The Industrial Organization of Rebellion: The Logic of Forced Labor and Child Soldiering*

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Abstract: We investigate the roots of one of the world's most pernicious forms of exploitation: child soldiering. We review a range of theories and show that most can be captured by a principal-agent model that incorporates punishments, indoctrination, and age-varying productivity. We argue it is almost always optimal to coerce rather than reward children, and show that rebel leaders will tend to forcibly recruit children under particular conditions: when punishment and supervision are cheap; when children's outside options are poor; and when rebel leaders are resource-constrained. To see which mechanisms dominate in practice, we interview and survey former members of Uganda's Lord's Resistance Army. The LRA provide a cruel natural experiment that reveals how children and adults respond to coercive incentives. The evidence suggests that children are more easily indoctrinated and disoriented than adults, but are less effective guerrillas; the optimal targets of coercion are young adolescents. We test and confirm several predications of the model on a novel "cross-rebel" dataset. Novel policy solutions are suggested.

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1. Introduction

Civil war research comes in three main flavors. The first seeks the causes of conflict empirically, often through cross-country regressions; a second models the interaction of competing parties, identifying the conditions in which order breaks down. These literatures have a common ingredient: both take the existence and organization of groups as given (Blattman and Miguel forthcoming). A third literature, originating with studies of agrarian revolutions, uses history and case studies to understand individual motives for violent collective action and the strategic use of rewards, ideology and identity (e.g. Lichbach 1994; Clapham 1998; Paige 1975; Wood 2003; Scott 1976). These studies focus, however, on the motives to participate, and tend to ignore agency problems: the incentives to perform and obey.

We argue that theories of industrial organization can add to our understanding of rebellious groups, especially systems of recruitment, command and control. To illustrate, we use formal theory, a case study, and new data to explain two unsettling patterns in guerrilla organization: coercion and child soldiering. Ours is part of a growing literature on the micro-foundations of rebel participation and organization, including the strategic use of violence (Kalyvas 2006; Wood 2006; Azam 2006), the use of social identity in national militaries (Akerlof and Kranton 2005), the formation of cohesive groups (Garfinkel 2004), and the role of resources and information asymmetry in rebel organization (e.g. Weinstein 2007; Gates 2002).

Child soldiers were reported in 21 armed conflicts in almost every region of the world in just 2002-07 (HRW 2008). Most are aged 12 to 18 (CSUCS 2008). Yet while child soldiers are commonplace, age of recruitment varies widely across groups. The best data come from a handful of surveys of ex-combatants. Figure 1 displays the distributions of recruitment age in 12 armed groups in countries where survey data exist: Colombia, Liberia, Sierra Leone, and Uganda. We observe wide variation in age profiles both within and between countries, with the proportion of child recruits (under 18) ranging from 12 to 70%. These data beg the question: why do age profiles vary so much across armed groups?

Fewer data are available on the extent of forced recruitment, but abduction is a common guerrilla tactic, especially in Africa. In the same 12 armed groups, rates of forced recruitment range from 2% to 99%, averaging 30% overall. This pattern begs another question: why do we see wide variation in coercion?

Coercion and child recruitment are not limited to soldiering; they are echoed in other pernicious forms of child labor; worldwide, more than 10 million children are employed in drug-trafficking, sex work, and

other hazardous labor (ILO 2003a). The eradication of these exploitative practices has received increased attention in law and public policy, but is informed by little research.[1]

We review the main explanations for child recruitment and show that each corresponds to a facet of organizational theory, and can be formalized in a principal-agent model with a rebel leader and a civilian. The formal model systematizes the wide array of explanations and clarifies the conditions where child recruitment is optimal. It yields several important insights. First, it is never optimal to coerce high-ability individuals since their incentives to escape punishment are too great. Rather, leaders will only coerce agents with low abilities and reservation utilities—in our setup, children. Moreover, such coercive child recruitment is only optimal when punishment is relatively cheap. The model thus predicts that it is seldom optimal for children to be voluntarily recruited, or for adults to be forced. It also predicts that child recruitment is most likely when punishment is 'cheap' in the sense that civilian, patron, or ally support is not weakened by the use of punishment and coercion. We develop the first representative database of African rebel groups and show that these predictions are borne out in practice.

Child coercion, however, is consistent with many mechanisms. To see which dominate in practice, we draw upon interviews, micro-level data, and a tragic natural experiment in Uganda. There a rebel group has abducted tens of thousands of young men and women. The evidence suggests that guerrilla ability, ease of escape, ease of indoctrination, and the value of outside options all rise in age. Rebels found coercive child recruitment attractive because children's reservation utilities were lower than adults, and were manipulated to be perceived as lower still. As expected, punishment is most common among children.

These findings, we conclude, suggest unconventional strategies to counter insurgency and discourage child recruitment, and may be extended to curb child and forced labor generally.

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[1] Economists have focused on the use of children in agriculture and industry, modeling child labor as a product of intra-household labor allocation rather than a firm decision (Basu 1999; Fares and Raju 2007; Edmonds and Pavcnik 2005; Udry 2004). Otherwise, models of child labor usually take the form of "classic" industrial organization, focusing on the dynamics of firm competition rather than agency problems (Rogers and Swinnerton 2008). Similarly, the literature on unfree labor tends to focus on indentured labor, and explores these relationships in general equilibrium models of agrarian economies, where forced labor arises from labor scarcity (e.g. Conning and Kevane 2007; Domar 1970; Engerman 1973). Our analysis of coercion is closer to the (pre-contract theory) analysis of pain as an incentive in the economics of slavery (e.g. Findlay 1975; Fenoaltea 1984).

2. Explanations for child soldiering

Why would a rebel leader recruit 13-year olds to fight a war? Answers are nearly as numerous as the journalists, human rights workers, and academics that produce them, but five main explanations stand out.

First, some point to the high proportion of young people in poor countries, due to a demographic shift exacerbated by war and AIDS deaths (Singer 2005; Rosen 2005; Cohn and Goodwin-Gill 1994). If children are as productive as adults, we should find a disproportionate number in armed groups.

Second, analysts have located the use of child soldiers in the supposedly "new" and "criminalized" wars of recent decades (Kaldor 1999; Honwana 2005; Reno 1999; Kaplan 1994). One reason is the erosion of taboos and other costs of employing coercion and children in war.

A third explanation emphasizes the functional value of children, especially for menial tasks. Scholars disagree, however, on their military effectiveness. Some say that children lack fortitude (Gutiérrez 2006; Wessells 2006). Others, including some rebel officers, attest to children's stamina and stealth (ILO 2003b; Boyden and de Berry 2004; Cohn and Goodwin-Gill 1994). Lighter, cheaper firearms may also increase the combat effectiveness of children (Machel 1996; Singer 2005).

Fourth, some argue that children require lower wages. Children's employment and educational opportunities may be low in either absolute or relative terms (Brett and Specht 2004; ILO 2003b; Honwana 2005; Machel 1996). It is also argued that children are more willing to fight for non-pecuniary rewards such as honor and duty, revenge, a sense of purpose, or protection (e.g. Brett and Specht 2004; Rosenblatt 1984). The vast majority of the evidence to support these claims, however, is largely anecdotal, although lab-based psychological evidence from the US bolsters some of these claims (Andvig and Gates 2006).

Finally, some argue the young are more malleable, adaptable, and obedient, as well as more easily indoctrinated and deceived. Hence they are easier to control and retain (Gutiérrez 2006; Peters et al. 2003; Cohn and Goodwin-Gill 1994; Boyden 2003). Testimony from rebel officers is one source of such claims (e.g. ILO 2003b). Developmental psychology also provides some support; lab experiments suggest that adolescent social and brain development may lead them to be more conformist and influenced by peers (Harris 1998) and more prone to risk-taking (O'Donoghue and Rabin 2000). Gutiérrez (2006) and Peters (2004) also argue that children's moral development is incomplete and malleable. This evidence, however, is incomplete and largely US- and lab-based.

3. Formalizing the logic of child soldiering

Underlying each explanation for child soldiering is the idea that a rebel leader optimally seeks to maximize gains and minimize costs. Here we show that several mechanisms can be represented in a principal-agent game with two actors, a rebel leader L and an agent A. The value of a model is threefold. First, it reveals the necessary and sufficient conditions for child recruitment to be optimal. Second, it suggests novel solutions to child soldiering as a policy problem. Finally, the model broadens our understanding of labor contracts that include the use of coercion, and yields general lessons on child and forced labor.

We introduce coercion into the standard principal-agent framework by allowing for a rebel leader to punish as well as reward recruits, and introduce children by allowing productivity and reservation utility to vary by agent type (age). The closest relations to this setup are Chwe (1990) and Gates (2004, 2002). Chwe models why child workers in the Industrial Revolution were more likely to be whipped. He argues the optimal contract will provide money rather than pain when the worker's reservation utility is sufficiently high. Children, who have poor outside options, thus suffer punishment. Likewise, Gates argues that children have fewer outside options and hence it is easier to incent them to meet the participation and incentive compatibility constraints. Our approach models a broader range of explanations for child recruitment. In particular, we allow reservation utilities to vary in age, disaggregate the psychological mechanisms, and model the implications of uncertainty and risk aversion. We also model the leader's choice of both agent and incentive, treating it as a simultaneous decision.

A. Structure and equilibrium in a basic model

Each agent in our setup has an age-dependent productivity factor θ, and he chooses how much effort a he will contribute to rebel activities. The rebel leader observes the agent's productivity type and faces two (simultaneous) choices: first, the optimal reward or punishment ρ to give to the recruit; and second, the optimal type θ to recruit. While θ is continuous, we can think of high types as adults and low types as children. The leader observes agent type and output (π), but agent effort (a) and the random shock in production (ε) are hidden to her.

In general terms, utilities are given by

$$u^A = r(\rho, \pi) - c^A(a, \theta) \text{ and}$$
$$u^L = \pi - c^L(\rho, \pi) \text{ with } \pi(a, \theta, \varepsilon).$$

Superscripts denote actors and subscripts denote partial derivatives. The leader's utility is production less her cost of rewards and punishments. The agent derives utility from output priced at $\rho \in R$ and disutility given by a cost function c^A of effort and (possibly) type. Incentives ρ can be negative or positive.

We present a general model in Appendix A, and here consider a simple model with explicit functional forms. In particular, we assume a stochastic linear production function $\pi = \theta a \varepsilon$, where ε has a Gamma distribution with mean 1 and standard deviation s. Productivity $\theta \in [0,1]$, and utilities are given by:

$$u^A = \begin{cases} \rho e^{-\pi} - a^2 & for \quad \rho \leq 0 \\ \rho(1-e^{-\pi}) - a^2 & for \quad \rho > 0 \end{cases}$$
$$u^L = \pi - \rho^2 \pi,$$

We assume that the agent's utility is exponential, so that the recruit's utility is increasing and concave in output, with diminishing returns to effort. Its sign is just the sign of incentive ρ. We also require that a participation constraint is met; that an agent's utility exceeds some reservation point $\underline{u}(\theta)$ determined by the values placed on successful versus unsuccessful escape:

$$\underline{u}(\theta) = p(\theta)\, v + (1 - p(\theta))\, d,$$

where $p(\theta) \in [0,1]$ is the probability with which a recruit will successfully escape; $v > 0$ is the value of the recruit's outside option (which for the moment we treat as fixed); and $d \leq -1$ is the punishment associated with an unsuccessful escape (torture and death). We assume this particular upper bound for d, because it captures that d is worse from the recruit's perspective than any punishment the rebel leader might ordinarily impose in order to induce effort on the part of the agent (since any incentive $\rho \leq -1$ is weakly dominated for the leader). We assume the probability of escape is an increasing, linear function of productivity ($p_\theta > 0$). These functions are illustrated in panels (a) to (c) of Figure 2. For simplicity we assume $v = .25$, $d = -1$, $p(0) = 0$, $p_\theta = 1$, and $s = .5$ for all graphs, unless noted otherwise.

