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

Bernd Beber
Columbia University

Christopher Blattman†
Yale University

October 2008

*Draft and incomplete: Please do not cite without permission*

Abstract:

This paper integrates case evidence, survey data, and contract theory to understand the motives and conditions behind one of the most pernicious forms of labor exploitation: child soldiering. 10 million plus children are employed in hazardous forms of labor like prostitution, mining, and soldiering. Much of this labor is forced, and the correspondence between the use of children and coercion is especially strong in armed rebellion. One of the worst offenders is Uganda's Lord's Resistance Army. Their recruitment tactics provide a cruel natural experiment, one that reveals how youth of different ages respond to a common set of incentives. We employ original survey data and interviews to argue that the rebels abducted young adolescents because they were more effective guerrillas than younger children and were more easily indoctrinated and disoriented than adults. We capture these dynamics in a principal-agent model that incorporates punishments, indoctrination, and age-specific productivity. The model demonstrates that coercion is a rational strategy when agents have poor alternatives (or poor expectations of their alternatives)—children, in our setup. Coercion and child recruitment, we conclude, go hand in hand, and are most likely to arise when punishment and supervision are cheap, when children's outside options are simultaneous poor in absolute and relative terms, and when rebel leaders are resource-constrained. The model holds unconventional lessons for preventing the recruitment of children into armed groups as well as other hazardous and illicit forms of child labor.

---

* **Acknowledgements:** We thank Jeannie Annan, Jim Fearon, Macartan Humphreys, Stathis Kalyvas, David Leonard, Edward Miguel, Gérard Roland, Jake Shapiro, Jeremy Weinstein, and Elizabeth Wood (as well as seminar participants at Yale, Stanford, and Columbia Universities) for comments on this and prior drafts. The Uganda data derive from the Survey of War Affected Youth (www.sway-uganda.org), collected by the author with Jeannie Annan, Khristopher Carlson, Dyan Mazurana, AVSI Uganda, and UNICEF Uganda. Earlier drafts of this paper circulated under the working title, "The Causes of Child Soldiering."

† Beber: Columbia University Department of Political Science, 420 W 118th St, 7th Fl, New York, NY 10027; 1 (347) 374-0732; bhb2102@columbia.edu. Blattman (corresponding author): Yale University Department of Political Science and ISPS, 77 Prospect Street, P.O. Box 208209, New Haven, CT 06520-8209; 1 (203) 432-3347; christopher.blattman@yale.edu.

# 1. Introduction

Civil war research comes in three main flavors. The first seeks the causes of conflict empirically, through cross-country regressions (e.g. Fearon and Laitin 2003; Collier and Hoeffler 2004). A second models the interaction of competing parties in intricate games, identifying the conditions under which order breaks down (e.g. Garfinkel and Skaperdas 2007). These literatures have one common ingredient: both take the existence and organization of groups as given.

A third literature, originating with studies of agrarian revolutions, uses rich case studies to understand individual motives for violent collective action (e.g. Paige 1975; Scott 1976; Lichbach 1994; Wood 2003) and the strategic uses of ideology, social identity, and civilian relations (e.g. Clapham 1998). Unlike the quantitative literature, these studies tackle the varieties of armed organization and the thorny problem of rational participation in risky and costly fighting.[1] These scholars, however, focus on the motives to participate rather than those to perform and produce—incentive compatibility, in the language of organizational theory. Few, furthermore, examine the consequences of information asymmetry and commitment problems for systems of incentives, command, and control. We argue in this paper that theories of the firm, contracts, and incentives have something to add to the sociological and political analysis of rebellious groups.

Armed rebellion has afflicted more than half of all nations since 1945, with a fifth suffering ten or more years of war (Blattman and Miguel forthcoming). These wars feature not just one but often several rebel organizations, not to mention government forces, militias, and paramilitaries. There is now a growing push to understand, theorize and test the micro-foundations of rebel participation and organization. These include efforts to model the strategic use of violence and looting (e.g. Azam 2006; Kalyvas 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. Gates 2002; Weinstein 2007). Our goal in this

[1] A fourth literature, military sociology, explores the determinants of participation, motivation, and cohesion using case analysis and social psychology. For instance, Shils and Janowitz (1948) emphasize the role of small group solidarity in their classic account of cohesion and motivation. See Kenny (2008) for a survey of the military sociology and organizational identity literatures.

paper is to bring together case study, data analysis, and formal theory to help explain two common, puzzling and unsettling features of guerrilla organization: forced labor and child soldiering.

Child soldiers have been reported in 21 armed conflicts in almost every region of the world in the last six years alone (HRW 2008). Most are thought to be aged between 12 and 18, although recruitment at ages as low as eight is not unknown (CSUCS 2008).[2] Yet while child soldiers are commonplace, they are not ubiquitous. Age of recruitment varies widely across armed groups. The best data come from a handful of surveys of former combatants during or after a civil war. Figure 1 displays the distributions of recruitment age in 12 armed groups in four countries with survey data: Colombia, Liberia, Sierra Leone, and Uganda.[3] We observe wide variation in age profiles both within and between countries, with the proportion of recruits under 18 ranging from 12 to 70%. These data beg the question: why do age profiles vary so much across armed groups? Why in particular do some groups employ so many child soldiers?

While data on child recruits abound, few data are available on the extent of forced recruitment. Mass abduction, however, is a common guerrilla measure, particularly in Africa. In our sample of 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 forced recruitment?

Finally, the data suggest that child soldiering and the use of coercion go hand-in-hand. Figure 2 maps the proportion of child recruits against the proportion of forced recruits in each armed group. If we fit a line to the data (a "cross-rebel regression"), a one percentage point increase in forced recruitment is associated with a 0.52 percentage point increase in the recruitment of child-

---

[2] The United Nations Convention on the Rights of the Child (UN 1989) bars the use of persons under the age of 15 from participation in hostilities. We, however, follow the Optional Protocol to this agreement (UN 2002) and define a child soldier as a participant in hostilities under the age of 18. Hence the phrase 'child soldier' includes a wide range of ages, including adolescents (in this paper, persons age 12 to 17) and young children under age 12. "Youth" is a term we will use for persons aged 14 to roughly 30. Since we focus on the role of children in military activities in this paper, we do not use the broader (and politically correct) term "children associated with fighting forces".

[3] The Uganda data were collected by the authors (and collaborators) and are described below. The other data were generously provided by other researchers and are described in the Data Appendix.

ren under 18 (p = 0.36) and a 1.05 percentage point increase among those under 15 (p = 0.13). The sample is select and small, and so conclusions must be drawn with caution. Even so, the correlation is strongly suggestive of a correspondence between coercion and child recruitment.

This correlation is not limited to child soldiers; it is echoed in other pernicious forms of child labor, including drug-trafficking, prostitution, pornography, and physically hazardous work such as mining and deep-sea fishing. The International Labor Organization estimates that more than 10 million children are engaged in these "worst forms" of labor (ILO 2003). The eradication of these exploitative practices has received increased attention in law and public policy, but is informed by little research. The economics literature focuses on the widespread use of children in agriculture and light industry, modeling such child labor as a product of intra-household labor allocation.[4] Consideration of the firm, incentives, and dangerous work is rare. Chwe (1990) models the decision to whip child works in 19th century Britain as the product of a principal-agent interaction. Otherwise, models of child labor in firms take the form of "classic" industrial organization, focusing on the dynamics of firm and sector competition rather than participation and motivation (e.g. Rogers and Swinnerton 2008).[5]

This paper proceeds inductively to develop a theory of armed organization. We draw upon qualitative interviews, survey data, and a tragic natural experiment to understand the roots of coercion and child soldiering in a particular case: northern Uganda. There a rebel group has abducted tens of thousands of young men and women, with a particular focus on adolescent boys. The evidence suggests that young boys were targeted for three main reasons: because they were overrepresented in the population; because they were more effective guerrillas than younger children; and, perhaps most importantly, because they were more easily indoctrinated and dis-

[4] See Basu (1999), Fares and Raju (2007), Edmonds and Pavcnik (2005), and Udry (2004) for reviews.

[5] Similarly, the literature on unfree labor tends to focus on indentured or debt-bonded labor, and explores these relationships in general equilibrium models of agrarian economies, where forced labor is a consequence of relative labor scarcity (e.g. Domar 1970; Engerman 1973; Conning and Kevane 2007). Our analysis of coercion in labor contracts is closest in spirit to the (pre-contract theory) analysis of pain as an incentive in the economic history of slavery (e.g. Findlay 1975; Fenoaltea 1984).

oriented than young adults, and thus stayed longer without escaping. These facts suggest a rebel rationale for child abduction: productivity in war is increasing in age, but responsiveness to punishment, threats, and propaganda are decreasing in age. Under fear of death, adolescents are more effective, long-lasting, and cheap than adults.

We show that these patterns can be captured in a model of rebel leaders and civilians, albeit one that diverges from standard principal-agent models in two ways: first, we allow for punishment as well as rewards; and second, we allow productivity, reservation prices, and the cost of effort to vary with age. We adopt these changes in order to capture the key dynamics suggested by the Ugandan case and data: the role of age in determining skill, escape, and indoctrination.

The model illustrates the conditions under which child abduction becomes a rational rebel strategy. At the level of the rebel group, these include cheap punishment, low levels of material and social resources, and high minimum force requirements. At the individual level, child abduction is more likely when a child's opportunities are poor relative to young adults, and when indoctrination and disorientation are eased by poor information and education.

Uganda's rebels, to be sure, abducted children for a variety of motives—spiritual, ideological, and rational. Our goal is not to dismiss other influences, but merely to suggest that any "irrational" motives merely augmented a clear set of rational incentives. Recognizing the strategic value of child abduction, we will see, not only suggests new strategies to counter insurgency and discouraging child recruitment, but also offers lessons for curbing child and forced labor generally.

## 2. The war in northern Uganda

The Lord's Resistance Army, or LRA, has fought a low-scale guerrilla war against the Ugandan government since 1988. The rebel force is led by Joseph Kony, a spirit medium of the Acholi tribe. He and the LRA seek a spiritual cleansing of the nation and a return to the political dominance that northern tribes enjoyed for the two decades following Independence.[6]

[6] See Allen (2005), Behrend (1999), Doom and Vlassenroot (1999), and Omara-Otunnu (1994) for a history of the conflict.

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. 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 riches or resources, and increasingly little social support, the LRA struggled to equip and maintain even this small force of forced recruits. The rebellion might have died out were it not for the Government of Sudan. In response to Uganda's support to rebels in southern Sudan, in 1994 Sudan began providing the LRA with weapons and territory for bases. Sudanese 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" to rebel commanders.

