When are terrorist groups vulnerable to leadership decapitation? Assessing the role of organizational consolidation

William A. Wagstaff
US Air Force
Center for Strategy and Technology

Danielle F. Jung
danielle.jung@emory.edu
Emory University
Department of Political Science

Is rebel and terrorist leadership decapitation an effective counter-terrorism strategy? The scholarship is mixed. We argue that the organizational structure of terrorist groups is critical to understanding the differential effect of leadership decapitation, and currently absent from existing work. Contrary to much of the existing literature, the more institutionalized a group, the more robust it is to decapitation—but *only* if the leader is killed. Organizational structure allows such groups to survive leadership turnover better. Using longitudinal data on terrorist group service provision, which we use to proxy a group's level of institutionalization, and leadership decapitation between 1970 and 2008, we find more institutionalized groups are robust to having their leader killed, but not to having their leader captured. Capturing a leader provides intelligence that allows counter-terrorism forces to disrupt group operations. Additional evidence on the lethality, frequency of attack, and propensity to claim an attack further support the differential effect of killing versus capturing a leader as well as the conditioning effect of organizational structure on these tactics. Our findings imply that the success of leadership decapitation rests on both the mode and organizational characteristics of the group.

Killing or capturing terrorist leaders is a major feature of many states' counter-terrorism policies. In September 1992, elite counter-terrorism forces raided a ballet studio in Lima, capturing Abimael Guzmán, leader of The Shining Path. In February 1999, the Turkish National Intelligence Organization captured PKK leader Abdullah Öcalan in Kenya as he traveled from the Greek embassy to the Nairobi airport. More recently, in May 2011, CIA and "SEAL Team 6" operators raided a compound in Abbottabad, Pakistan, killing Osama bin Laden. Many states now operate drones to target militants, resulting in the deaths of some high-ranking members of their respective organizations. The rate at which terrorist groups suffer decapitation has increased since 1970, peaking with the start of the "Global War on Terror" around 2001.[1] This begs the question: Is leadership decapitation an effective counter-terrorism tactic? And if so, under what conditions?

Scholarship is mixed on whether "leadership decapitation" strikes reduce the threat these groups pose. On one side, scholars working on both counter-terrorism and counter-insurgency tactics argue leadership decapitation does not work, and may even make violence worse (Hafez and Hatfield 2006, Jordan 2009, Kaplan et al. 2005, Pape 1996, Staniland 2014). Other scholars find leadership decapitation does work (Johnston 2012, Price 2012, Phillips 2015). Still other work, often highlighting the qualified success with reducing PKK-inflicted violence, finds capturing a terrorist leader may be more effective than killing her (Cronin 2011, Pape 2003). This large, and growing, literature faces significant theoretical and empirical obstacles, but there is consensus that, because decapitation strategies remain tools of many counter-terrorism forces, the effects are particularly important to understand.

[1] See Figures 1a and 1b. Leadership decapitation data come from Price (2012), and cover 1970-2008 across 60 states.

We argue that one reason the literature on leadership decapitation remains somewhat inconclusive is that it does not incorporate how group structure, and in particular formal and informal institutions, mediates the relative effectiveness of killing or capturing a leader. While we are not the first to argue that more institutionalized terrorist groups are more robust to leadership decapitation (see Langdon et al. 2004), the generally accepted wisdom is that they are more vulnerable (Byman 2006, Carley, Lee and Krackhardt 2002, Deibert and Stein 2002, Sageman 2004). Regardless, the idea that organizational characteristics matter for the consequences of leadership targeting has growing acceptance (Freeman 2014, Johnston 2012, Jordan 2009, 2014, Long 2010, Price 2012). Earlier data limitations constrained these studies to a small set of cases or weak proxies for institutionalization, such as age and size. Institutionalization likely fluctuates over the lifetime of a group as counterinsurgency efforts and group mission change (see Heger, Jung and Wong 2012, Jung 2017). Size can also be an imperfect proxy. Size and the level of institutionalization may, but do not necessarily, correlate with one another, particularly as technology eases coordination costs. Furthermore, the covert nature of terrorist and insurgent organizations often renders any efforts to calculate size, especially longitudinally, fraught with measurement error.