The leader's problem is to jointly choose the optimal agent θ and incentive ρ that maximizes her objective function u^L.[2] In doing so, she must satisfy the incentive compatibility constraint (IC) and the participation constraint (PC) to ensure that the agent is motivated to stay and perform:

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[2] The leader's problem is to set a wage for each possible realization of productive output, i.e. π. Since π is continuous, the leader has to optimally choose a wage function. We make the problem tractable by limiting the leader's optimization to a specific and known array of curves, which is defined over an array parameter ρ. That is, we fix $r(\cdot)$ and have the leader optimize over scalar ρ.

$$r_a = c_a^A \text{, and} \tag{IC}$$

$$r - c^A \geq \underline{u}. \tag{PC}$$

We solve the model in Appendix A, along with formal proofs of our propositions. Figure 2 illustrates the relationships, in equilibrium, between agent utility and productivity, output, and the incentive schedule.

First, note that above some threshold level of productivity it is always optimal to reward (Figure 2a). Otherwise high productivity agents—who have a higher expectation of evading capture—will run away when threatened. It is also never optimal to provide rewards to recruits with productivity below the threshold, because if the leader provides (potentially more costly) rewards anyhow, he will choose a recruit with a higher value for θ and positive reservation value.

Second, both punishment and rewards stimulate effort among high and low types, respectively. Panel d of Figure 2 indicates the equilibrium levels of agent effort by type. Note that high types exert more effort than low types. The reason has nothing to do with the responsiveness to punishments versus rewards; rewards buy the same amount of effort as pain. Rather, high types are responding to the fact that they are more effective at generating output as a consequence of their greater ability.

The consequence of this setup is that it is never optimal to recruit low types (i.e. children); the leader always abducts high-productivity types and provides rewards, almost regardless of the value for v, d or s. Figure 3 illustrates the rebel leader's payoff u^L for individuals of different productivity types θ. The highest utility comes from abducting relatively high-productivity individuals (in our age analogy, adults). These have to be treated relatively well or else they will desert.

B. When is child soldiering optimal?

When are punishment and child recruitment equilibrium strategies? An obvious response is that it will be optimal to recruit children if they are more productive as guerrillas (or at least at specific tasks). For instance, the relative effectiveness of child soldiers has arguably increased with the advent of lighter weaponry with less recoil, and children may also be less likely to arouse suspicion when deployed as spies.

We explore the formal logic of this claim in Appendix A, but as we see in the empirical analysis below, the evidence points in the opposite direction: except for a few minor and specialized tasks, children appear to be less productive in warfare than adults. That is, π is generally increasing in age. If true, then in our simple model, forcibly recruiting low θ types (children) is only optimal in extreme circumstances. We

therefore draw several extensions to the model from the child soldiering literature to illustrate more common, plausible mechanisms that lead to low-type recruitment.

Extension 1: Cheap punishment

One of the most crucial parameters is the costliness of punishment versus rewards, assumed equal in the base model. In practice, punishment may be cheap; the effort to make or carry out threats may be lower than the effort required to build wealth. Material rewards may also have a higher opportunity cost, as leaders can purchase another factor of production (e.g. artillery) or consume resources directly.

Punishment can also be costly. Rebel groups are often funded by sympathetic foreign powers or diasporas, and some donors will condition their support on the observance of human rights. The good will of local populations can also yield items of value (food, supplies, informants, hideouts). Popular support could also lower the price of recruits if it yields social pressure on people to join, or if recruits gain utility from the act of participation itself (Weinstein 2007; Wood 2003; Gates 2002).Indeed, military strategists generally consider popular support essential to successful insurgency and counter-insurgency (Galula 1964; Mao 1961/2000; Guevara 1961/1998; Petraeus 2006). These 'social resources' may be depleted if civilians are abused or coerced into fighting.

A simple generalization of the model allows for rewards and punishments to diverge in cost by adding a relative cost parameter, $k \in R$, to the leader's utility function: $u^L = \pi - k\rho^2\pi$. In the base model, k implicitly equals one. When punishment is cheap, then $k = 1$ for rewards and $0 < k < 1$ for punishments.

We recalculate equilibrium values and find that punishment is an equilibrium strategy for sufficiently small k. Panel b of Figure 3 shows the leader's optimal target productivity θ as a function of the cost multiplier k (for $d = -3$). As the relative cost of punishment declines, the utility the rebel leader receives from recruiting low types increases. Below some threshold of k the optimal recruit switches to the low-productivity type. Indeed, the optimal choice θ is never decreasing in k. Moreover, if productivity is increasing in ability, cheap punishment is a necessary condition for the low-type equilibrium to be uniquely optimal. This will prove to be one of the most important predictions of the model.

Extension 2: Productivity and the probability of escape

Ability may also impact the ability to escape, a dynamic we represented in the base model by endogenizing p to be increasing in θ (for simplicity assuming that $p(\theta) = \theta$). The endogenous reservation utility

function is an essential part of the model; it drives the lower reservation prices for low types, and augments the incentive for leaders to abduct low productivity individuals. This result can be generalized; an increase in p_θ always leads to a decrease in the optimal θ (Appendix A contains a proof). That is, the more sensitive a recruit's chance of escape is to his age, the younger are the individuals targeted for abduction.

Extension 3: Misinformation and the perceived value of outside options

A recruit's participation constraint depends on his *beliefs* about the value of outside opportunities rather than the opportunities themselves. Rebel groups routinely seek to manipulate beliefs by restricting information and through disinformation, and a recruit's susceptibility to disinformation is potentially a function of his age or ability. We can model this possibility by introducing a "misinformation" factor, $m(\theta)$, into the agent's reservation utility: $\underline{u}(\theta) = p(\theta)\, m(\theta)\, v + (1 - p(\theta))\, d$, where $m(\theta) \in [0,1]$ with constant $m_\theta \geq 0$. This simple form is useful primarily for understanding the implication of ability-dependent misinformation for the rebel leader's decision. The greater the leader's ability to mislead low type recruits (the higher the m_θ), the lower the productivity type targeted by the leader under rewards and punishments.

Reservation utilities that increase in ability are not sufficient for coercive low-type recruitment to be optimal; cheap punishment is still required. However, the more steeply reservation utilities rise in ability (i.e. the more that children have trouble with escape, or the more easily they are misled) the less cheap punishment will need to be before a leader finds it optimal to switch from the high- to low-types. Age-sensitive reservation utilities thus facilitate child recruitment in a wider range of scenarios.

Extension 4: Indoctrination

Propaganda and information are also used by rebel leaders to indoctrinate—in essence to provide intrinsic motivations to fight. Like misinformation, ease of indoctrination could also vary in age and ability, as suggested by the adolescent psychology literature discussed in section 2. One way to introduce indoctrination in our model is for low type agents to incur differential costs for exerting an equivalent amount of effort. Again, our goal is not to provide a model of agent indoctrination, but rather to look at the implications for the rebel leader's choice of incentive and type. We incorporate this type of indoctrination by allowing the agent's cost of effort to be a function of his θ, where $c^A{}_\theta > 0$. Specifically, we assume

$$u^A = \begin{cases} \rho e^{-\pi} - n(\theta)a^2 & for \quad \rho \leq 0 \\ \rho(1 - e^{-\pi}) - n(\theta)a^2 & for \quad \rho > 0 \end{cases}$$

where $n(\theta) \in [0,1]$ with constant and non-negative n_θ. We prove in Appendix A that the optimal θ is decreasing in n_θ; that is, the fact that low types (children) are more easily indoctrinated can compensate for a relative lack of skill and make them appealing targets.

Extension 5: Ability and the value of outside options

Economic development is a two-edged sword as far as child soldiering is concerned. On the one hand, pro-poor development will slow rebel recruitment. As the returns to civilian life increase—a rise in v—reservation values increase as well. If the returns to the rebel leader's production do not rise at the same (i.e. if the returns from development are not easily captured), then growth will eventually make recruitment of any form untenable. On the other hand, this same growth could exacerbate child soldiering; if incomes rise only moderately, rebel leaders will reevaluate the types they can afford to retain, and so will take to conscripting lower types. Eventually pro-poor development will spell the end of recruitment (and rebel activities), but in the medium term rebel leaders may take to child soldiering as their only economical alternative while they increasingly run out of options. Figure 4 provides a graphical depiction of this dynamic; in panel a, θ^* is generally decreasing in v as the curve shifts down and to the left.

Like guerrilla productivity, outside options are unlikely to be invariant in age and ability. We can also consider the case where v depends on θ, so that $\underline{u}(\theta) = p(\theta)\, v(\theta) + (1 - p(\theta))d$. The slope of v in θ now depends on the nature of the economy; in principle, children could face a higher opportunity cost of recruitment if it pulls them out of school and reduces lifetime educational attainment and wages. There is some evidence of such a tradeoff from northern Uganda (Blattman and Annan forthcoming). On the other hand, immediate opportunities for children could be very poor, and if people in war zones have short horizons (i.e. high discount rates), then development opportunities are skewed towards older individuals (i.e. the higher is v_θ). This case is illustrated in panel b of Figure 4. The optimal θ appears to be much more sensitive to the level of v, however, than its slope in θ.

Extension 6: Uncertainty about errors in production

We have modeled the leader-agent interaction as one with hidden action; there is some error in the translation of effort and ability into services that are observed by the rebel commander, and the rebel leader does not observe this error. What happens if this error increases in size, as might happen if the rebel group becomes spread over a wide territory, or if a particular group's monitoring technology is

poor? The recruit optimally adjusts his effort downward, because the link between effort and output has weakened. But this means that the recruit's expected payoff falls, which hampers retention as it becomes more difficult to meet the recruit's participation constraint. This distance dynamic is modeled by Gates (2002). In our model, the leader responds by lowering his productivity target in recruitment and pursuing those who are easier to retain: low productivity (younger) individuals.

Further possible extensions

While not included in the model, resource constraints could also affect a leader's decision on agent type. Both punishments and rewards are costly, and an active budget constraint will force the leader to move closer to not taking either action (which corresponds to the point at which the solid and the dashed lines meet in Figure 3). If age is a useful proxy of productivity, then a punishment-oriented rebel leader would respond to budget pressures by targeting fewer children while a rewards-oriented leader would respond by targeting more children. When punishment is less costly than rewards, however, a rewarding leader may find it optimal at some point to switch to the most optimal punishing equilibrium available.

Balcells et al. (2008) also suggest that a minimum force size may be necessary to wage war. If the minimum requirement is large (for instance, because of a strong government response, or a large territory) then for a fixed amount of resources even a wealthy rebel leader may find it optimal to recruit low productivity individuals to reach some critical mass. We have not considered the contest element of warfare in this paper, but it is a productive avenue for future research.

'Social resources' may also be available to a rebel leader. Where popular support exists, punishment may not for two reasons. First, as noted above, punishment could actually reduce a rebel force's reputation and public support, making the marginal cost of punishment very high. Second, social resources may be non-rival, and hence the marginal cost of rewarding an additional high-productivity recruit might be quite low. In both cases, only rebel groups with few initial social resources (like the LRA, described below) may find it optimal to recruit children.

Further extensions of the model could help us understand other elements of guerrilla organization and child soldiering, such as the incentive for rebel leaders to destroy the outside options of recruits (e.g. through the destruction of schools and farms, or the murder of parents), and the role of supervision and investments in monitoring technology. We also consider the impacts of risk aversion in Appendix A. Other extensions could help understand other facets of guerrilla organization: team production, promotion,

and the creation of organizational identity. Agency and contract theory will remain a powerful tool of rebel analysis for some time to come.

C. Empirical implications

Whether child soldiering is optimal depends crucially on the relative productivity of children versus adults, and the relative cost of punishment. If children are more productive than adults, then child recruitment will almost always be optimal, and the nature of recruitment will depend principally on the slope of the reservation utilities in age. If children are less productive than adults, then cheap punishment is essential to maintaining the low-type equilibrium, although the extent to which punishment must be cheap declines in the extent to which reservation utilities increase in age.