LRA activity peaked in 2002 when the Ugandan army drove the LRA from Sudan into Uganda. This push, in concert with the 2005 indictment of the rebel leadership by the International Criminal Court (ICC), eventually drove the LRA to the negotiating table. A fragile truce has existed since 2006. The vast majority of abductees, roughly 82%, 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 remainder, tragically, are presumed perished.

In newspapers and human rights reports, the LRA is the archetypal irrational, barbaric, apolitical rebel force of Africa's so-called "new wars" (e.g. Kaplan 1994; Kaldor 1999). 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.[7] 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, and violence.

[7] For a critique of "new wars" see Kalyvas (2001). On the LRA, see the edited volume by Allen and Vlassenroot (2008).

## 3. Interview and survey data

We conducted unstructured 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 five months of field work in 2005 and 2006. 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 the 2005 International Criminal Court indictments of the rebel leadership.

We also conducted representative surveys in concert with an NGO, a psychologist, and two human rights scholars. A first survey, in 2005, targeted males born in the Districts of Kitgum and Pader between 1975 and 1991. 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 the escalation of the war. We randomly sampled 1,162 households in eight clusters, using the earliest sample frame available: U.N. World Food Programme lists compiled in 2002. 88% of sampled households were found and interviewed. Enumerators worked with household heads to develop a 'retrospective 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. The 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 absentee youth: 9.5% of males and 17.5% of females

were not found. Female absenteeism is higher because of migration for marriage; the slow return from displacement camps beginning in 2006, and the time elapsed since the 2005 rosters.

## 4. Abduction and war experiences

Forced recruitment in our sample was large-scale and indiscriminate. Two in five males and one in five females aged 14 to 30 were abducted for at least two weeks.[8] 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. An Amnesty has been granted to all "returnees" and self-reported acceptance rates back into the community are high.

### A. Incentives, coercion, and control in the LRA

The impoverished LRA seldom provided material incentives. Just 5% report material rewards, of which the most common was food. Money or loot was rarely given, even among 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

[8] We took several measures to guard against youth misrepresenting themselves as abductees (in the hopes of receiving aid). We made clear that no assistance would be provided. We also compared abduction reports by the household head and abductees and followed up major inconsistencies. Finally, we asked more than 200 detailed questions about each abduction. Only five percent of abductees raised suspicion, and reclassifying these as "non-abducted" has no material impact on our conclusions.

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.[9]

While spiritual messages and initiation were common, former abductees also reported political propaganda and the promise of material rewards. The feasibility and importance of overthrowing the government appears to be the most common throughout the data, followed by incitement over the crimes committed by Museveni and promises of government positions and loot. These methods were successful. 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%.

---

[9] 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.

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 certain type of [holy] oil which they put on you. It confused you and 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."

## B. An army of child soldiers

Three times as many youth aged 14 were abducted as those aged 9 or 23 (Figure 3, vertical bars). The preference for adolescent boys holds true even after adjusting for the disproportionate number of young people in the population. From 1989 to 2004 a 14-year old youth in the study population had an average of a five percent chance of abduction—twice the level of risk faced by one aged either 9 or 23 (Figure 3, connected line). Some factor beyond the excess supply of children and youth must account for LRA behavior.

The focus on adolescents is even more pronounced once we account for release. LRA raiding parties commonly abducted all able-bodied members of a household to carry looted goods, but were generally under explicit instructions from Kony to release children under 11 and adults older than their mid-20s, once loot was delivered to a safe location. This pattern can be seen in Figure 4, which displays the year- and location-adjusted deviation from the average probability of release, by age of abduction.[10] Fourteen percent of survey respondents were released in the first month of abduction (ignoring those left behind due to injury). The probability of release is highest for children under 10, dips sharply for adolescents, and is rising in age thereafter.

## 5. The logic of child soldiering

### A. Existing explanations

Why recruit children? Answers are nearly as numerous as the journalists, human rights workers, and academics that produce them, but five main types 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 (Cohn and Goodwin-Gill 1994; Rosen 2005; Singer 2005). 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 (e.g. Kaplan 1994; Kaldor 1999; Reno 1999; Honwana 2005). One reason is the erosion of taboos and other costs of employing coercion and children in war.

Third, others emphasize the functional value of children, especially for menial tasks. There is disagreement, however, on children's military effectiveness. Some say that children lack the necessary fortitude (Gutiérrez 2006; Wessells 2006). Others, including some rebel commanders, attest to children's stamina and stealth (Cohn and Goodwin-Gill 1994; ILO 2003; Boyden and de

[10] The regression line is a running-mean calculated via symmetric nearest-neighbor smoothing with a 0.5 bandwidth. The 90 percent confidence interval is indicated by the dashed lines.

Berry 2004). Lighter and cheaper firearms may also increase the relative combat effectiveness of children and the incentives to recruit them (Machel 1996; Coalition 2004; Singer 2005).

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

Finally, some argue the young are more malleable, adaptable, more easily indoctrinated and deceived, and less likely to question authority. Hence they are easier to command, control, and retain (e.g. Cohn and Goodwin-Gill 1994; Boyden 2003; Peters et al. 2003; Gutiérrez 2006). Testimony from with rebel officers is the primary source of such claims (e.g. ILO 2003) although developmental psychology provides some additional support. Evidence, largely from U.S.-based lab experiments, suggests that adolescent social and brain development may lead them to be more conformist and influenced by peers (e.g. 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 largely lab-based and remains inconclusive.

## B. Empirical strategy

To weigh accounts theories of child soldiering, the "ideal" experiment would be one where different recruiting arrangements were offered to random samples of civilians, with outcomes observed for all recruits by age. The LRA offers nearly such a terrible case, albeit for just one sort of recruiting arrangement—a coercive one.

LRA recruitment was large-scale, involuntary, 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.[11] These same characteristics, however, predict participation in Uganda's government militia.

In this context, cross-age comparisons of in the self-reported actions, attitudes, and experiences of former abductees reveal the differential response of children and adults to threats and violence. We employ the following specification for comparisons of an abductees' self-reported attitude or action, $y$, 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 mortality, especially abductees that did not return, may introduce 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 underreporting 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.

---

[11] In logit regressions of abduction on pre-war household traits, the coefficients on wealth, education, occupation and orphaning are small and statistically insignificant. Only household size predicts abduction: very large households were slightly less likely to be raided, in part because they were harder to overwhelm and control by a small band of fighters.(Blattman and Annan 2007).

## C. Results

**Length of stay.** First, abduction lengths fall steeply in abduction age: from 9 months at age 12–13 to 4.5 months by age 24–25 (see Figure 5). According to the linear regression results, length falls by 0.5 months for every year of age (Table 2). One reason 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.

**Ease of disorientation.** Rebel leaders 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.

**Ease of indoctrination.** Younger abductees were also more easily indoctrinated and influenced. 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 appears to be driven primarily by males.

Older males were also less 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 that Kony's 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.

**Rewards and punishments.** The likelihood of receiving a material is low has almost zero correlation with age, even when accounting for length of abduction (Table 5). Adults, however, are less likely to receive threats and punishments and more likely to report positive political propaganda. Threats and punishments were only measured among males abducted longer than two weeks. 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) while threats of death and punishment declined by 0.6 percentage points with each year of age. 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.

Adults are 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% at 12–13 to 18% at 24–25. This impact diminishes, however, when accounting for length, suggesting the abuse of dead bodies is partly a function of length and partly of age.

**Roles.** Finally, roles within the armed group suggest that young children were least effective as fighters. Mid-adolescents are the most likely to receive and be allowed to keep a firearm, with the likelihood of being a fighter dropping off sharply below age 12 (Figure 7). Abductees younger than 12 also took much longer to receive a gun, even when they did receive one: 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 8). Adolescent males were also 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.[12]

## 6. A formal theory of coercion and child soldiering

We can draw several inferences from these data. First, guerrilla productivity increases in age, especially 8–14. Second, punishment is more common among children and adolescents. Third, younger abductees tend to remain longer because they are more easily disoriented, more fearful of escape, and more easily manipulated. In sum, adolescents are less able than adults, but when abducted they are the most responsive to (inexpensive) coercion, and so stay longer than adults. The leader yields a smaller benefit per recruit, but accrues those benefits over a longer period.

This simple logic is easily incorporated into a principal-agent game with two actors, a rebel leader $L$ and an abductee $A$. The value of a model is threefold. First, it reveals the specific conditions under which child recruitment will occur. Second, it suggests novel solutions to the problem of child soldiering. Finally, the model broadens our understanding of labor contracts to include the use of coercion, and thus reveals some general lessons on child and forced labor.

We introduce coercion into the standard principal-agent framework by allowing for punishments in addition to positive rewards. We introduce children by allowing productivity and reservation utilities to vary by agent type (i.e. age of the recruit). The closest relations to our setup are Chwe (1990) and Gates (2002; 2004). Chwe models why child workers during the Industrial Revolution were more likely to be whipped. His main result is that the optimal contract will provide money rather than pain when the worker's reservation value is sufficiently high. Children, who have poor outside options, are thus more likely to suffer punishment. Gates also argues that

[12] Children younger than 12 were also less able to carry heavy loads, although the effect is only significant among females rising from less than 85% in preadolescence to over 92% in adolescence and adulthood. A regression using a quadratic age term confirms the relationship, but a test of joint significance has a p-value of just 0.5.

children have fewer outside options and hence it is easier to incent them to meet the participation and incentive compatibility constraints.

Our approach differs in three ways. First, we endogenize reservation utilities: the quality of outside opportunities rise with productivity, so that the extent to which the leader has to treat an abductee favorably is increasing in the abductee's age or skill level. Second, we model the leader's simultaneous decision over what type of agent to abduct, and what incentives to offer by type. Third, we model death as a possible, but uncertain, consequence of non-participation.

## A. Structure of the model

Each abductee in our setup has an age-dependent productivity factor $\theta$, and he chooses how much effort $a$ he will contribute to rebel activities. The rebel leader observes the abductee's productivity type (i.e. his age), and faces two decisions: first, the optimal reward or punishment $\rho$ to give to the recruit; and second, the optimal type $\theta$ to recruit. The rebel leader observes both agent type and productive output, but she is unable to directly observe either the abductee's effort level or a random component in production. The abductee is fully informed.

Utilities are given by

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

$$u^L = \pi(a, \theta, \varepsilon) - c^L(\rho, \pi(a, \theta, \varepsilon))$$

where output is given by production function $\pi$ with non-negative inputs $a$ and $\theta$, and random component $\varepsilon$. The abductee derives utility from output priced at $\rho \in R$ and disutility given by a cost function $c^A$ of effort. The leader's utility is given by production less the cost of rewarding or punishing effort. Superscripts denote actors and subscripts denote partial derivatives.