Here, we use institutionalization to refer to any formal or informal structure, procedure, or norm that governs the terrorist group's operations. For example, Shapiro (2013) and Shapiro and Jung (2014) discuss "auditing departments" that help manage a terrorist group's day-to-day activities. Groups may also have clear lines of succession, formal or otherwise (Johnston et al. 2016). These features may allow the group to survive leadership fatalities since terrorist agents are still embedded within a command and control apparatus separate from any individual leader. Such groups are also concerned about damage to their reputation, and so take measures to demonstrate strength (potentially via a higher success rate) after their leader is killed. Ultimately, killing the leader of a highly institutionalized group is a different type of setback to the organization than capture.

To preview our results, we find that if a leader is captured, institutionalization no longer insulates the group. We argue this is because capturing a leader facilitates more extensive intelligence collection. In Vietnam, for example, the Viet Cong took days to recover from members' deaths, but months to recover from defections since defectors possessed institutional knowledge valuable to counter-insurgency intelligence efforts (Popkin, in Berman 2009:29). More generally, leaders of highly institutionalized groups are more likely to have detailed information about organizational structure than leaders of less institutionalized groups. This access to specialized knowledge allows counterterrorism forces to infiltrate institutionalized groups, disrupt operations, and, perhaps most importantly, target successors. Taken together, these efforts are more likely to lead to group failure. Prior to failure, however, groups face the same reputational costs as those groups whose leader is killed. They also launch attacks to bolster their reputation, but the increased counter-terrorism pressure means that the attacks are less likely to be successful if the leader is captured.

Our core empirical finding is that highly institutionalized groups are more likely to survive leadership fatality than less institutionalized groups. Our main analyses focus on the influence of institutionalization on group survival after leadership decapitation. We find highly institutionalized groups survive longer than less institutionalized groups after a leader is killed, but not after a leader is captured. This differential effect is also apparent in the success rate of a decapitated group's attacks. In particular, the success rate of more institutionalized groups increases after the leader is killed, while there is no such increase after the leader is captured.[2] We then briefly explore a number of other observable implications from previous scholarship in this area. We find evidence that after a group's leader is killed, more institutionalized groups: (1) launch *fewer* attacks per year and (2) kill *more* people per attack than their less institutionalized counterparts. After a group's leader is captured, more institutionalized groups (1) launch *more* attacks per year and (2) kill *fewer* people per attack. We also find some evidence that more institutionalized groups are more likely to claim an attack regardless of the mode of decapitation mode because of a common reputational concern.

Ultimately, we provide a framework—institutionalization and reputation—to reconcile the sometimes-conflicting findings in the current literature. We account for variation across a wide array of outcome variables related to the duration, lethality, and publicity of terrorist groups between 1970 and 2008. This new understanding of the connection between counter-terrorism tactics and group structure has important policy implications—particularly in the age of drones, which allow for only one mode of leadership decapitation: killing. Policymakers should be aware of the fact that the same mode of leadership decapitation will not be equally effective against all groups. While deciding to kill or capture a terrorist leader is surely a complicated political and logistical question, this study points out potential benefits to capturing the leaders of more institutionalized, or institutionalizing, groups.

Leaders, Institutionalization, and Decapitation

A large body of scholarship finds leaders matter (Jones and Olken 2005, Lieberson and O'Conner 1972, Nepstad and Bob 2006, Pfeffer 1977). Leaders foster cooperation (Cremer and

---

[2] In Appendix Table A-14, we report on a robustness check using Johnston's (2011) identification strategy of looking at attempts vs. successes to disentangle if targeting matters. Because of a small sample size we are reluctant to place too much emphasis on this in the main paper, but our results appear to be robust to this concern.

van Knippenberg 2002), push organizations to adapt (Vera and Crossman 2004), and inspire subordinates (Shamir, House and Arthur 1993). Perhaps most importantly, leaders formulate goals and drive the organization towards their accomplishment (Bass 1990, Bersom and Avolio 2004, Kirkpatrick and Locke 1991). Terrorist leaders are no different. They serve an important role directing their organizations and inspiring followers. Some, like ISIS leader Abu Bakr al-Baghdadi, give rousing speeches to espouse the group's ideology and call potential followers to action. Leaders also orchestrate violent and non-violent campaigns (Heger 2014) and select targets (Abrams and Potter 2015, Shapiro 2013).