Which circumstances dominate in practice is unclear. Our empirical analysis proceeds in two parts. First, we use data and a natural experiment from northern Uganda, to argue that the latter case best describes the evidence: cheap punishment plus productivity and reservation utilities increasing in age. The Uganda findings also accord with the evidence on neurological development discussed in Section 2: ease of indoctrination and misinformation appear to fall in age, while ease of escape rises. If these relationships hold generally, our model has several cross-country (and cross-rebel) predictions. We outline these predictions in a final section and describe some preliminary tests using a new database on rebel groups.

4. The case of northern Uganda

To weigh these alternative explanations, the "ideal" experiment would be one where different recruiting arrangements (or contracts) were offered to random samples of civilians, with responses observed for all recruits by age. The Lord's Resistance Army offers nearly such a terrible case, albeit for just one sort of recruiting arrangement—coercion. Between 1994 and 2004 the LRA abducted tens of thousands of young men and women, with a particular focus on adolescent boys. We draw upon interviews, representative survey data, and a tragic natural experiment to understand the roots of coercion and child soldiering in northern Uganda. The case provides support for several of the mechanisms in the model.

A. Background

The LRA has fought a low-scale guerrilla war against the Government of Uganda since 1988. The rebels are led by Joseph Kony, a spirit medium of the Acholi tribe. He and the LRA seek a spiritual clean-

sing of the nation and a return to the political dominance that northern tribes enjoyed for the two decades following Independence (Behrend 1999; Omara-Otunnu 1994).

Civilian support for the LRA was meager from the start. Initially, Kony pulled together a few hundred hardened fighters, the remnants of other disbanded and defeated rebels groups (Behrend 1999; Allen 2005). Unpopular and poorly equipped, these fighters began raiding the homesteads of their Acholi brethren for food, medicine, and recruits. Small roving bands conducted night raids on rural homes. From 1988 to 1994 the LRA stole several thousand youth from their homes.

With few natural resources, and increasingly few 'social resources', the LRA struggled to maintain this small force of forced recruits. The rebellion might have died out were it not for the Government of Sudan, who in 1994 began providing the LRA with arms and territory for bases. Khartoum's aim was to destabilize northern Uganda in retaliation for Museveni's support for southern Sudanese rebels (the SPLA). Their support invigorated the LRA, and attacks and abductions escalated. Tens of thousands of Ugandan youth, primarily adolescent males, were abducted after 1994. Young women were also taken in lesser numbers to become fighters, servants, and wives (Annan et al. 2009). The vast majority of abductees, roughly 82%, eventually escaped and survived. Less than 800 youth are thought to remain in the bush—roughly 1% of the estimated 60,000 to 80,000 abductees (Annan et al. 2006; Pham et al. 2007). The rest, tragically, are presumed perished.

LRA activity peaked in 2002 when the Ugandan army drove the LRA from Sudan into Uganda, and intense fighting continued through 2004. Defeat suffered since that time has kept the LRA small and on the move, principally in eastern DRC and southern Sudan. They ceased abduction in Uganda by 2005.

In newspapers and human rights reports, the LRA is the archetypal irrational, barbaric, apolitical rebel force of Africa's so-called "new wars". Mass child abduction, the use of spirit practices, and brutal civilian violence are treated as evidence of Kony's lunacy. Yet just as claims of increasingly irrational rebellion have been refuted by scholars of civil war, virtually every scholar of the LRA finds method in Kony's madness (e.g. Allen and Vlassenroot 2008). LRA tactics were undoubtedly distorted by spiritual beliefs and ideology. Our interviews and survey data, however, testify to the rational thread that runs through abduction, spirit practices, coercion, and violence.

B. Data

We conducted qualitative interviews with more than 100 former abductees, 20 community and clan leaders, and 25 commanders from the Ugandan armed forces and the LRA over ten months of field work over 2005-07. Among the LRA, our main interviews subjects were foot soldiers and mid-ranking officers, including junior commanders, abduction party leaders, catechists, spies, 'wives', bodyguards, and even accountants. Interview subjects were contacted through key informants, such as village leaders, and so are not necessarily representative of all rebels. Returned senior commanders were not targeted for interview as they had been extensively interviewed by others, had developed a well-honed narrative, and were unlikely to be forthcoming given recent indictments of the rebel leadership.

We also conducted representative surveys in concert with an NGO, a psychologist, and two human rights scholars (Annan et al. 2008). A first survey, in 2005, targeted males born in the Districts of Kitgum and Pader between 1975 and 1991, and a second round in 2007 interviewed the same cohort of females.

To minimize attrition from migration and mortality, we selected respondents from a sample frame of youth living in the region before escalation of the war. We randomly sampled 1,162 households in eight clusters, using the earliest sample frame available: UN World Food Programme lists compiled in 2002. 88% of sampled households were found and interviewed. Enumerators worked with household heads to develop a roster of all youth living in the household in 1996—a year easily recalled as the date of the first election since 1980. Using these rosters, 881 surviving males were randomly selected an interview in 2005-06 and 857 females were selected in 2007. Former abductees were oversampled in both cases.

More than a third of target respondents had moved since 1996, and enumerators tracked them to their current locale. 741 males and 619 females were found, including 688 abductees. Thus there are two sources of attrition. A first is mortality (including not returning from abduction, which in 95% of cases implies death): 20% of male abductees and 5% of female ones were lost in this way. The second is failure to locate 9.5% of males and 17.5% of females. Female absenteeism is higher because of migration for marriage; the return from displacement that began in 2006, and the time elapsed since the 2005 rosters.

C. Descriptive analysis: LRA recruitment, command, and control

Forced recruitment by the LRA was large-scale and indiscriminate. Roughly two in five males and one in five females aged 14 to 30 report they abducted for at least a day. The survey collected self-reported, retrospective information on their war and abduction experiences, listed in Table 1. Lengths of abduction

ranged from a day to ten years, averaging 7.2 months. Youth who failed to escape were trained as fighters and, after a few months, received a gun.

The LRA was exceptionally young. Figure 5 illustrates the distribution of age at the time of recruitment. Three times as many youth aged 14 were abducted as those aged 9 or 23. The preference for adolescent boys holds true even after adjusting for the disproportionate number of young people in the population; a 14-year old youth in the study population had a 5% average chance of abduction—twice the risk faced by ages 9 or 23. Some factor beyond the relative supply of children must account for this pattern.

The focus on adolescents is more pronounced once we account for release. 14% of survey respondents were released in the first month of abduction (ignoring those left due to injury). LRA raiding parties commonly abducted all able-bodied members of a household to carry looted goods, but were often under explicit instructions from Kony to release children under 11 and adults older than their mid-20s, once loot was delivered safely. Figure 6 displays a running mean, by age of abduction, of the deviation from the average probability of release (adjusted for location and abduction year). Release is highest for children under 10, dips sharply for adolescents, and is rising in age thereafter.

The impoverished LRA seldom provided material incentives. Just 5% report material rewards, principally food. Money or loot was rarely given, even to officers. Such rewards were promised upon victory, however. "They used to tell us," said one abductee, "that if we fight and overthrow the government then we would get wealth, and even the young soldiers would get high ranks in the army."

Violence and the threat of punishment was the main instrument of control in the LRA. 55% of abductees were severely beaten (versus 12% of non-abductees) and 24% report being attacked with a weapon (versus 2% of non-abductees). Beatings or death were the punishment for attempted escape, a sentence other abductees were often forced to carry out with clubs and knives.

Initiation sometimes involved the forced commission of violence; 25% of abductees were forced to harm or kill a civilian, and 23% to desecrate dead bodies—a deeply held taboo. 12% of abductees report being forced to kill a family member or close friend. Such violence served to break down a youth's psychological defenses and desensitize her to violence. More importantly, it bound her to the group, by raising the specter of community rejection if she were to flee.

Other forms of misinformation were used to promote fear and loyalty. Abductees were told that rebels would kill escapees and their families. Abductees who caught word of the universal amnesty were told it

was a ruse, and any who escaped would be killed by the government, and the LRA banned radios after the government began to announce messages of peace on air.

The LRA also limited escape opportunities by moving the abductee as far as possible from home. Half of abductees were tied, and the first day's march would deliberately backtrack, move in circles, and disorient. Abductees were taken to the bases in Sudan as quickly as possible.

Spiritual practices were also central to motivating recruits—an explicit attempt to create new social bonds and loyalty based on a shared cosmology (as well as fear). Kony created a cult of mystery and spiritual power which few Acholi question even now. Those with whom we spoke disagreed not on whether Kony possesses spiritual power, but rather whether these spirits are good or bad. These purported powers were used to instill fear, awe, and loyalty. A spiritual initiation ceremony, typically featuring prayers and anointment with oil, was reported by the majority of those taken two weeks or longer. The LRA is highly structured, with detailed spiritual restrictions on personal conduct (e.g. eating, drinking, and bathing) and on military practices. Kony is also feared and respected as a prophet. Three former bodyguards described a catalog of fulfilled prophesies. They also described displays of power, such as the ability to vanish. Through the power of the spirits Kony was also said to be omnipresent and able to track down escapees by the smell of the oil with which they were anointed.

While spiritual messages and initiation were common, so were political propaganda and the promise of material rewards. The importance of overthrowing the government is most commonly reported in our data, followed by incitement over crimes committed by Museveni and promises of government positions.

Together, this spiritual, political and material propaganda were often effective. 30% say they once felt allegiance to Kony, 11% admitted there was a time they felt like staying with the LRA, and 6% admitted that they aspired to become a commander. Of those abducted more than 2 months, those figures rise to 60, 28, and 16%. According to a two-year abductee, "for a time I forgot survival and became a part of them; I was abducting and stealing just like them." Such "forgetting" and shift in identity was commonly reported. In some cases this was associated with Kony's spiritual powers. According to one informant, "In the bush, there is something that confused people. There is a certain type of holy oil which they put on you. It confused you and you could never think of home."

Accounts of allegiance and forgetting suggest that LRA discipline, religion and propaganda did not simply change individual incentives, but fundamentally altered the beliefs and values of recruits. Such

indoctrination and identity manipulation has been widely remarked upon in social psychology and military sociology. More recently, economists Akerlof and Kranton (2005) have articulated how such preference shifts can be formally modeled in the framework of incentive theory, arguing such preference shifts are the most plausible explanation for observed behavior. For those who remain with the LRA for long periods of time, the decision to escape is usually associated by a moment of "awakening". "When I grew up," explained one young man, "I saw that everything Kony said was false. If it were really true then the government could have been overthrown. And here the people he abducted before me had all escaped." Some of these stories reflect a realization that the promised benefits would not be received: "We would ambush and carry things," said another young man, "but then I wouldn't benefit. It was the leaders who benefited. Then I thought I should escape because I had not gone on my own but had been abducted."

D. The incentives to recruit children in Uganda

The focus on abducting young adolescent, so evident in Figure 5, is striking. The evidence suggests that northern Uganda is a clear example of case X of our theoretical model. Children appear to have been less effective fighters than adults. In this case, the key to child soldiering is the relative cheapness of punishment to the LRA. The forced commission of violence, threats of beatings, and spiritual intimidation were nearly costless in time and material resources. More importantly, with few initial social resources, and material backing coming from one of the least human-rights-sensitive regimes on the planet (Khartoum) the LRA faced little social penalty to child abduction and coercion.

We attempt to test this proposition in the following section, in a cross-rebel analysis. We can also use the unusual nature of LRA recruitment tactic—a uniform, coercive strategy offered nearly at random to a sample of different ages—to investigate the additional mechanisms that facilitated child soldiering. Our evidence suggests that adolescent recruits were indeed more easily manipulated, and had lower expected probabilities of escape, than adults.

Empirical strategy

LRA abduction was large-scale and virtually indiscriminate. Rural Acholi households live in scattered rural homesteads at some distance from their neighbors. Typically, abduction parties of 10 to 15 guerrillas would swing down from their Sudanese bases to conduct military missions several weeks in length, raiding homesteads in their path for loot and recruits. Abduction party leaders reported that the only criterion

for abduction was the demand to release young children and adults. Indeed, abduction by the LRA is indistinguishable from random after accounting for year and location of birth. No other pre-abduction household trait is associated with a higher risk of abduction, whether household wealth, education levels, or orphaning.[3] These same characteristics, however, predict participation in a government militia.