We assume that cost and production functions are positive. Production increases in all inputs, and the abductee's reward function $r(\cdot)$ is increasing and concave in $\pi$ and abductees experience diminishing returns to effort (i.e. $\pi_{aa} < 0$ and hence $r_{aa} < 0$). A recruit who is not exerting any effort can expect to gain net utility if he increases his effort ($u_a^A > 0$ at $a = 0$) and that the abduc-

tee's cost of providing additional effort is non-decreasing in the amount of effort already contributed ($c_{aa}{}^{A} \geq 0$). All functions are continuous and thrice differentiable over their domain.[13]

This setup has several special features. First, the real-valued incentive $\rho$ can be negative or positive. Second, as we are modeling abduction alone, we require that a participation constraint is met—that is, the recruit's utility exceeds some reservation point $\underline{u}(\theta)$.[14] Third, the principal in our model observes agent type and thus will calibrate rewards and punishment to just meet an abductee's reservation utility.[15] For the same reason, the agents chosen by the rebel leader always participate. The question then is not what incentives the agent faces to reveal his type, but rather what effect the endogenous participation constraint has on the principal's choice of agent.

## B. An example with explicit functions

An example with explicit functions illustrates the dynamics at work.[16] We suppose a stochastic linear production function $\pi = \theta a \varepsilon$ with input $a$ and "technology" parameter $\theta$. The random variable $\varepsilon$ has a Gamma distribution with mean 1 and standard deviation $s$. Utilities are given by

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

$$u^{L} = \pi - \rho^{2}\pi$$

---

[13] Also note that non-zero effort, ability, and incentives are both required for the leader and abductee to accrue utility. We assume that "market entry" for the leader is optimal ($c_{\pi}{}^{L} < 1$ at $\pi = 0$). The rate at which the leader's cost rises with output is increasing in the incentives given to the abductee ($c_{\pi\rho}{}^{L} > 0$), and the rate at which the abductee's benefits from rebel activities rise with effort is increasing in his productivity ($r_{a\theta} \geq 0$). For the leader's cost function, we have $c_{\rho}{}^{L} < 0$ for $\rho < 0$, and $c_{\rho}{}^{L} = 0$ for $\rho = 0$, which means the leader's costs are minimized when she neither rewards nor punishes.

[14] We also assume that if $r - c^{A} \leq \underline{u}$ at some $\tilde{\theta}$, then $r - c^{A} < \underline{u}$ for all $\theta > \tilde{\theta}$, which ensures that if the participation constraint is not met for some level of productivity, then it won't be met for higher levels either. Finally, we assume $r - c^{A} > \underline{u}$ at $\theta = 0$ and $r - c^{A} < \underline{u}$ as $\theta \to \infty$. That is, the participation constraint is met for abductees of the lowest type but not of the highest type.

[15] The leader's problem is to set a wage for each possible realization of productive output, i.e. $\pi$. Since $\pi$ 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 $\rho$. That is, we fix $r(\cdot)$ and have the leader optimize over scalar $\rho$.

[16] We provide a general solution in the Mathematical Appendix. It yields three points. First, only an interior solution exists for $\theta$. Second, the participation constraint always binds with equality. Third, the incentives given to the abductee are determined by the way in which his reservation value depends on his skill level. If reservation utility is a monotonically increasing function of productivity, then the abductee's equilibrium payoff is likewise increasing in skill.

where $\phi$ is a coefficient of absolute risk aversion. Reservation utility, $\underline{u}(\theta)$, equals $\ln(\theta)$.

Figures 8 to 10 illustrate the properties of these functions (and the general model). For simplicity we assume $\phi = 3$. First, as seen in Figure 8, the reservation price becomes arbitrarily small (large) as productivity goes to zero (infinity), ensuring an interior solution for $\theta$. The specific functional form of $\underline{u}(\theta)$ is not important. Second, the abductee's utility is increasing in output, as shown in Figure 9. The sign of $u^A$ is determined by the sign of the incentive scheme $\rho$. Third, Figure 10 shows how the abductee's utility changes with shifts in the leader's payout scheme for different levels of output $\pi$ (or effort, if we fix $\theta$ and $\varepsilon$). Both an increase in output and a move away from punishment toward rewards leaves the abductee better off.

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

$$r_a = c_a^A \text{ and} \qquad \text{(PC)}$$

$$r - c^A \geq \underline{u}. \qquad \text{(IC)}$$

We solve the example in two parts. First, we examine punishment solutions ($\rho \leq 0$) and solve the incentive compatibility and participation constraints for optimal effort:

$$a = \frac{-\theta + \sqrt{\theta^2 - \phi^2(1+2s^2)\underline{u}}}{\phi(1+2s^2)}$$

Details are provided in the Mathematical Appendix. We can use these equations to write $u^L$ in terms of $\theta$ and maximize over a grid of values for $s$ and $\phi$. For instance, for $s = .5$ and $\phi = 3$, we find $\theta^{**} \approx .80$, $a^{**} \approx .25$, $\rho^{**} \approx -.41$, $u^{L**} \approx .16$, and $u^{A**} \approx -.22$.

Next we consider the case where $\rho > 0$. From incentive compatibility and the participation constraint we can implicitly define effort in terms of $\theta$, which yields

$$\frac{2a}{\phi\theta}\left[(1+\phi\theta a s^2)^{1+1/s^2} - (1+\phi\theta a s^2)\right] - a^2 - \ln(\theta) = 0$$

Unlike the punishment case, we cannot solve algebraically for $a$ and then substitute into the objective function $u^L$, but we can compute $u^L$ numerically and maximize over $\theta$. For $s = .5$ and $\phi = 3$, we find that $\theta^* \approx 1.31$, $a^* \approx .30$, $\rho^* \approx .55$, $u^{L*} \approx .27$, and $u^{A*} \approx .27$.

Figure 11 illustrates the rebel leader's payoff for individuals of different productivity levels. The highest utility comes from abducting relatively high-productivity individuals (i.e. in our age analogy, adults) who have to be treated relatively well or else they would desert.

Note that the empirical distribution that we would expect around $\theta^*$ does not follow from the graph of $u^L$, but rather from any error the rebel leader may make in determining $\theta$. If we assume that the rebel leader's belief about $\theta$ is drawn from some symmetric distribution, then the rebel leader's optimal productivity target will be drawn from a symmetric distribution around $\theta^*$.

## D. When is punishment (and child abduction) an equilibrium strategy?

In the model so far, the leader always abducts high-productivity types and provides rewards, regardless of the values $\phi$ and $s$. One reason is that we have assumed punishment is as costly to the leader as rewards. In reality, however, punishment may be cheap. For instance, the effort to make (or carry out) a threat may be less than the effort required for a leader to accumulate wealth. Moreover, material rewards may have a higher opportunity cost in rebellion. We do not model alternative uses of resources explicitly, but in principle a leader could obtain utility from consuming resources directly or by employing another factor of production (e.g. artillery).

A simple generalization of the model allows for rewards and punishments to differ in cost. To do so, we let $u^L = \pi - k\rho^2\pi$, where $k \in R$. In the example above, $k = 1$ for all values of $\rho$. When punishment is cheaper than rewards, then $k = 1$ for rewards ($\rho > 0$) and $k < 1$ for punishment ($\rho < 0$). We calculate equilibrium values as before and find that punishment is an equilibrium strategy for sufficiently small $k$, provided both risk aversion and uncertainty are low. Figure 12 illustrates this point for $s = .5$, $\phi = 3$, and $k = .01$. To the extent that productivity reflects age, we should expect to see the empirical distribution of recruitment age symmetrically distributed around the optimal $\theta$, not unlike the distribution we observed in Figure 3.

## E. Implications and extensions of the model

The model describes three ways in which an adult- and rewards-focused strategy is optimal. First, when abductees are sufficiently averse to the risks associated with participating in rebel activities the leader will target productive individuals and provide rewards. The same will obtain if production uncertainty is large. Finally, the leader's optimal strategy won't involve punishment if a punishment regime is relatively costly to maintain.

While not included in the model, resource constraints could also affect a leader's decision on agent type. Both punishments and rewards are costly for the rebel leader, 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 Figures 11 and 12). 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.

Finally, 'social resources' may also be available to a rebel leader—popular support (i.e. from ideology or ethnicity) that can be used to obtain supplies or reduce reservation utilities of recruits and hence reduce the cost of recruitment. Where popular support exists, punishments may not be for two reasons. First, social resources may be non-rival, and hence the marginal cost of rewarding an additional high-productivity recruit might be quite low. Second, the use of punishment could actually reduce a rebel force's reputation and public support, making the marginal cost of punishment very high when levels of punishment are initially low. In this case, only rebel groups with few initial social resources (like the LRA) may find it optimal to recruit children.

A final generalization shows how the incentives to recruit low productivity types (i.e. children) may be greater in poor regions. To see this, consider the following participation constraint,

$$\underline{u}(\theta) = \ln(\delta\theta) .$$

In the previous example, $\delta = 1$. The larger is $\delta$, however, the more quickly prices will increase in productivity. If age is a proxy for $\theta$, then we could think of a society's economic or educational opportunities as a proxy for $\delta$. In Figure 8, $\delta$ represents the skill level where the abductee's reservation utility equals zero. An increase in $\delta$ will leave all abductees better off: their utility (if abducted) will be higher than it would be otherwise, because rebel leaders now have to treat them better to retain them. But at the same time, exactly because high-productivity abductees have now become more difficult to retain, rebel leaders will take to conscripting more children: The (global) maximum in Figure 11 will shift to the left.Further extensions of the model could help us understand other elements of guerrilla organization and child soldiering: the impact of lighter or cheaper weaponry; 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. 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.

## 7. Conclusions, predictions, and policy implications

The evidence from Uganda suggests several crucial dynamics that we attempt to capture in a model of agency and incentives. First, children are less productive than adults as fighting as well as outside activities, and so both guerrilla production and reservation utilities rise with age. Two other factors also shape reservation utilities. One is that children are also more easily disoriented and less able to escape than adults, and so outside opportunities are less valuable in expectation.

We also argue that children are more easily manipulated and intimated, reducing the perception of outside opportunities relative to staying and fighting for the rebel group.

Rebel leaders like Kony are not ignorant of these dynamics. 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. The same dynamics, we argue, influence the decisions of gangsters, pimps, sweat shop owners, and other unscrupulous operators and contribute to the most pernicious forms of child labor.

