_R} \left(\frac{\phi}{\psi} \frac{\partial V_Y}{\partial L} - \left(\frac{1}{\phi} \right) \left(\frac{n-1}{n^2} \right) \left(\frac{1-\beta}{\beta} \right) \right)$$

Which is positive for small n. ■

Bibliography

Acemoglu, D. and A. Wolitzky (2011): "The economics of labor coercion," *Econometrica*, 79, 555–600.

Austin, G. (2005): "Trade and Politics in the Niger Delta," *International Journal of African Historical Studies*, 23–25.

——— (2009): "Factor markets in Nieboer conditions: Pre-colonial West Africa, c. 1500-c. 1900," *Continuity and Change*, 24, 23–53.

Barham, B. and O. Coomes (1994a): "Wild Rubber: Industrial organisation and the microeconomics of extraction during the Amazon Rubber Boom (1860-1920)," *Journal of Latin American Studies*, 26, 37–72.

Barham, B. L. and O. T. Coomes (1994b): "Reinterpreting the Amazon rubber boom: investment, the state, and Dutch disease," *Latin American Research Review*, 29, 73–109.

Bellows, J. and E. Miguel (2006): "War and institutions: New evidence from Sierra Leone," *The American economic review*, 394–399.

Clark, D. J. and C. Riis (1998): "Contest success functions: an extension," *Economic Theory*, 11, 201–204.

Dal Bó, E. and P. Dal Bó (2011): "Workers, warriors, and criminals: social conflict in general equilibrium," *Journal of the European Economic Association*, 9, 646–677.

Domar, E. D. (1970): "The causes of slavery or serfdom: a hypothesis," *The Journal of Economic History*, 30, 18–32.

Doyle, S. A. C. (1909): *The crime of the Congo*, New York, Doubleday.

Dube, O. and J. Vargas (2013): "Commodity Price Shocks and Civil Conflict: Evidence from Colombia*," *The Review of Economic Studies*.

Fenske, J. (2011): "Land abundance and economic institutions: Egba land and slavery, 1830–19141," *The Economic History Review*, 65, 527–555.

——— (2013): "Does land abundance explain African institutions?" *The Economic Journal*.

Garfinkel, M. R. and S. Skaperdas (2007): "Economics of conflict: An overview," *Handbook of defense economics*, 2, 649–709.

Grossman, H. I. (1991): "A general equilibrium model of insurrections," *The American Economic Review*, 912–921.

Grossman, H. I. and M. Kim (1995): "Swords or plowshares? A theory of the security of claims to property," *Journal of Political Economy*, 1275–1288.

Hardenburg, W. E. (1912): *Putumayo, the Devil's Paradise: Travels in the Peruvian Andes*, T. Fisher Unwin.

Hochschild, A. (2011): *King Leopold's ghost*, Pan Books.

Hultman, L. (2010): "Keeping peace or spurring violence? Unintended effects of peace operations on violence against civilians," *Civil Wars*, 12, 29–46.

Humphreys, M. and J. Weinstein (2004): "What the fighters say," *Center for Globalization and Sustainable Development working paper*, 20.

Karen Human Rights Group, . (2006): "Surviving in Shadow: widespread militarisation and the systemic use of forced labour in the campaign for control of Thaton district," Tech. rep., Karen Human Rights Group.

Keen, D. (2005): *Conflict & Collusion in Sierra Leone*, James Currey Oxford.

Lagerlöf, N.-P. (2009): "Slavery and other property rights," *The Review of Economic Studies*, 76, 319–342.

McLaren, J. (2008): "Globalization and Civil War 1," *Development*.

Mussa, M. (1974): "Tariffs and the distribution of income: The importance of factor specificity, substitutability, and intensity in the short and long run," *The Journal of Political Economy*, 82, 1191–1203.

Neary, J. P. (1978): "Short-run capital specificity and the pure theory of international trade," *The Economic Journal*, 488–510.

Nieboer, H. J. (1910): "Slavery as an industrial system," *Cambridge Books*.

Skaperdas, S. (1992): "Cooperation, conflict, and power in the absence of property rights," *The American Economic Review*, 720–739.

United Nations Security Council, . (2002): "Panel of Experts Report," Tech. rep.

——— (2009): "Panel of Experts Report," Tech. rep.

——— (2010): "Panel of Experts Report," Tech. rep.