In this context, cross-age comparisons of the self-reported actions, attitudes, and experiences of former abductees will estimate the differential response of children and adults to threats and violence. We employ the following specification for comparisons of an abductees' response, y, over age of abduction, A:

$$y_i = \alpha A_i + \boldsymbol{Y_i \Pi} + \boldsymbol{L_i \Pi} + \boldsymbol{H_i \Pi} + \varepsilon_i \, .$$

To account for changes in rebel practice over time, space and gender, we include vectors of abduction year indicators, $\boldsymbol{Y}$, and gender-specific indicators for location of birth, $\boldsymbol{L}$. To account for any residual selection into abduction and reduce standard errors, we include a pre-abduction variables, $\boldsymbol{H}$ (including household assets and parents' occupation, education, and death).

Note that selective mortality may create attrition bias. The potential bias is unknown, but the most plausible forms of selection (e.g. children are less skilled fighters, and the less skilled are more likely to die) understate cross-age differences. Finally, war experiences are measured with error. We are especially concerned about under-reporting of measures such as loyalty or violence committed. So long as any systematic error is uncorrelated with abduction age, however, that measurement error will be cancelled out in cross-age comparisons. Only measurement error that varies with age of abduction will cause bias.

Results

First, an analysis of roles in the armed group suggest that children were no better than adults as fighters, and young children in particular were likely to be worse. The LRA waited longest to give abductees younger than 12 a gun: youth aged 8–9 took 10.5 months to receive a gun, compared to 3.7 months for youth aged 12–13 and just 2 months for those 18–19 (Figure 7). A large number of young abductees never even received a gun; young children were nearly half as likely to have received one as adolescents aged

[3] In logit regressions of abduction on pre-war household traits, the coefficients on wealth, education, occupation and orphaning are small and not statistically significant. Only household size predicts abduction: large households were slightly less likely to be raided, in part because they were harder to control by a small band of fighters (Blattman and Annan forthcoming).

15 to17 (Figure 8). Receipt of a firearm was also lower among young adults, however. Interviews with former abductees and mid-ranking officers suggest that this was because not all adults could be trusted (a theme we return to below, with evidence). When they were trusted, however, we see that they received a gun more quickly than children and adolescents. Adolescent males, however, were most likely to report that they were considered 'dependable fighters' by their superiors. Regressions using an abduction age quadratic suggest that these non-linear relationships are highly statistically significant (see Table 2).

If children were less able fighters, why focus on abducting youth aged 11 to 17? Figure 7 provides the clearest answer; abduction lengths fall steeply in abduction age: from 9 months at age 12–13 to 4.5 months by age 24–25. According to the linear regression results, length falls by 0.5 months for every year of age (Table 3).

One reason that younger abductees stay longer is that younger recruits are less likely to plan and execute an escape. Escape took three forms (excluding release): rescue by the Ugandan army (6%); escape in the heat of battle (28%); and running away at night or when scavenging (56%). Involuntary escape, such as rescue, is highest among the young and falls by 0.6 percentage points for every year of age (see Table 3). Voluntary and premeditated escape, on the other hand, is least common among the young, rising by 0.8 percentage points with each year of age—from 54% at age 12–13 to 64% at 24–25.

LRA officers and abductees also explained that young abductees were most fearful of escape because their surroundings were more unfamiliar and because they were insufficiently cunning. According to a 7-year servant to Kony, "Old people are able to escape, but for the children it is difficult because they do not know how." To assess this claim, the survey asked abductees if they knew their whereabouts when they escaped (Table 3). Familiarity with one's location at the time of escape is increasing in age—0.8 percentage points for each additional year (significant at the 10% level), rising from 48% at age 12–13 to 55% at age 24–25.

Younger abductees also appear to have been more easily indoctrinated and misled. According to one, "it is easy to convince a child of 12 years of anything. He will believe any promises made and does not know the difference between good and bad. But if you are mature, you know they will not overthrow the government." The data, reported in Table 4, support these accounts, especially among male recruits. First, older abductees were less likely to report that they ever felt safer in the LRA, falling 0.5 percentage points with each year of age, from 7.5% at age 12–13 to none at age 24–25. The effect is driven by males.

Older males were also least likely to report feeling allegiance to Kony. Allegiance fell by 0.7 percentage points with each year of age (significant at the 10% level), from 32% at age 12–13 to 23% at 24–25. Older males were also less likely to say they believed in Kony's spiritual powers, such as the claim that his magic provided protection from bullets. This belief fell 0.6 percentage points with each year of age (significant at the 10% level), from 13% among those abducted at age 12–13 to 8% of those 24–25.

Other relationships are quadratic in nature: highest among adolescents and lowest among children and adults. Aspiration to become a commander is 7% in the teenage years, falling below 5% among children and adults. Roughly 13% of adolescent abductees report there was a time they felt like staying with the LRA, with these rates falling steeply towards zero among young children and adults.

Finally, children were more likely than adults to receive threats and punishments. Threats of death and punishment, which were only measured among those abducted more than two weeks, declined by 0.6 percentage points with each year of age (Table 5). Adults were also less likely to be forced to commit violence. Being forced to kill a family member fell from 16% at ages 12–13 to 9% at 24–25, while being forced to abuse dead bodies fell from 28% to 18%. This impact diminishes, however, when accounting for length, suggesting the abuse of dead bodies is partly a function of length and partly of age.

The LRA does not appear to have followed a dual strategy of rewards for adults and punishments for children. The likelihood of receiving a material reward (mainly extra food) has almost no correlation with age, even when accounting for length of abduction (Table 5). Material rewards are rare in general in the LRA, however, in large part due to the poverty of the group. Nevertheless, political propaganda, primarily regarding the overthrow of the government and the re-establishment of an ethnic Acholi government, was more commonly reported by older recruits. After accounting for length, propaganda reports rose 1.5 percentage points for each year of age (from 43% of those abducted at 12–13 to 79% at age 24–25). Adults are also less likely to report threats and no propaganda: 55% of abductees age 12–13 report threats and no propaganda, versus 21% of those 24–25.

5. Cross-rebel predictions and analysis

A single case helps to refine our theory and validate some basic assumptions, but cannot test it. This paper is primarily a theory-building exercise; testing of the model requires in-depth comparative analysis,

qualitative and quantitative, for future research to pursue. We finish, however, by articulating some testable predictions and conducting preliminary tests of key predictions using new cross-rebel data.

A. Predictions

What patterns of rebel organization and recruitment would falsify the model? First, when guerrilla productivity is increasing in age, cheap punishment is a necessary condition for the low-type equilibrium. We should not observe groups that recruit large numbers of young adolescents via rewards, nor should we observe armed groups that recruit large numbers of adults via coercion. In particular, there should be a negative correlation between age of recruitment and the use of coercion.

Deviations from this relationship should take a predictable form. Even when high-type recruitment is optimal, some circumstances, especially as an increase in the value of outside options, will lower the optimal rewards-based recruitment (i.e. a leftward shift of the curve in Figure 4). Hence rewards-based recruitment of adolescents may be observed in some middle income countries.

Second, we should not observe child recruitment where punishment is expensive, as when groups start with high initial levels of social resources or external support from a rights-conscious donor; similarly, rebel groups with low levels of initial civilian support and resource bases that are unresponsive to human rights abuses should be less likely to recruit and reward large numbers of high-ability adults.

Third, a decrease in the cost of punishment should be associated with an increase in the use of children and coercion. For instance, coercive recruitment should increase the further a rebel group strays from its social base of support, and the average age of recruitment should fall alongside it.

Note, however, that age is not a perfect proxy for productivity. If there is a distribution of productivity within each age group, then we would expect some children to exhibit high ability and some adults to exhibit low ability. If rebel leaders can observe this ability, initially or after some time, then they may target high-ability children with rewards. Alternatively, they may choose to abduct and coerce both children and adults, screening out high ability types (who escape), leaving only low ability types that are predominantly children but include low-type adults. Hence the above predictions are approximate relationships only.

B. Data and measurement

No systematic data on rebel groups exist, and so to test our predictions we created an original dataset. Information on rebel recruitment and resources is scarce, scattered and inconsistent. To maximize data

quality and depth, we gathered data on a random sample of African rebel groups. We sampled at the civil conflict level (allowing for multiple conflicts per country) using all civil conflicts in sub-Saharan Africa in the period 1980-2004 reported in the UCDP/PRIO Armed Conflict dataset (Harbom et al. 2008). 14 of 42 conflicts were randomly selected; within a conflict, we sought information on all non-state armed actors listed in the dataset: 43 groups from a total of 124 across all conflicts.[4] Single-incident coups were dropped, leaving 40 armed groups in the sample.

A team of eight student researchers used reports, academic literature, news archives, and related sources to develop detailed, sourced, group-specific narratives on key variables: method and age of recruitment, remuneration type, and resource base (material and social, internal and external). Academic experts were contacted for each group to complete and validate the results. Appendix B provides a detailed description of the dataset and coding process and narratives are available from the authors.

Based on these narratives and expert interviews, the authors and research team coded several variables: *Percentage of recruits under 18*; an indicator for evidence of 5 percent or more of *Recruits under 15*; an indicator for evidence of 20 percent or more *Forced recruitment*; an indicator for *Forced child recruitment*; indicators for any evidence of *Monetary rewards paid*; ordinal scales for the *Degree of initial civilian support* and *Initial material resources*; and an indicator for *Natural resource wealth*.

Table 6 describes the coding and summary statistics for each variable. Under-18 recruitment ranges from 0 to 70 percent, with a mean of 13 percent. More than a third of our sample recruited children under 15 in significant numbers. Likewise, a third of groups forcibly recruit. We were conservative in our measure of forced recruitment, coding only the most overt coercion, in essence abduction.[5]

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[4] To ensure a random sample across the maximum number of countries, we stratified the sample by the number of conflicts reported in a country, drawing approximately one third of conflicts from each stratum: (i) countries with a single listed conflict; (ii) countries with 2 to 5 conflicts; and (iii) countries with 6 or more conflicts. The sample includes groups from Burkina Faso, Cote d'Ivoire, D.R. Congo, Ethiopia, Gambia, Guinea-Bissau, Mali, Nigeria, Senegal, Somalia, South Africa, and Uganda.

[5] Note that, with the exception of the LRA, there are no quantitative data on the groups in our sample, and so all coding is subjective and approximate. *Percentage of recruits under* 18, for instance, could be coded no finer than approximate quintiles. Such fine distinctions proved impossible for *Recruits under 15* and *Forced recruitment*, and so we code only a dummy variable. Approximately a third of the groups were small, short-lived and obscure, and (as detailed in Appendix B) here the data are weakest.

C. Analysis

Cross-rebel statistical analysis is plagued by a number of challenges. One is sample selection: we only observe groups that have been minimally successful in organizing and sustaining a movement. Another is that data are scarce or of poor quality. Finally, group characteristics and practices are endogenously determined, frustrating causal claims. Thus cross-rebel regressions must be used with caution. Nevertheless, this group-level analysis is more novel and more insightful that the usual cross-country analysis, and presents perhaps the only large-sample mans of testing theories about rebel organization and behavior.

Nevertheless, cross-rebel data confirm our primary prediction: child recruitment and coercion are strongly correlated. *Forced recruitment* and *Percentage recruits under 18* have a correlation coefficient of 0.53, and *Forced recruitment* and R*ecruits under 15* have a correlation coefficient of 0.60 (see Table 7). Both are significant at the 1 percent level (and neither the magnitude nor their significance of the coefficients changes if the LRA are excluded). Figure 10 plots *Forced recruitment* on *Percentage recruits under 18*; fitting a simple regression line, we see a clear upward slope that is likewise robust to the exclusion of the seeming outlier, the LRA. Table 8 displays the results of linear regressions of our two child soldiering measures on *Forced recruitment*.[6] The coefficient on forced recruitment in all cases is negative and statistically significant; the *Percentage recruits under 18* is 14 percentage points higher in groups that recruit forcibly (column 1); and a group that forcibly recruits is 61 percentage points more likely to *Recruit under 15* (column 5). The direction, magnitude and significance of the coefficients are robust to the inclusion of country dummies and an indicator for the LRA (although the magnitude tends to decline).