Note that we reached this theory inductively, using a case study, a cross-rebel correlation, and scattered evidence on the worst forms of child labor, to identify a handful of forces that can explain the terrible phenomenon of forced child labor. The deductive work—testing and refinement of the theory—remains to be done, and for this purpose we outline a number of predictions. One is that coercive contracts should almost never be offered to adults, except when their outside options are exceptionally poor, perhaps involving almost certain death, or when monitoring and control are exceptionally great. Even when adults are abducted, it should be optimal for leaders to use positive incentives to retain and motivate them to produce.

When should be expect to observe rebel groups using child soldiers? One situation is when punishment is cheap, in the sense of few economic or social penalties for the use of coercion. Hence rebel groups seeking international support, or local civilian loyalty, is unlikely to employ child abduction. Those with no material or social resources to begin with, such as the LRA, will display no disincentive to coerce. As rebel groups move into territory distant in spatial or social terms from their support base, however, we should see a greater likelihood of coercion –a prediction also consistent with Gates (2002). Finally, rebel groups with independent sources of finance—ones that do not depend on goodwill, such as resource extraction—will seek to use coercion only when these resources are insufficient to mobilize a sufficiently large rebel force.

Child soldiering should also be more likely in poor countries where children's economic opportunities are poor relative to that of adults, and where their access to education and information (both of which could make disorientation and indoctrination more difficult) is less. The important point is that a nation's absolute poverty may not be sufficient; relative opportunities matter.

These findings yield several policy implications. For instance, government's counter-insurgency efforts 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 rebel resources are fixed, the rebel leader's incentive is to increase the abduction of children.

An obvious means of discouraging recruitment of all forms is aggregate educational and economic opportunities, as suggested by the International Labor Organization (ILO 2007). But our model suggests that this relationship may not be so simple: opportunities for children must rise faster than that of adults for child recruitment to become more costly.

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: 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 for returnees 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 rela-

tives 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.

# 8. References


Akerlof, G. A. and R. E. Kranton (2005). "Identity and the Economics of Organizations." Journal of Economic Perspectives **19**(1): 9-32.

Allen, T. (2005). War and Justice in Northern Uganda: An Assessment of the International Criminal Court's Intervention. London, Crisis States Research Centre, Development Studies Institute, London School of Economics.

Allen, T. and K. Vlassenroot, Eds. (2008). The Lord's Resistance Army: War, Peace and Reconciliation in Northern Uganda.

Andvig, J. and S. Gates (2006). Recruiting Children for Armed Conflict. Child Soldiers Initiative Working Group Session. Pittsburgh, Pennsylvania.

Annan, J., C. Blattman, et al. (2006). The State of Youth and Youth Protection in Northern Uganda: Findings from the Survey of War Affected Youth, UNICEF.

Azam, J.-P. (2006). "On thugs and heroes: Why warlords victimize their own civilians." Economics of Governance **7**(1): 53-73.

Balcells, L., S. N. Kalyvas, et al. (2008). International System and Technologies of Rebellion: How the Cold War Shaped Internal Conflict., Unpublished working paper, Yale University.

Basu, K. (1999). "Child Labor: Cause, Consequence, and Cure, with Remarks on International Labor Standards." Journal of Economic Literature **37**(3): 1083-1119.

Behrend, H. (1999). Alice Lakwena & Holy Spirits: War In Northern Uganda 1985-97. Columbus, Ohio University Press.

Blattman, C. and J. Annan (2007). "The Consequences of Child Soldiering." HiCN Working Paper **22**.

Blattman, C. and E. Miguel (forthcoming). "Civil War." Journal of Economic Literature.

Boyden, J. (2003). "The Moral Development of Child Soldiers: What Do Adults Have to Fear? ." Peace and Conflict: Journal of Peace Psychology **9**(4): 343-62.

Boyden, J. and J. de Berry, Eds. (2004). Children and Youth on the Front Line: Ethnography, Armed Conflict and Displacement. Studies in Forces Migration. New York, Oxford, Berghahn Books.

Brett, R. and I. Specht (2004). Young Soldiers: Why They Choose to Fight. Boulder, Lynne Reiner.

Chwe, M. S.-Y. (1990). "Why Were Workers Whipped? Pain in a Principal-Agent Model." The Economic Journal **100**(403): 1109-1121.

Clapham, C. S. (1998). African Guerrillas, Indiana University Press.

Coalition (2004). Child Soldiers Global Report. E. Restoy and C. Ricca, Coalition to Stop the Use of Child Soldiers.

Cohn, I. and G. S. Goodwin-Gill (1994). Child Soldiers: The Role of Children in Armed Conflict, Institut Henry-Dunant, Oxford University Press.

Collier, P. and A. Hoeffler (2004). "Greed and Grievance in Civil War." Oxford Economic Papers **56**(4): 563-595.

Conning, J. H. and M. Kevane (2007). Freedom, Servitude and Voluntary Labor. Buying Freedom: The Ethics and Economics of Slave Redemption. K. A. Appiah and M. Bunzl. Princeton, Princeton University Press.

CSUCS. (2008). "Some Facts." Retrieved 7/29/2008, from http://www.child-soldiers.org/childsoldiers/some-facts.

Domar, E. D. (1970). "The Causes of Slavery or Serfdom: A Hypothesis." The Journal of Economic History **30**(1): 18-32.

Doom, R. and K. Vlassenroot (1999). "Kony's Message: A New Koine? The Lord's Resistance Army in Northern Uganda." African Affairs **98**(390): 5.

Edmonds, E. V. and N. Pavcnik (2005). "Child Labor in the Global Economy." Journal of Economic Perspectives **19**(1): 199-220.

Engerman, S. (1973). "Some Considerations Relating to Property Rights in Man." Journal of Economic History **33**(1): 43-65.

Fares, J. and D. Raju (2007). Child Labor Across the Developing World: Patterns and Correlations. World Bank Policy Research Working Paper 4119, World Bank.

Fearon, J. D. and D. D. Laitin (2003). "Ethnicity, Insurgency and Civil War." American Political Science Review **97**(1): 75-90.
Fenoaltea, S. (1984). "Slavery and Supervision in Comparative Perspective: A Model." Journal of Economic History **44**(3): 635-68.
Findlay, R. (1975). "Slavery, Incentives, and Manumission: A Theoretical Model." The Journal of Political Economy **83**(5): 923.
Garfinkel, M. R. (2004). "On the Stability of Group Formation: Managing the Conflict Within." Conflict Management and Peace Science **21**(1): 43-68.
Garfinkel, M. R. and S. Skaperdas (2007). Economics of Conflict: An Overview. Handbook of Defense Economics. T. Sandler and K. Hartley, Elsevier. **2:** 649-709.
Gates, S. (2002). "Recruitment and Allegiance: The Microfoundations of Rebellion." Journal of Conflict Resolution **46**(1): 111-130.
Gates, S. (2004). Recruiting Child Soldiers. CSCW workshop, "Techniques of Civil War," organized by the Working Group on Microfoundations of Civil War, 20-21 August 2004.
Gutiérrez, F. (2006). Organizing minors. Ford Institute Workshop on Child Soldiers.
Harris, J. R. (1998). "The nurture assumption: Why children turn out the way they do." New York.
Honwana, A. (2005). Child Soldiers in Africa.
HRW. (2008). "Facts about child soldiers." Retrieved 7/29/2008, from http://www.hrw.org/campaigns/crp/fact_sheet.html.
ILO (2003). Investing in Every Child: An Economic Study of the Costs and Benefits of Eliminating Child Labour. Geneva, International Labour Organization.
ILO (2003). Wounded Childhood: The Use of Child Soldiers in Armed Conflict in Central Africa. Washington, D.C., International Labor Organization.
ILO (2007). Prevention of child recruitment and reintegration of children associated with armed forces and groups: Strategic framework for addressing the economic gap. Geneva, International Labour Organization.
Kaldor, M. (1999). New and old wars. Organized violence in a global era. Cambridge, UK, Polity Press.
Kalyvas, S. N. (2001). ""New" and "Old" Civil Wars: A Valid Distinction?" World Politics **54**: 99-118.
Kalyvas, S. N. (2006). The Logic of Violence in Civil War. New York, Cambridge University Press.
Kaplan, R. D. (1994). The Coming Anarchy. Atlantic Monthly**:** 44–76.
Kenny, P. D. (2008). Discipline, Identity and Cohesion in Armed organizations, Unpublished working paper, Yale University.
Lichbach, M. I. (1994). "What makes Rational Peasants Revolutionary?: Dilemma, Paradox, and Irony in Peasant Collective Action." World Politics **46**(3): 383-418.
Machel, G. (1996). Impact of Armed Conflict on Children. New York, UNICEF.
O'Donoghue, T. and M. Rabin (2000). Risky Behavior among Youths: Some Issues from Behavioral Economics, UC Berkeley Department of Economics Working Paper.
Omara-Otunnu, A. (1994). Politics and the Military in Uganda, 1890-1985. London, Macmillan in association with St. Antony's College, Oxford.
Paige, J. M. (1975). Agrarian Revolution: Social movements and export agriculture in the underdeveloped world. New York, Free Press New York.
Peters, K. (2004). Re-examining Voluntarism: Youth Combatants in Sierra Leone. Pretoria, Institute for Security Studies.
Peters, K., P. Richards, et al. (2003). What Happens to Youth During and After Wars? A Preliminary Review of Literature on Africa and an Assessment of the Debate, RAWOO Working Paper.
Pham, P., P. Vinck, et al. (2007). Abducted: The Lord's Resistance Army and Forced Conscription in Northern Uganda. B.-T. I. o. V. Populations, Human Rights Center, University of California, Berkeley; Payson Center for International Development, Tulane University.
Reno, W. (1999). Warlord Politics and African States, Lynne Rienner Publishers.
Rogers, C. A. and K. A. Swinnerton (2008). "A theory of exploitative child labor." Oxford Economic Papers **60**(1): 20.
Rosen, D. M. (2005). Armies of the Young : Child Soldiers in War and Terrorism.
Rosenblatt, R. (1984). "Children of War." American Educator: The Professional Journal of the American Federation of Teachers.