Our model also suggests that groups that forcibly recruit children should be less likely to pay monetary wages; that groups with higher initial popular support should be less likely to forcibly recruit children, and that groups with independent resources bases (like natural resource wealth) will be more likely to forcibly recruit children. Each of these hypotheses is borne out weakly in the cross-rebel analysis. Individual regressions of *Recruitment under 18* and a *Forced child recruitment* indicator on measures of *Monetary wages paid*, *Initial civilian support*, *Natural resource wealth*, and *Initial material resources* all

[6] Agent and incentive types are jointly determined in the model, and so the use of *Forced recruitment* as an independent rather than a dependent variable is arbitrary. Also note that all regressions cluster standard errors by country, and are weighted by the inverse probability of selection. Inferences are within-sample only, so that weights sum to one.

have the predicted sign (see Table 9). Individually, however, none are statistically significant, perhaps in part because of the small sample size and missing data. When *Forced child recruitment* is regressed on all of the independent variables at once (column 8) we see much larger and robust coefficients: Groups with natural resource wealth are 79 percentage points more likely to forcibly recruit children, while groups with initial civilian support for 58 percentage points less likely. Such groups are 70 percentage points less likely to pay monetary wages, but this coefficient is not statistically significant. These results must be regarded with some caution, due to the number of missing observations (largely Somali groups and small, short-lived insurgencies). We can regard the correlations in Table 9 as applying principally to larger, more sustained insurgencies.

Finally, the model predicts that as outside opportunities improve, adolescents may be more likely to be recruited voluntarily. We proxy for outside opportunities with GDP per capita. We find little support for this prediction (Table 9); groups in wealthier countries are actually less likely to forcibly recruit children (column 7) and this correlation is large and statistically significant when considered in concert with the other independent variables (column 8). One possible explanation is that GDP per capita also proxies for state counter-insurgency capacity (Fearon and Laitin 2003); weaker or less popular groups may opt to forcibly recruit children, but such groups may also be more easily defeated by stronger regimes, and hence be defeated, dwindle, or choose not to form in the first place. This returns us to one of the fundamental weaknesses of cross-rebel analysis: sample selection in terms of the rebel movements observed. While many of our predictions are borne out by the evidence, a comparative and historical approach is likely to be a more robust avenue of future research and testing of the theory.

6. Conclusions, predictions, and policy implications

What is the implication of our argument for public policy and counter-insurgency? We suggest that children are also more easily disoriented and less able to escape kidnapping than adults, and so outside opportunities are less valuable in expectation. We also argue that children are more easily manipulated and intimated by unscrupulous principals, reducing the perception of outside opportunities relative to staying and being productive in the organization. Rebel leaders like Kony are not ignorant of these dynamics. The same dynamics arguably influence the decisions of pimps, sweat shop owners, and other unscrupulous operators and contribute to the most pernicious forms of child labor. The crucial insight of the

principal agent set-up, similar to that argued by Chwe (1990), is that threatening or inflicting pain is a rational and optimal strategy for motivating people who are poor in the sense of having bad alternatives. Hence children's reservation utilities are crucial—it is only because they are low in reality as well as perception and expectation that abduction and punishment are optimal.

These findings yield several policy implications. For instance, a government's policing or counter-insurgency effort could have serious unintended consequences. As discussed above, increases in government resources (from U.S. counter-terrorism funding and training, for instance) could raise the minimum force size requirement for a rebel group. If punishment is cheap and resources are fixed, a rebel leader's incentive is to increase the abduction of children. The same is true for pimps and sweatshops.

A seemingly obvious means of discouraging recruitment of all forms is aggregate educational and economic opportunities, an approach advocated by the International Labor Organization (ILO 2007). But our model suggests that this relationship may not be so simple: first, intermediate levels of development could actually push the optimal age of recruitment downwards, especially if adults share in growth more than children; and second, outside opportunities for recruits must rise faster than that for rebel leaders, otherwise the rebel leader's incentives to seize the country (and hence recruit) increase proportionally.

Reducing poverty and increasing access to education are long term solutions to an urgent and immediate problem. Where child abductions continue to occur, the evidence and theory in this paper suggests an unconventional intervention: counter-abduction training. A child's reservation utility is lower in part because of the rebel leader exploits a child's lower expectations of successful escape and community acceptance. Programs of education and counter propaganda should therefore increase a child's valuation of his outside options and make children less attractive as recruits. Just as Western schoolchildren perform fire drills, or learn not to speak to strangers, so should children in war zones be drilled in escape and misinformation.

Just such a counter-propaganda effort was launched by Ugandan civil society, albeit too little and too late. In 2000, organizations began to broadcast messages of reconciliation, welcome and amnesty. One rebel commander reported that, by 2004, such broadcasts helped lead to orders to cease abductions: evidence of amnesty and reconciliation became so widespread that a new abductee would 'taint' previous ones by revealing the truth. Informal education programs also emerged. As returned youth swelled in number, returnees began to teach young relatives and neighbors how to escape. Experienced hunters also

began to pass on methods of triangulating one's location (and the direction of home) by the shape of various rock formations scattered across the landscape. In retrospect, more and better education and communication earlier in the conflict could have reduced the effectiveness of abduction. Just as posters, billboards and radio jingles teach Ugandan youth to avoid landmines or HIV/AIDS (or just as U.S. schoolchildren learn fire and earthquake drills), so too could formal school or community programs have been developed to counter rebel propaganda and teach escape.

The same lessons apply to the more than 10 million children employed in hazardous labor, where coercion is the norm. Hundreds of millions of children also labor in agriculture and industry, where similar incentives to coerce undoubtedly exist. Cheap punishment (e.g. the absence of social or economic sanctions against child employment) will tend to promote child enslavement. Programs and campaigns that increase awareness of children's rights and options, or improve their educational opportunities or the returns to human capital investment, should make indoctrinating and retaining children in exploitative employment more difficult.

Perhaps more unexpectedly, a ban on non-hazardous forms of child labor in legitimate firms could increase the incentives to coercively employ children in illicit activities; by lowering children's economic opportunities relative to adults, it becomes easier to retain a child through threats and punishment. Such counter-intuitive implications highlight the importance and value of applying advances in agency and incentive theory to these unconventional areas.

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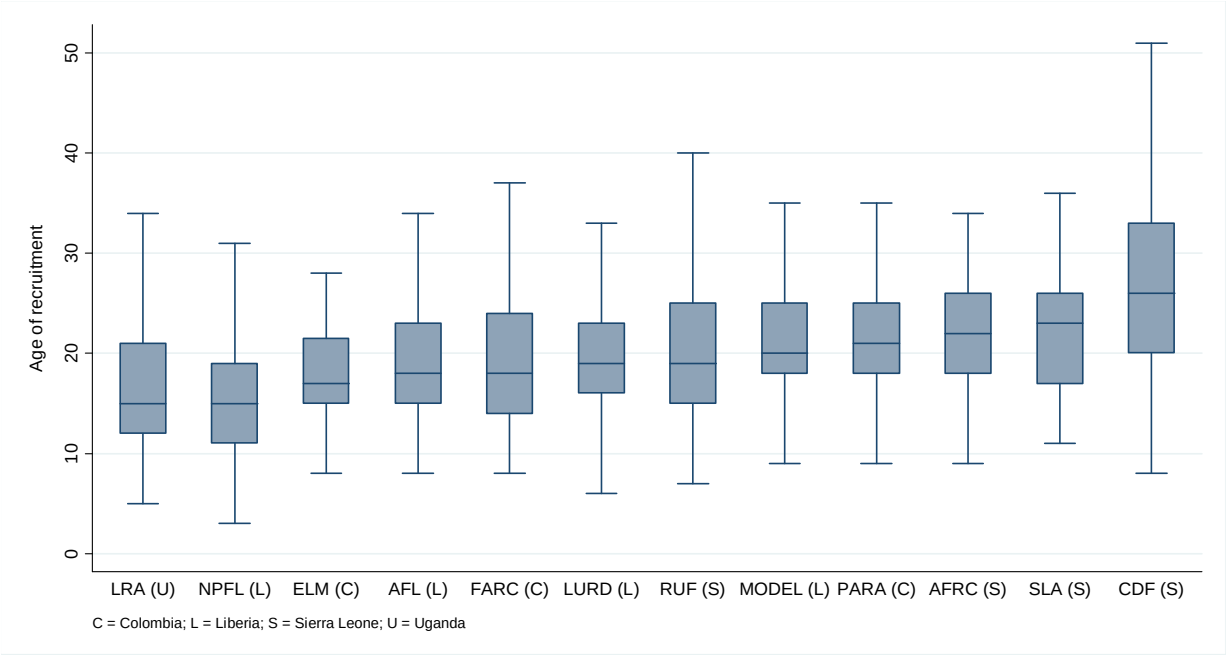
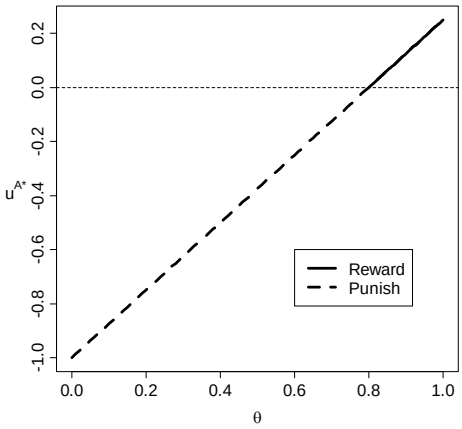
Figure 1: Distribution of recruitment age in 12 armed groups



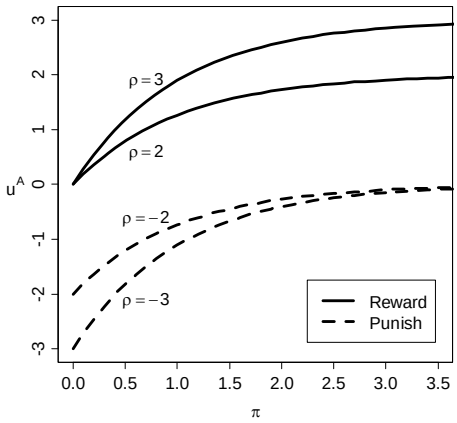
Notes: Each box ranges from the 25th to the 75th percentile, with the mean indicated by the horizontal line through the middle. The lines, or whiskers, represent the minimum and maximum of the distribution, with outliers omitted. Results are based on individual surveys of ex-combatants. In Sierra Leone and Liberia, we use age at the time of recruitment into the faction on which recruitment data was collected (chosen randomly if the respondent belonged to multiple factions). In Uganda, we use age at the time of longest-lasting abduction, omitting all abductions less than two weeks in length. In Colombia, we use age of first recruitment into an armed group.

Figure 2: Abductee utility and effort: key relationships in equilibrium

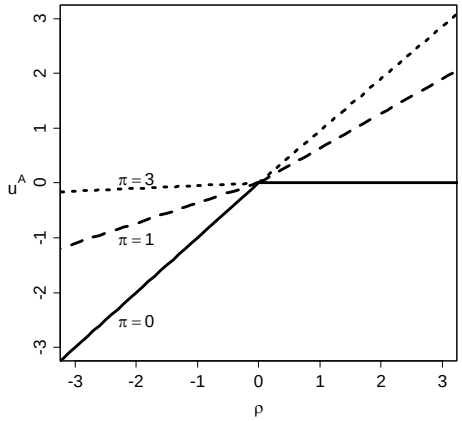
a. Reservation utility as a function of productivity



b. Utility as a function of productive output



c. Utility as a function of the reward/punishment schedule



d. Optimal effort as a function of productivity

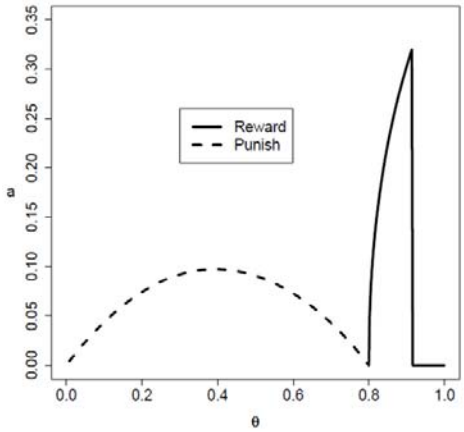
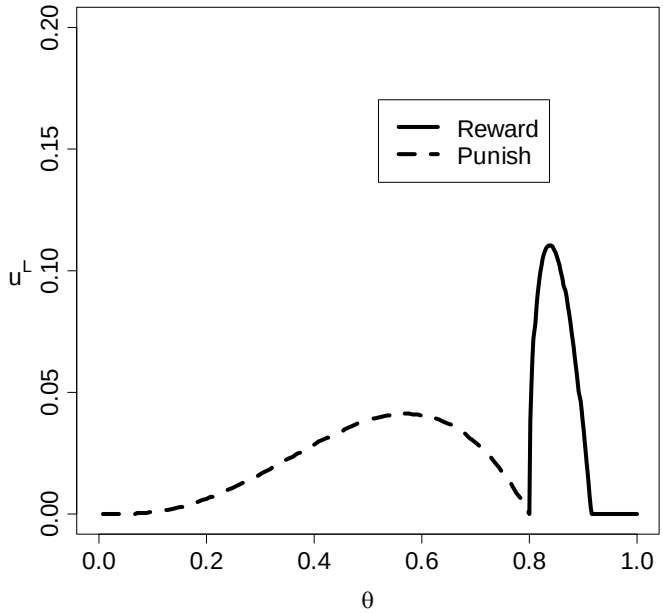


Figure 3: Leader's utility in terms of abductee productivity

a. Base case: Punishment and rewards are equally costly



b. Punishment less costly than rewards

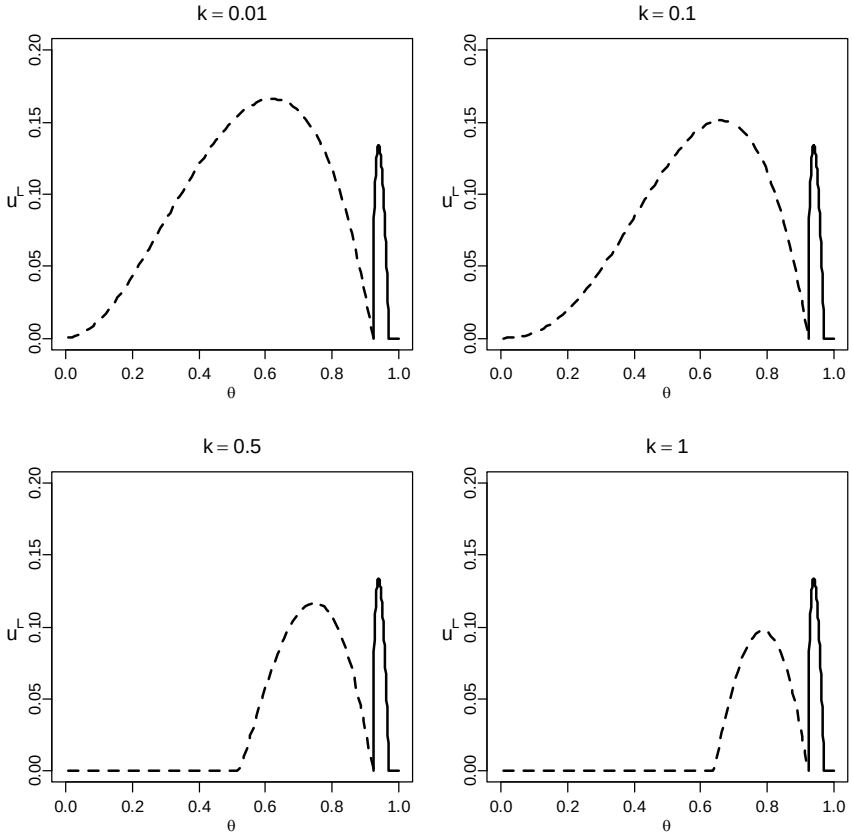
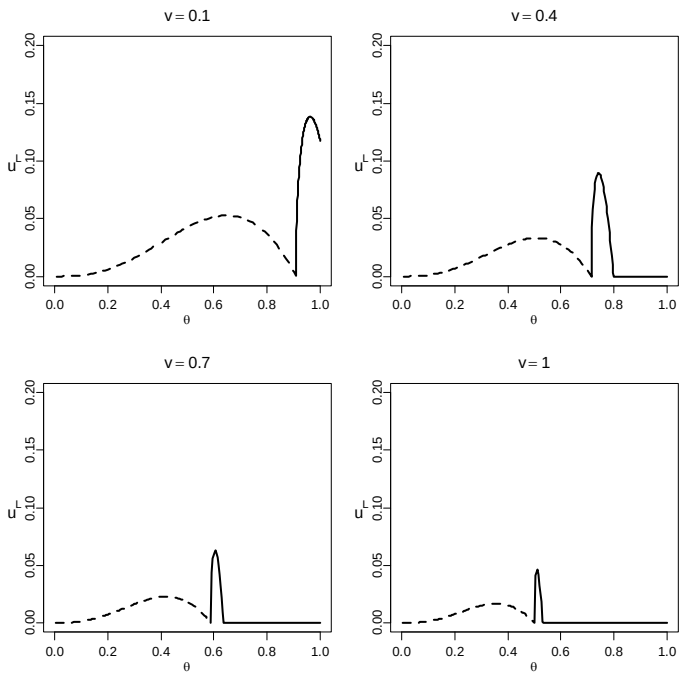


Figure 4: Leader's utility in terms of θ,
at different levels of development and returns to ability

a. for different levels of development (v)



b. for different returns to age and ability (v_θ)

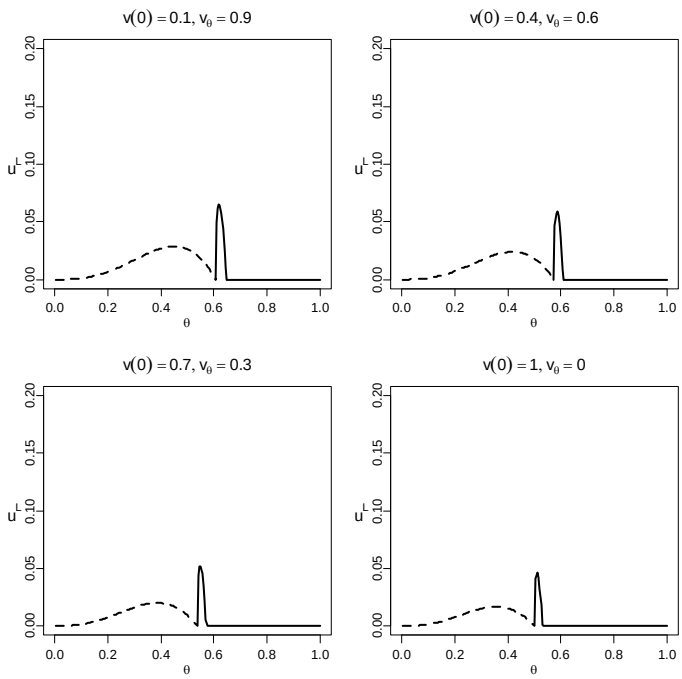
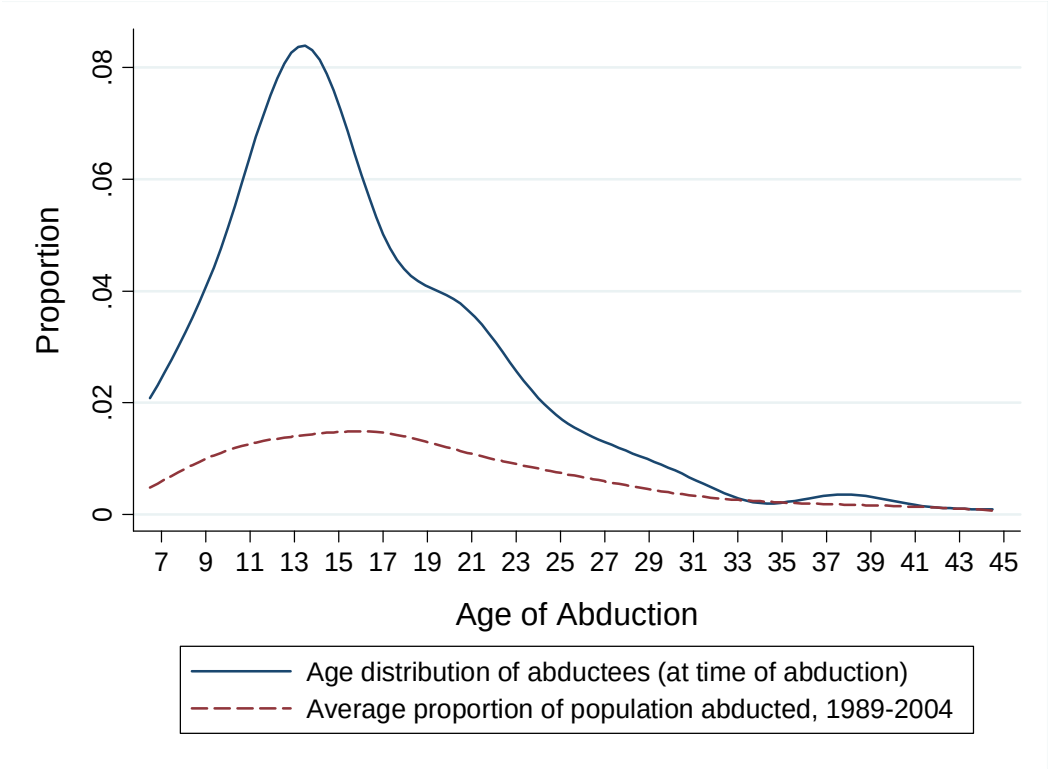
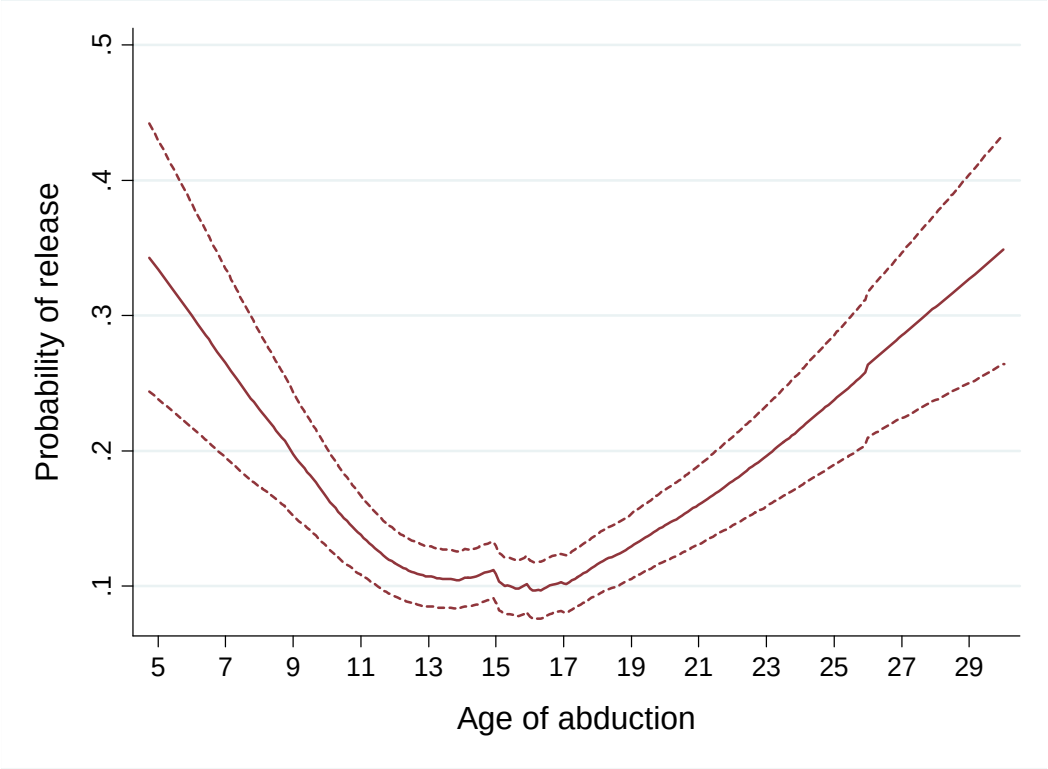