Scott, J. C. (1976). Moral Economy of the Peasant: Rebellion and Subsistence in South East Asia. New Haven, Yale University Press.
Shils, E. A. and M. Janowitz (1948). "Cohesion and Disintegration in the Wehrmacht in World War II." Public Opinion Quarterly **12**(2): 280-315.
Singer, P. W. (2005). Children at War. New York, Pantheon Books

Udry, C. (2004). "Child Labor." Unpublished working paper, Yale University.
UN (1989). Convention on the Rights of the Child. Art. 38. United Nations.
UN (2002). Optional protocol on the involvement of children in armed conflict United Nations. **A/RES/54/263**.
Weinstein, J. M. (2007). Inside Rebellion. Cambridge, Cambridge University Press.
Wessells, M. (2006). Child Soldiers: From Violence to Protection. Cambridge, Harvard University Press.
Wood, E. J. (2003). Insurgent Collective Action and Civil War in El Salvador. New York, Cambridge University Press.

## Mathematical Appendix

Consider the game described in section IV. As described in the text, the leader's non-linear programming problem is to find $\theta$ and $\rho$ that maximize $u^L$ such that

$$r_a = c_a^A \text{ and} \tag{1}$$

$$r - c^A \geq \underline{u}. \tag{2}$$

First, we show that the abductee can solve equation (1) for $a$, given $\theta$ and $\rho$. Recall that $c_{aa}^A \geq 0$ and $r_{aa} < 0$, and hence as $a \to \infty$, $u_a^A < 0$.[17] We also assumed that $u_a^A > 0$ at $a = 0$. But then by the Intermediate Value Theorem a solution $a^*$ must exist for $u_a^A = 0$, i.e. equation (1).

Since we can find some $a^*$ that will ensure incentive compatibility for any $\theta$ and $\rho$ chosen by the rebel leader, we can write $a^*$ as a function of $\theta$ and $\rho$ and in turn drop constraint (1) from the leader's optimization problem. The leader's problem now reads

$$\max_{\theta,\rho} \; u^L(\theta,\rho,a^*(\theta,\rho)) \;\text{ s.t. }\; r - c^A \geq \underline{u},$$

with Lagrangian

$$\mathcal{L} = \pi - c^L + \lambda(r - \underline{u} - c^A)$$

and first-order conditions

$$\mathcal{L}_\rho + \mathcal{L}_a a_\rho^* = 0, \text{ and}$$

$$\mathcal{L}_\theta + \mathcal{L}_a a_\theta^* = 0.$$

Since $a^*$ is implicitly defined by $u_a^A = 0$, where $u_a^A$ is continuous around solution $(a^*,\theta^*,\rho^*)$ (because $u^A$ is twice differentiable in the three parameters over their domains) and $u_{aa}^A \neq 0$ (because $c_{aa}^A \geq 0$ and $r_{aa} < 0$), we can use the Implicit Function Theorem to compute $a_\rho^*$ and $a_\theta^*$. Taking derivatives, the first-order conditions become

$$-c_\rho^L + \lambda r_\rho + (\pi_a - c_a^L)\left(\frac{-r_{a\rho}}{r_{aa} - c_{aa}^A}\right) = 0, \text{ and} \tag{3}$$

$$\pi_\theta - c_\theta^L + \lambda(r_\theta - \underline{u}_\theta) + (\pi_a - c_a^L)\left(\frac{-r_{a\theta}}{r_{aa} - c_{aa}^A}\right) = 0. \tag{4}$$

where the Lagrange multiplier $\lambda \geq 0$.[18] We now show that the participation constraint binds at any solution.

The intuition behind the proof is as follows. Suppose the participation constraint is not active. That means that the leader can choose the abductee's skill level without having to worry about picking someone so capable he would leave, and she will set the agent's skill level (which enters the leader's utility through production) so as to equalize marginal revenue and marginal cost and

[17] The fact that $r_{aa} < 0$ reflects an assumption about production function $\pi$, namely $\pi_{aa} < 0$, which implies $\pi_{aa}/(\pi_a\pi_a) < -r_{\pi\pi}/r_\pi$ and so $r_{aa} = r_{\pi\pi}\pi_a\pi_a + r_\pi\pi_{aa} < 0$.

[18] $L_a$ is equal to $\pi_a - c_a^L + \lambda r_a - \lambda c_a^A$, which simplifies to $\pi_a - c_a^L$ because of incentive compatibility.

realize an optimal level of production. Now the leader still has to optimize the incentive schedule offered to the agent and, by way of these incentives, the agent's effort level. So what effort level will the leader aim for? Note that effort only enters the leader's utility through production—but production is already optimal by way of the skill level that the leader selected! This means that any effort level will satisfy the leader, who in turn minimizes costs by offering neither rewards nor punishment. But without incentives, the abductee provides no effort and no output is generated, which is not optimal for the leader by assumption and hence a contradiction.

**Lemma 1.** *At any solution of the leader L's optimization problem, the participation constraint binds with equality, i.e.* $r - c^A = \underline{u}$.

*Proof.* Suppose to the contrary that there is some solution at which the participation constraint does not bind. Then $\lambda = 0$, and since $c_a^L = c_\pi^L \pi_a$ as well as $c_\theta^L = c_\pi^L \pi_\theta$, we can factor equation (4) and have

$$(1 - c_\pi^L)\left(\pi_\theta + \pi_a\left(\frac{-r_{a\theta}}{r_{aa} - c_{aa}^A}\right)\right) = 0. \tag{5}$$

Since $r_{a\theta} \geq 0$ by assumption, the second factor is positive and $c_\pi^L = 1$ at any solution.[19] Equation (3) in turn reduces to $-c_\rho^L = 0$, which implies $\rho = 0$. But $r_\pi = 0$ at $\rho = 0$, which means the abductee has no incentive to exert effort and sets $a = 0$. Hence $\pi = 0$, which implies $c_\pi^L < 1$ (because market entry is optimal), a contradiction. □

This result is not as straightforward as it may appear, because of the leader's ability to punish. Suppose some abductee will stay with the leader even if subjected to punishment. In equilibrium the leader will then induce effort by punishing the abductee as much as she can without the abductee trying to escape. This is the case even though the leader could provide rewards *at exactly the same cost*. The intuition is that if the leader is providing rewards, then she will abduct someone skilled who requires rewards to stay.

Since the participation constraint binds at any solution, it follows immediately that the extent to which the abductee's equilibrium payoff varies with his type can be characterized by how his reservation value depends on skill level. If reservation utility is a monotonically increasing function of productivity, then the abductee's equilibrium payoff is monotonically increasing in skill. This implies in particular that types above some skill threshold do not experience punishment.

**Corollary 1.** *Define* $u^A \leq \hat{u}^A$ *as punishment payoff and* $u^A > \hat{u}^A$ *as reward payoff. If* $\underline{u}(\theta)$ *is monotonically increasing in* $\theta$*, then there is some threshold* $\underline{\theta}$ *such that agents of type* $\theta \leq \underline{\theta}$ *are punished and agents of type* $\theta > \underline{\theta}$ *are rewarded in equilibrium.*

---

[19] We assume $r_{a\theta} \geq 0$, which is valid only for $\pi \leq 1$ in the example in section IV.C. However, a modified version of the proof holds in that case: By taking derivatives of the example's explicit functions and substituting in equation (5), we have

$$(1 - c_\pi^L)\left(a + \theta\left(\frac{(\pi - 1)|\rho|e^{-\pi}}{-\theta^2|\rho|e^{-\pi} - 2}\right)\right) = 0$$

Setting the second factor equal to 0 and solving for $\varrho$ yields $|\varrho| = -2a/(\theta e^{-\pi})$, a contradiction. Hence at any solution of equation (5), we have $c_\pi^L = 1$, as required for the rest of the proof.

*Proof.* If $\underline{u}_\theta > 0$, then by Lemma 1 $u^{A*}$ is also monotonically increasing in $\theta$ and hence there exists a unique $\underline{\theta}$ such that the claim holds. □

We now turn to the optimal skill level selected by the leader. We have three equations with three unknowns: First-order conditions (3) and (4) and the participation constraint. Our strategy is to show that we can solve each equation separately for a different parameter and then use a fix point theorem to establish that a solution exists for the system of equations as well.

**Proposition 1.** *In game* $\Gamma$*, a solution of the leader L's optimization problem for productivity parameter* $\theta$ *exists and is located in the interior of the domain of* $\theta$*.*

*Proof.* The leader's optimization problem is given by first-order conditions (3) and (4) and participation constraint $r - c^A = \underline{u}$. We first solve equation (4) for $\lambda$, which yields

$$\lambda = \frac{(1 - c_\pi^L)\left(\pi_\theta + \pi_a\left(\frac{-r_{a\theta}}{r_{aa} - c_{aa}^A}\right)\right)}{\underline{u}_\theta - r_\theta}. \tag{6}$$

By assumption, $\underline{u}$ intersects only once with $r - c^A$, from below, and hence $\underline{u}_\theta > r_\theta$ at any solution. In turn $\lambda \geq 0$, as required, for any $c_\pi^L \leq 1$.

We solve equation (3) for $\rho$. Note that the LHS of (3) is continuous in $\rho$. For some sufficiently large $|\rho|$, where $\rho$ can be either positive or negative, we have $c_\pi^L = 1$ (i.e. units of output can be priced so aggressively that an increase in production is not worthwhile for the leader). This means $\lambda = 0$ from (6) and $\pi_a - c_a^L = \pi_a (1 - c_\pi^L) = 0$ and so equation (3) simplifies to $-c_\rho^L$, which is negative for $\rho > 0$ and positive for $\rho < 0$. But then some $\rho^*$ that solves (3) must exist, by the Intermediate Value Theorem.

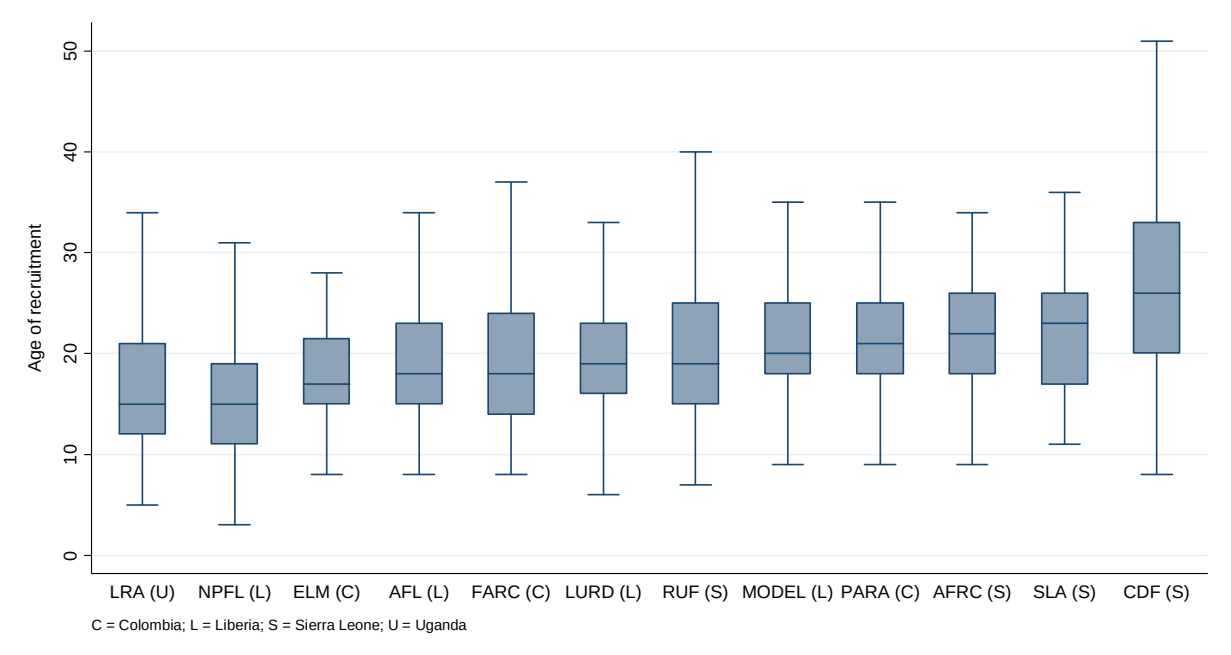
Third, we solve constraint (2) for $\theta$. From Lemma 1, we know that $r - c^A = \underline{u}$ at any solution, where both sides of the equation are continuous in $\theta$. Since $r - c^A > \underline{u}$ at $\theta = 0$ and $r - c^A < \underline{u}$ as $\theta \to \infty$, an interior solution $\theta^*$ must exist, again by the Intermediate Value Theorem.[20]

We can now define the functions $f^\rho(\rho^*,\theta^*)$, $f^\theta(\lambda^*,\theta^*)$, and $f^\theta(\lambda^*,\rho^*)$, where $f^i$ gives the set of optimal values for $i$, given optimal values for parameters $j \neq i$. Let $f$ be the Cartesian product of these functions. Function $f$ is a mapping from $S \to S$, where $S$ is the Cartesian product of the support of $\lambda$, $\rho$, and $\theta$. Since $\lambda, \theta \in R^{+}$, and $\rho \in R$, we know that $S$ is non-empty, compact, and convex (specifically, a convex subset of $R^3$). The first three steps of the proof showed that $f(s)$ is non-empty for all $s \in S$. Since $u^A$ and $u^L$ are thrice differentiable in their inputs, functions $f^i$ are continuous, and in turn function $f$ is continuous. Then all conditions for Brouwer's fixed point theorem are met, and a fixed point exists, i.e. a solution for the leader's optimization problem exists.

Finally, we verify that a corner solution does not exist, which follows from Lemma 1 and the fact that $r - c^A \neq \underline{u}$ at either $\theta = 0$ or as $\theta \to \infty$. If $\theta = 0$, the abductee's reservation values is arbitrarily small and the participation constraint does not bind, but then the leader prefers to move her productivity target upward. Similarly, for sufficiently large $\theta$, the abductee's reservation price is larger than the payoff he can receive from the leader, so it is not a feasible solution. □

[20] Another way to state the assumption that $r - c^A > \underline{u}$ at $\theta = 0$ and $r - c^A < \underline{u}$ as $\theta \to \infty$ is to require $r - c^A > \underline{u}$ at $\theta = 0$ and $\overline{\underline{u}}_\theta > \overline{r}_\theta$, where the upper bar denotes the average over the domain of $\theta$, i.e. an increase in productivity will in expectation boost the abductee's reservation price more than it will increase his benefits accrued from rebel service.

Figure 1: Distribution of recruitment age in 12 armed groups




Notes: Each box ranges from the 25$^{th}$ to the 75$^{th}$ 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: Percentage of child recruits and abductions in 12 armed groups

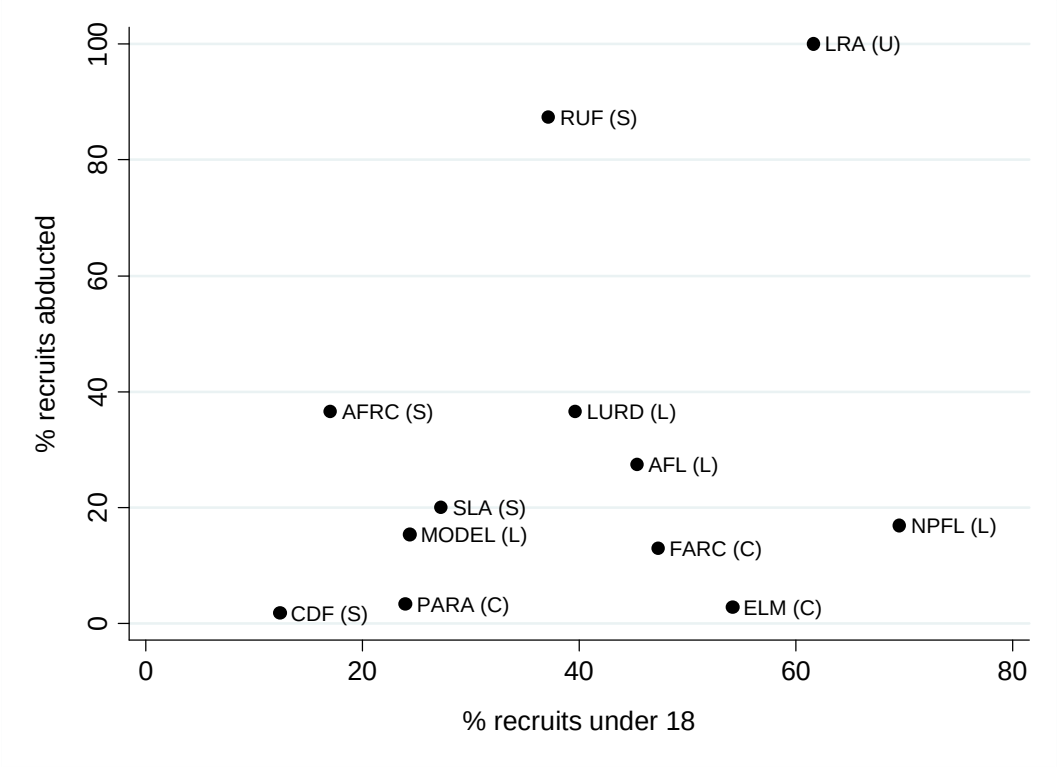
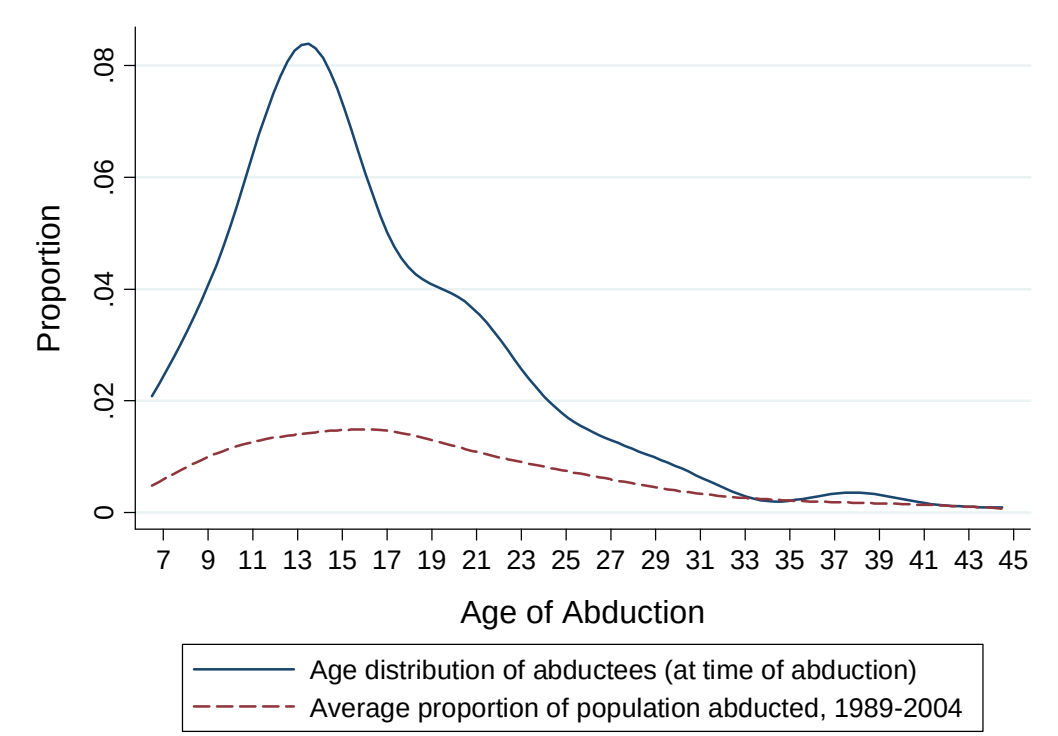
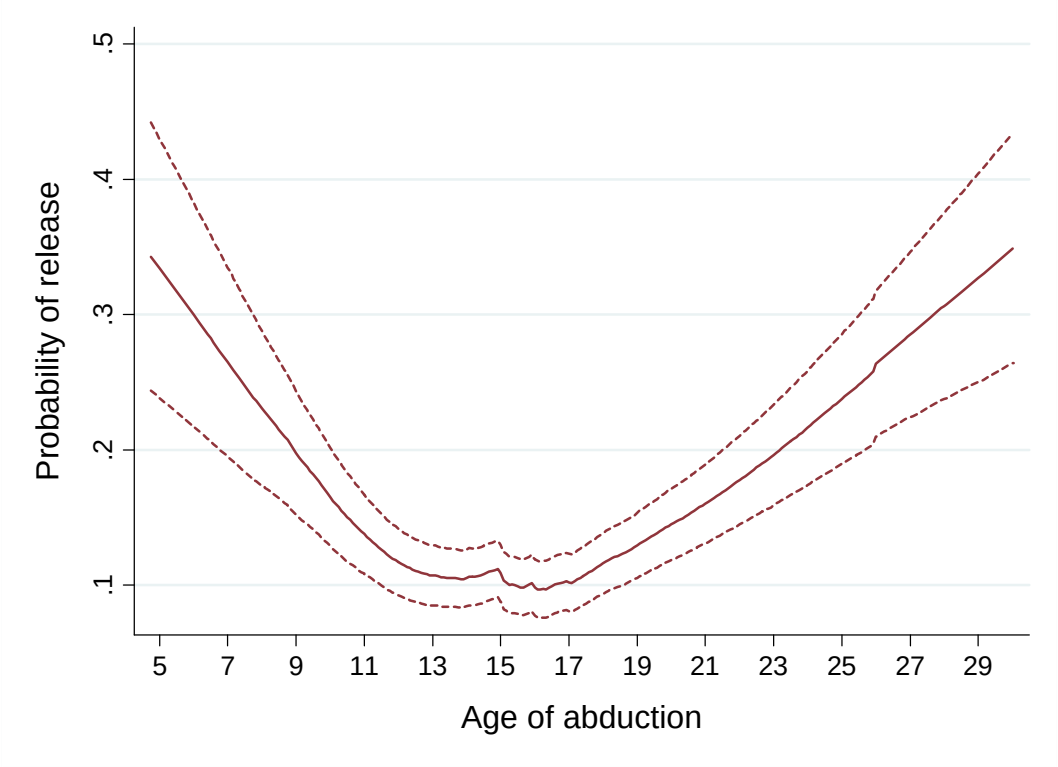