Figure 5: Distribution of age at the time of abduction in the LRA



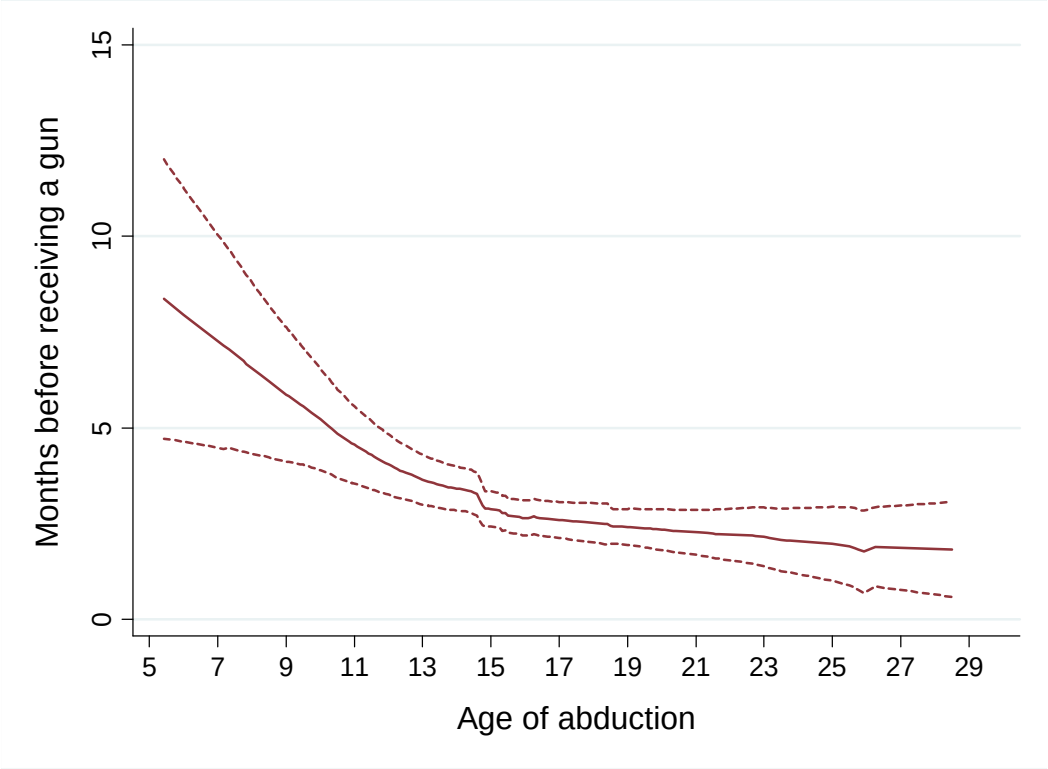
Notes: Data include absentee youth and youth who have since died or did not return from abduction (collected from the household survey). Multiple abductions are included. The proportion of the population abducted by age is calculated by dividing the number of youth abducted at each age in each year by the total number of youth in the population of that age in that year, and calculating the running-mean over all years via symmetric nearest-neighbor smoothing (bandwidth = 0.5).

Figure 6: Probability of being released in the first month of abduction, by age of abduction



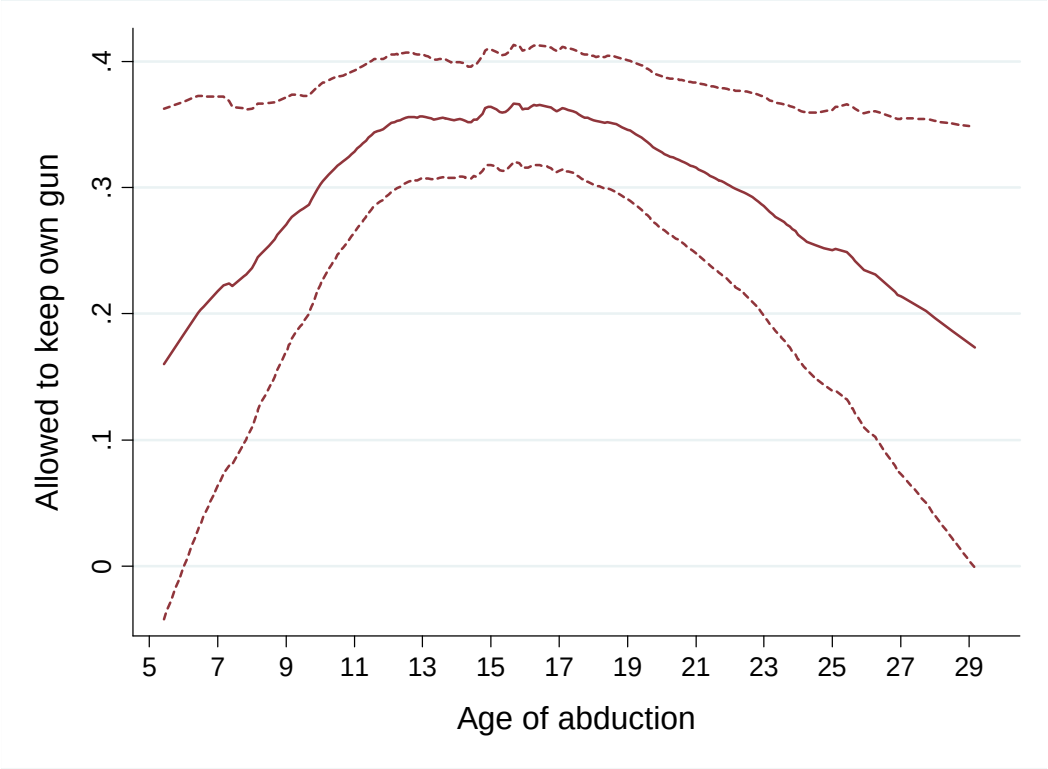
Notes: The solid line is a running-mean calculated via symmetric nearest-neighbor smoothing with a bandwidth of one. The dotted lines represent the 95% confidence interval. Youth left behind because of injuries are not considered released. Data do not include absentee or non-surviving youth. Multiple abductions enter individually.

Figure 8: Average number of months before receiving a firearm, by age of abduction



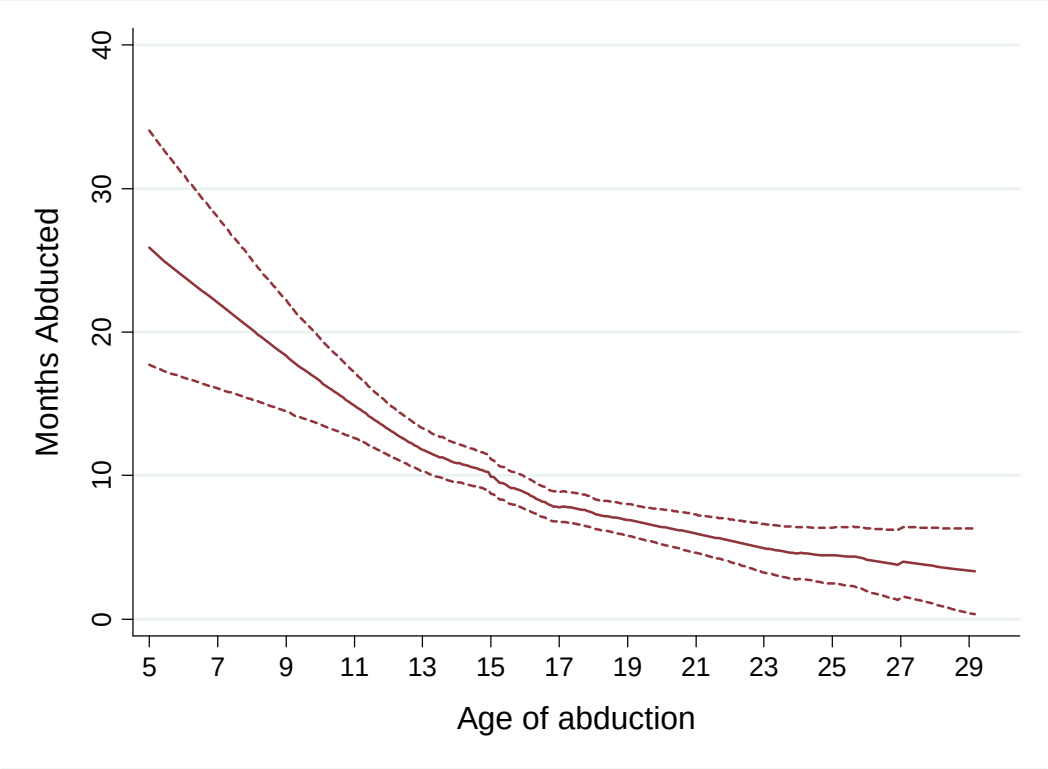
Notes: The solid line is a running-mean calculated via symmetric nearest-neighbor smoothing with a bandwidth of one. The dotted lines represent the 95% confidence interval. Data do not include absentee or non-surviving youth.

Figure 8: Probability of being allowed to keep one's own firearm, by age of abduction



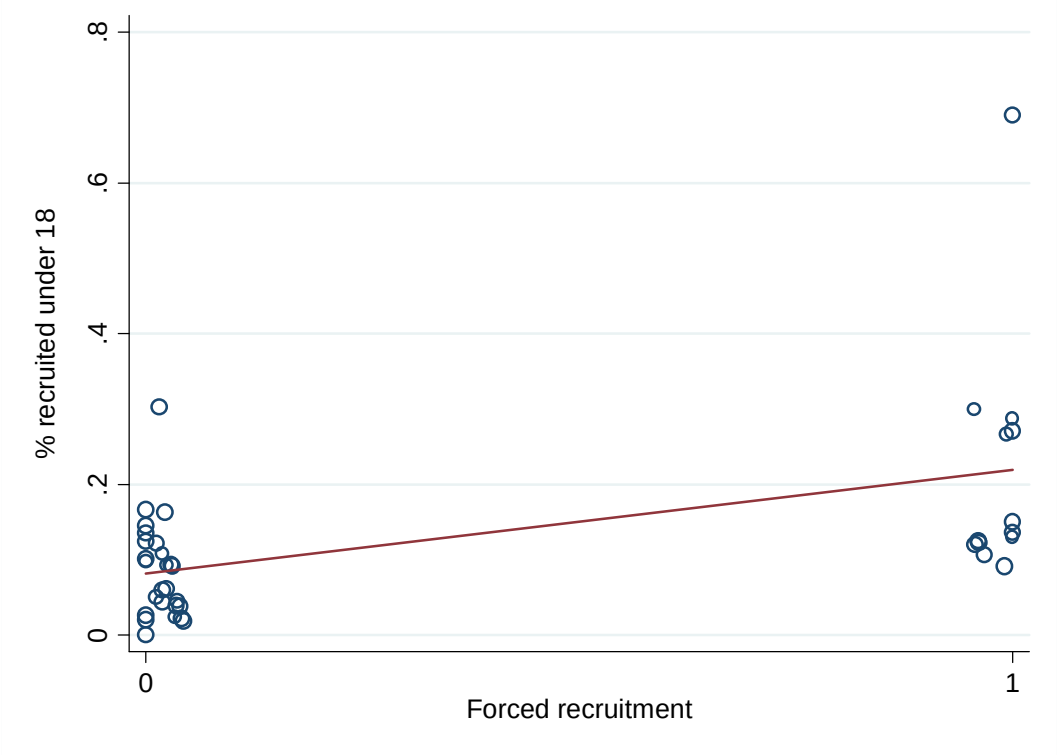
Notes: The solid line is a running-mean calculated via symmetric nearest-neighbor smoothing with a bandwidth of one. The dotted lines represent the 95% confidence interval. Data do not include absentee or non-surviving youth.