Figure 3: Distribution of age at the time of abduction in the LRA



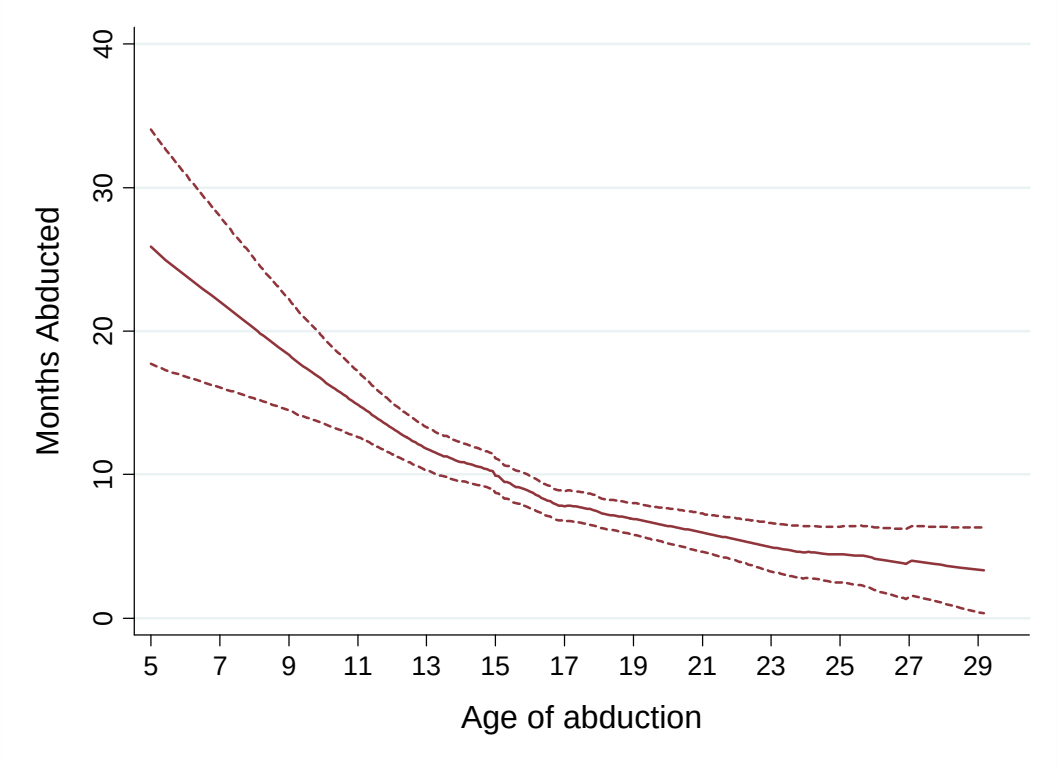

Notes: Data include absentee youth and youth who have since died or did not return from abduction (collected from the household survey). Multiple abductions are included. The proportion of the population abducted by age is calculated by dividing the number of youth abducted at each age in each year by 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 4: Probability of being released in the first month of abduction, by age of abduction



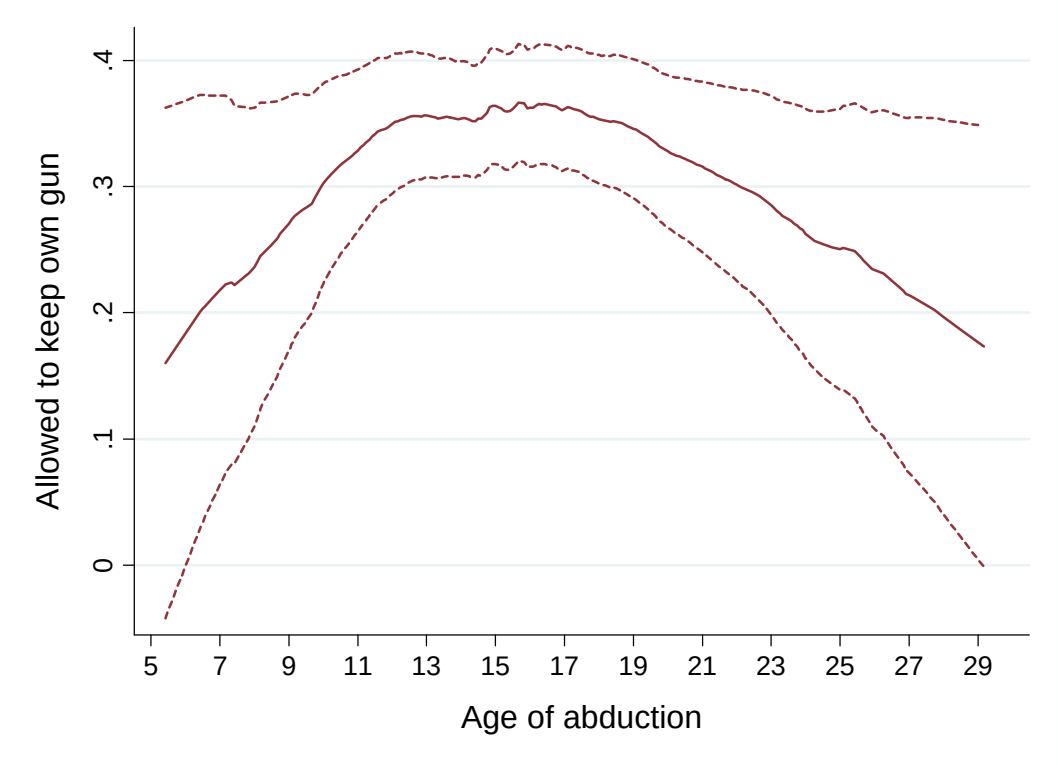

Notes: The solid line is a running-mean calculated via symmetric nearest-neighbor smoothing with a bandwidth of one. The dotted lines represent the 95% confidence interval. Youth left behind because of injuries are not considered released. Data do not include absentee or non-surviving youth. Multiple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

Figure 5: Average length of abduction by age of abduction



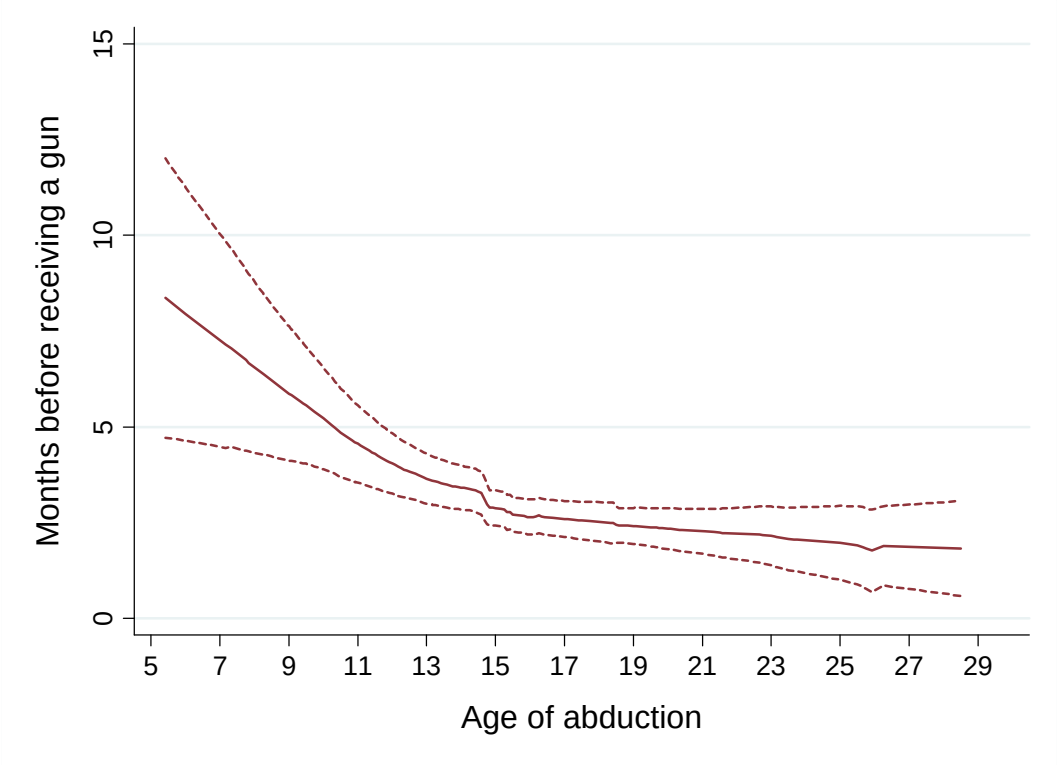

Notes: The solid line is a running-mean calculated via symmetric nearest-neighbor smoothing with a bandwidth of one. The dotted lines represent the 95% confidence interval. Released youth are excluded from the analysis. Data also do not include absentee or non-surviving youth. Multiple abductions enter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

Figure 6: 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 7: 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 8a: Abductee's reservation utility as a function of his productivity

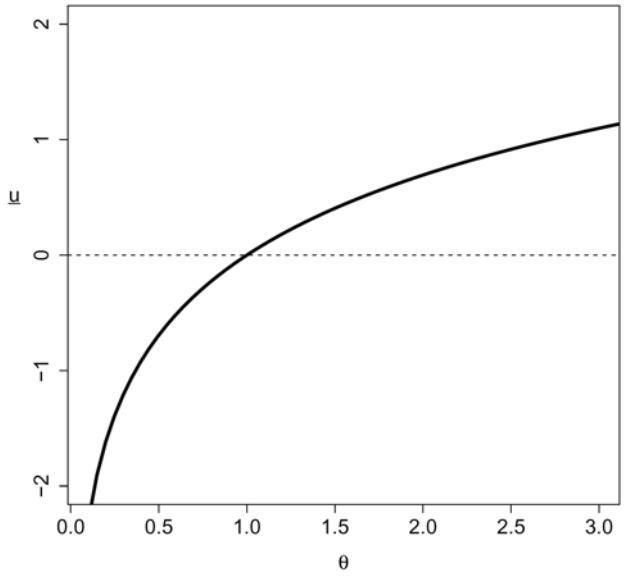



Figure 8b: Abductee's reservation utility as a function of his productivity under the equilibrium incentive scheme

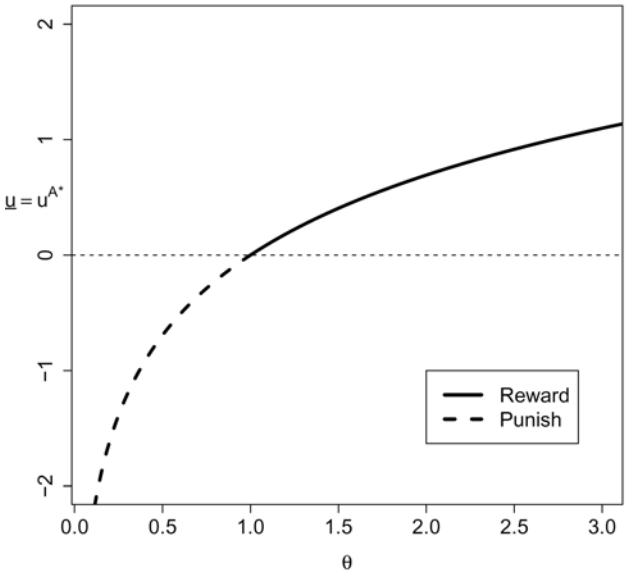


Figure 9: Abductee's utility as a function of productive output

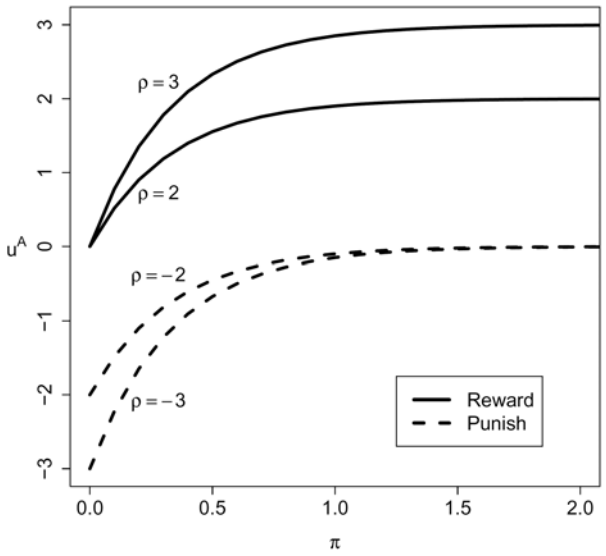



Figure 10: Abductee's utility as a function of the reward/punishment schedule

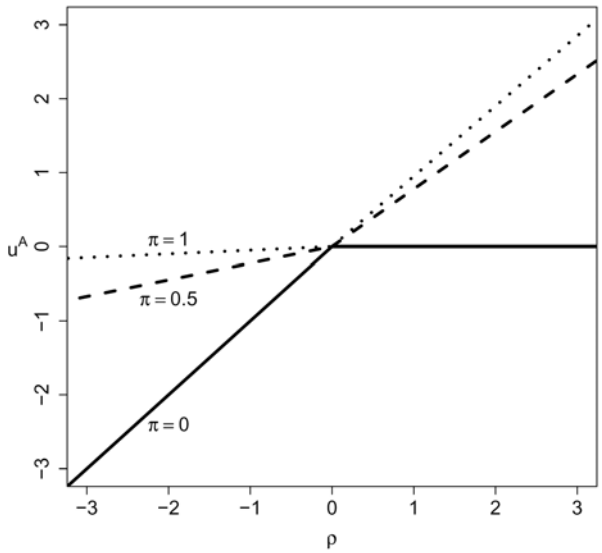


Figure 11: Leader's utility in terms of abductee productivity
(when punishment and rewards are equally costly)

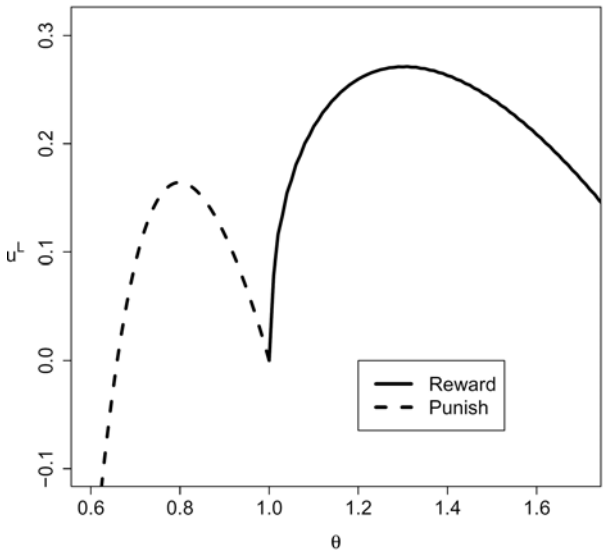



Figure 12: Leader's utility in terms of abductee productivity
(when punishment is cheap)

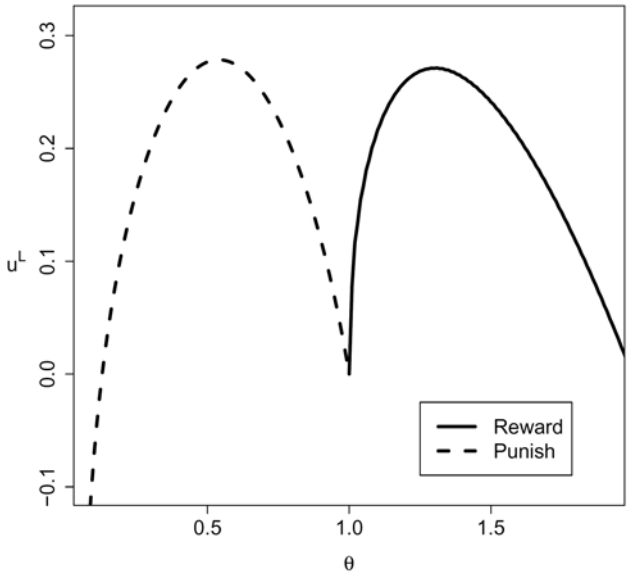


**Table 1: Summary statistics**

| 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: How abduction length varies with age of abduction**

| | (1) | (2) |
|---|---|---|
| | **Abduction length (months)** | |
| Abduction age | -0.50 | -0.40 |
| | [0.137]*** | [0.161]** |
| Female x Abduction age | | -0.36 |
| | | [0.309] |
| Observations | 788 | 788 |
| R-squared | 0.14 | 0.14 |

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 3: Escape means, by age of abduction**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | **Rescued** | **Ran away** | **Knew escape location** | **Knew escape location if ran away** |
| Abduction age | -0.006<br>[0.002]** | 0.008<br>[0.004]** | 0.008<br>[0.005]* | 0.010<br>[0.006]* |
| Observations | 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<br>[0.002]** | -0.006<br>[0.004] | -0.006<br>[0.003]* | -0.001<br>[0.002] | -0.003<br>[0.003] | 0.005<br>[0.003]* |
| **B. Quadratic form** | | | | | | |
| Abduction age | 0.024<br>[0.024] | 0.010<br>[0.022] | 0.028<br>[0.023] | 0.037<br>[0.018]* | 0.043<br>[0.014]*** | 0.088<br>[0.017]*** |
| Abduction age-squared | -0.001<br>[0.001] | 0.000<br>[0.001] | -0.001<br>[0.001] | -0.001<br>[0.001]** | -0.001<br>[0.000]*** | -0.002<br>[0.001]*** |
| **C. Linear form, by gender** | | | | | | |
| Abduction age | -0.009<br>[0.003]*** | -0.007<br>[0.004]* | | | -0.003<br>[0.004] | 0.010<br>[0.004]** |
| Abduction age × Female | 0.009<br>[0.005]* | 0.005<br>[0.007] | | | 0.001<br>[0.006] | -0.016<br>[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: Role within the rebel group, by age of abduction**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | **Forced to carry heavy loads** | | **Ever allowed to keep (sleep with) own gun** | | **Ever led other soldiers** | | **Considered someone leaders could depend on** | |
| **A. Males** | | | | | | | | |
| Abduction age | 0.003 | 0.021 | 0.005 | 0.075 | 0.011 | 0.031 | 0.008 | 0.08 |
| | [0.004] | [0.021] | [0.004] | [0.028]** | [0.003]*** | [0.012]** | [0.002]*** | [0.028]*** |
| Abduction age-squared | | -0.001 | | -0.002 | | -0.001 | | -0.002 |
| | | [0.001] | | [0.001]** | | [0.000] | | [0.001]** |
| Ln (Abduction length) | 0.039 | 0.039 | 0.15 | 0.144 | 0.055 | 0.055 | 0.134 | 0.133 |
| | [0.012]*** | [0.013]*** | [0.005]*** | [0.005]*** | [0.007]*** | [0.008]*** | [0.010]*** | [0.010]*** |
| Observations | 462 | 462 | 462 | 462 | 462 | 462 | 462 | 462 |
| | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
| | **Forced to carry heavy loads** | | **Listed fighter as a primary role** | | **Ever led other soldiers** | | **Was a forced wife** | |
| **B. Females** | | | | | | | | |
| Abduction age | 0.013 | 0.102 | 0.001 | 0.021 | 0.001 | 0.005 | 0.002 | 0.048 |
| | [0.008] | [0.039]** | [0.004] | [0.029] | [0.002] | [0.019] | [0.005] | [0.030] |
| Abduction age-squared | | -0.002 | | -0.001 | | 0 | | -0.001 |
| | | [0.001]** | | [0.001] | | [0.000] | | [0.001] |
| Ln (Abduction length) | 0.044 | 0.038 | 0.042 | 0.041 | 0.012 | 0.012 | 0.124 | 0.124 |
| | [0.012]*** | [0.012]*** | [0.025] | [0.025] | [0.017] | [0.016] | [0.022]*** | [0.021]*** |
| | 226 | 226 | 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"