Figure 9: Average length of abduction by age of abduction



Notes: The solid line is a running-mean calculated via symmetric nearest-neighbor smoothing with a bandwidth of one. The dotted lines represent the 95% confidence interval. Released youth are excluded from the analysis. Data also do not include absentee or non-surviving youth. Multiple abductions enter individually.

Figure 10: Forced recruitment and child soldiering



Notes: Each circle represents a rebel group. The solid line represents predicted values from a linear regression (see Table 8). N=39.

Table 1: LRA survey summary statistics

Variable	Mean	Std. Dev.	N	Sample characteristics			
				Covers multiple abductions	Males only	>2 weeks only	Females only
Abduction length (in months)	7.22	15.49	894	×			
Released within first one month (excluding injured)	0.14	0.35	894	×			
Escaped in rescue by Ugandan armed forces (excluding released)	0.06	0.24	782	×			
Escaped during battle (excluding released)	0.28	0.45	782	×			
Escaped by running away (excluding released)	0.56	0.50	782	×			
Knew location at time of escape (battle and running away only)	0.49	0.50	702	×			
Age of longest abduction	15.46	4.94	688				
Ever received a reward	0.05	0.21	462		×		
Ever felt allegiance to Kony	0.30	0.46	688				
Ever felt like wanted to stay with LRA	0.11	0.31	688				
Ever wanted to be a commander one day	0.06	0.24	462		×		
Ever felt safer inside rather than outside the LRA	0.05	0.21	688				
Ever believed in magical protection from bullets	0.07	0.25	462		×		
Considered dependable by LRA	0.19	0.39	462		×		
Ever tied or imprisoned	0.49	0.50	688				
Ever forced to carry heavy loads	0.81	0.39	688				
Ever severely beaten	0.55	0.50	688				
Ever attacked with a weapon	0.24	0.43	688				
Ever ranked or led/gave orders to other soldiers	0.03	0.18	688				
Ever given a gun	0.35	0.48	462		×		
Allowed to keep (sleep with) a gun	0.28	0.45	462		×		
Months before receiving a gun (if ever received)	3.48	4.38	194		×		
Listed primary role as a fighter	0.06	0.24	226				×
Received threats from LRA	0.95	0.22	351		×	×	
Received political and ethnic propaganda from LRA	0.49	0.50	351		×	×	
Received threats and no propaganda from LRA	0.50	0.50	351		×	×	
Ever forced to harm or kill a civilan	0.25	0.43	688				
Ever forced to harm or kill a family member or friend	0.12	0.33	688				
Ever forced to abuse dead bodies	0.23	0.42	688				

Table 2: Role within the rebel group, by age of abduction

	(1)	(2)	(3)	(4)	(5)	(6)
	Ever allowed to keep (sleep with) own gun		**Ever led other soldiers**		**Considered someone leaders could depend on**	
A. Males						
Abduction age	0.005	0.075	0.011	0.031	0.008	0.08
	[0.004]	[0.028]**	[0.003]***	[0.012]**	[0.002]***	[0.028]***
Abduction age-squared		-0.002		-0.001		-0.002
		[0.001]**		[0.000]		[0.001]**
Ln (Abduction length)	0.15	0.144	0.055	0.055	0.134	0.133
	[0.005]***	[0.005]***	[0.007]***	[0.008]***	[0.010]***	[0.010]***
Observations	462	462	462	462	462	462

	(7)	(8)	(9)	(10)	(11)	(12)
	Listed fighter as a primary role		**Ever led other soldiers**		**Was a forced wife**	
B. Females						
Abduction age	0.001	0.021	0.001	0.005	0.002	0.048
	[0.004]	[0.029]	[0.002]	[0.019]	[0.005]	[0.030]
Abduction age-squared		-0.001		0		-0.001
		[0.001]		[0.000]		[0.001]
Ln (Abduction length)	0.042	0.041	0.012	0.012	0.124	0.124
	[0.025]	[0.025]	[0.017]	[0.016]	[0.022]***	[0.021]***
	226	226	226	226	226	226

Standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%
Controls included but not displayed: Location of birth dummies; year of abduction; parent's education, occupation and death; pre-abduction household assets
Youth with missing dependent variable (those abducted less than two weeks) coded as "0"

Table 3: Abduction length and means of escape, by age of abduction

	(1)	(2)	(3)	(4)	(5)
	Abduction length (months)	**Rescued**	**Ran away**	**Knew escape location**	**Knew escape location if ran away**
Abduction age	-0.50 [0.137]***	-0.006 [0.002]**	0.008 [0.004]**	0.008 [0.005]*	0.010 [0.006]*
Observations	788	782	782	702	447

Standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%
Each abduction is a separate observation, clustered by individual
Controls included but not displayed: Indicator for previous abduction; Gender x location of birth dummies; year of abduction; parent's education, occupation and death; pre-abduction household assets

Table 4: Attitudes towards the rebel group, by abduction age

	(1)	(2)	(3)	(4)	(5)	(6)
	Felt safer in LRA	**Felt allegiance to LRA**	**Believed in magical protection (males only)**	**Wanted to be a commander (males only)**	**Wanted to stay in LRA**	**Tied or imprisoned**
A. Linear form						
Abduction age	-0.005	-0.006	-0.006	-0.001	-0.003	0.005
	[0.002]**	[0.004]	[0.003]*	[0.002]	[0.003]	[0.003]*
B. Quadratic form						
Abduction age	0.024	0.010	0.028	0.037	0.043	0.088
	[0.024]	[0.022]	[0.023]	[0.018]*	[0.014]***	[0.017]***
Abduction age-squared	-0.001	0.000	-0.001	-0.001	-0.001	-0.002
	[0.001]	[0.001]	[0.001]	[0.001]**	[0.000]***	[0.001]***
C. Linear form, by gender						
Abduction age	-0.009	-0.007			-0.003	0.010
	[0.003]***	[0.004]*			[0.004]	[0.004]**
Abduction age × Female	0.009	0.005			0.001	-0.016
	[0.005]*	[0.007]			[0.006]	[0.007]**
Observations	688	688	462	462	688	688

Standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%
Controls included but not displayed: Gender x location of birth dummies; year of abduction; parent's education, occupation and death; pre-abduction household assets
Youth with missing dependent variable (those abducted less than two weeks) coded as "0"

Table 5: Incentives received from the rebel group, by age of abduction

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Ever rewarded (males only)		**Received propaganda (males abd >2 weeks only)**		**Received threats (males abd >2weeks only)**		**Threats no propaganda (males abd >2 weeks only)**		**Forced to harm family**		**Forced to abuse dead**	
Abduction age	0.000	0.004	0.013	0.015	-0.003	-0.006	-0.015	-0.017	-0.008	-0.007	-0.007	-0.003
	[0.004]	[0.003]	[0.007]*	[0.006]**	[0.002]	[0.003]**	[0.007]*	[0.006]**	[0.002]***	[0.003]**	[0.004]**	[0.004]
Log of Abduction length		0.063		0.043		-0.032		-0.048		0.045		0.067
		[0.010]***		[0.018]**		[0.015]**		[0.019]**		[0.006]***		[0.007]***
Observations	462	462	351	351	351	351	351	351	688	688	688	688

Standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%
Controls included but not displayed: Location of birth; year of abduction; parent's education, occupation and death; pre-abduction household assets
Youth with missing dependent variable (those abducted less than two weeks) coded as "0" unless otherwise noted

Table 6: Rebel group summary statistics

Variable	Coding	Mean	Std Dev	Min	Max	N
Percentage recruits under 18	Groups coded as having 0-5%, 5-19%, 20-39%, 40-59%, or 60-80% recruits under the age of 18. We estimate the percentage as the midpoint within each range.	0.13	0.13	0.025	0.70	39
Recruits under 15	Indicator coded 1 if evidence that 5% or more of recruits were under age 15	0.36	0.49	0	1	39
Forced recruitment	Indicator coded 1 if more than 20% of recruits believed to be coerced.	0.33	0.48	0	1	39
Forced child recruitment	Indicator coded 1 if more than 20% of recruits believed to be coerced and more than 5% of recruits are under	0.51	0.88	0	4	39
Monetary rewards paid	Indicator coded 1 if reports of monetary rewards paid to any recruits	0.23	0.42	0	1	40
Initial civilian support	A two-point scale for whether a group has the non-coerced support of the population in its base region, on which it can draw for resources, cooperation, or harbor. 0 =None; 1=Mixed; 2=High.	1.06	0.81	0	2	34
Initial material resources	A two-point scale estimating a group's level of material resource wealth, including dononr finance and natural resources. 0=Low; 1=Medium; 2=High.	0.71	0.74	0	2	31
Natural resource wealth	Indicator coded 1 if the group draws on natural resource wealth.	0.32	0.47	0	1	34
Initial GDP per capita	1980 national GDP per capita, in current PPP-adjusted US dollars, via IMF financial statistics	472	629	130	3884	40

Table 6: Correlation matrix for key variables

	% recruits under 18	Recruits < 15	Forced recruitment	Forced child recruitment	Monetary rewards paid	Initial civilian support	Initial material
% recruits under 18	1.00						
Recruits under 15	0.60***	1.00					
Forced recruitment	0.53***	0.60***	1.00				
Forced child recruitment	0.85***	0.60***	0.83***	1.00			
Monetary rewards paid	0.07	-0.03	0.13	0.03	1.00		
Initial civilian support	-0.35**	-0.28	-0.28	-0.41**	-0.13	1.00	
Initial material resources	0.36**	0.16	0.16	0.23	0.43**	0.02	1.00

*** p<0.01, ** p<0.05, * p<0.1

Table 8: Child soldiering and forced recruitment

	(1)	(2)	(3)	(4)	(5)	(6)	(9)	(10)
	Percent recruits under 18				**Recruits under 15 (dummy)**			
Forced recruitment	0.14***	0.08***	0.09**	0.04*	0.61***	0.44*	0.59***	0.43*
	[0.02]	[0.02]	[0.03]	[0.02]	[0.12]	[0.21]	[0.13]	[0.22]
LRA dummy			0.53***	0.53***			0.25**	0.14
			[0.03]	[0.01]			[0.10]	[0.10]
Observations	39	39	39	39	39	39	39	39
R-squared	0.26	0.37	0.7	0.79	0.35	0.43	0.36	0.44
Country dummies	N	Y	N	Y	N	Y	N	Y

Regressions are weighted by the inverse probability of selection
Robust standard errors in brackets, clustered by country
*** p<0.01, ** p<0.05, * p<0.1

Table 9: Determinants of child soldiering

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Percent recruits under 18						**Forced child recruitment (dummy)**					
Monetary rewards paid	-0.02					-0.17	-0.14					-0.70
	[0.05]					[0.11]	[0.33]					[0.63]
Initial civilian support		-0.06*				-0.05		-0.45				-0.58*
		[0.03]				[0.03]		[0.30]				[0.28]
Natural resource wealth			0.02			0.14**			0.09			0.79**
			[0.06]			[0.05]			[0.44]			[0.26]
Initial material resources				0.07		0.14*				0.37		0.63
				[0.05]		[0.07]				[0.29]		[0.39]
Initial GDP per capita					0.01	-0.06					-0.04	-0.52**
					[0.02]	[0.04]					[0.17]	[0.17]
Observations	29	34	34	31	39	22	29	34	34	31	39	22
R-squared	0.00	0.11	0.00	0.16	0.01	0.42	0.00	0.16	0.00	0.08	0.00	0.46

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1