Leaders, especially terrorist leaders, also face an informational problem in which they are unable to monitor directly their agents (i.e., a principal-agent problem) and often create institutions in response. This institutionalization allows for more direct monitoring and sanctioning of their terrorist agents, but simultaneously increases the likelihood of discovery. The Basque group ETA varied its structure over its lifetime, becoming more decentralized in response to stronger counter-terrorism efforts (Heger, Jung, and Wong 2012).[3] The types of institutions terrorist leaders can adopt are diverse. Groups may provide club goods, available only to those terrorist agents who act in accordance with the leadership's direction (Berman 2009). They may also embed terrorist agents in marriage relationships (Shapiro 2013) or create "auditing departments" to facilitate monitoring (Shapiro and Jung 2014). The Provisional Irish Republican Army, an example of an institutionalized hierarchical group, was "organized like a business, with positions, responsibilities, and authority dispersed in a pyramid-shaped organization" (Dishman 2005, 241).

[3] There has also been a trend towards decentralization more generally in recent years as groups respond to counter-terrorism efforts around the world. Al-Qaeda, for example, has undergone a radical decentralization since 2001, becoming more of a "franchise" to which disparate groups claim allegiance (Hubbard 2014). While this certainly frustrates counter-terrorist efforts, our analysis suggests that it may increase the effectiveness of killing the leader.

While some leaders may initially create institutions, they are ultimately independent of the leader. Institutions create expectations for how an organization functions and are resistant to change (Clemens and Cook 1999), though more recent work has begun to explore variation in organizational stability (Levitsky and Murillo 2009). One reason institutions endure is that they are costly to create, provide benefits (e.g., reducing transaction costs, coordinating focal points), and are, therefore, costly to change (North 1990). Institutions define the rules that govern the organization (Milgrom, North and Weingast 1990). It is this durability that enables institutions to work as a commitment mechanism (North and Weingast 1989).[4] So while leaders matter for the smooth functioning of organizations, institutionalization moderates the disruption of unexpected leadership turnover.

When a leader is killed or captured, institutionalization allows a group to continue functioning. Having a clear line of succession is particularly important for the continued viability of an organization. Previous work notes that groups with clear lines of succession, such as the Easter Rebellion of Ireland and the Huk of the Philippines, are more likely to survive leadership turnover (Langdon et al. 2004). Previous work that highlights the importance of leaders to terrorist groups generally argues that succession is highly problematic, rendering leadership decapitation an effective counter-terrorism technique (Price 2012: 20–21). In this line of argument, leaders of terrorist groups must be charismatic, expert, and willing to work under extreme conditions. Finding replacements, therefore, is exceedingly difficult.

What this work has, broadly-speaking, overlooked, however, is that institutions extend the viability of terrorist groups after leadership decapitation. In particular, institutions that establish clear lines of succession (for a very dangerous position) have a positive effect on the

[4] See also work on how various institutions facilitate credible commitments on monetary policy (Bernhard, Broz and Clark 2002), trade (Büthe and Milner 2008), and even between a dictator and political elites (Boix and Svolik 2013).

terrorist group's survival of during leadership transitions. For example, leaders of institutionalized terrorist groups typically have a lieutenant who is generally acknowledged to be the next leader should anything happen to the current leader.[5] Succession is sometimes, notwithstanding factionalism, routine (or at least regularized). After an airstrike killed Abu Musab al-Zarqawi, the leader of the ISIS predecessor Al-Qaeda in Iraq, on 7 June 2006, Abu Ayyub al-Masri immediately assumed the role until his ouster in October 2006. At this point Abu Omar al-Baghdadi gained command of the now-called Islamic State of Iraq until his death on 18 April 2010. The current leader, Abu Bakr al-Baghdadi, assumed command that same day. These quick successions minimize the disruptions such sudden leadership transitions inevitably incur.

Establishing clear lines of succession has at least three benefits. First, it reduces the likelihood of factionalism and infighting should the leader be killed or captured. It does this by establishing expectations for who will be the next leader. While some parties may have different ideas of who should succeed in office, it stands to reason that such dissenting opinions have already been taken into account when the leader picks a second-in-command. Second, establishing a second-in-command early allows for that person to be groomed. Price (2012), for example, argues (in part) that leaders of values-based organizations are particularly difficult to replace because of their unique characteristics. But the leader can foster these traits, and knowledge of the organization, over time. The longer a person is second-in-command the more time the leader has to develop the necessary traits and knowledge to assume leadership of the group. Finally, the institutions in which this line of succession is embedded provide a mechanism to transfer power. In particular, the group imbues the office (e.g., the "emir" in ISIS and ISI) with the power to make decisions over defined territory or functional competency. Thus, a

---

[5] For example: Abu Mahammad al-Adnani for ISIS, Guzmán for The Shining Path, and Osman Öcalan (Abdullah Öcalan's brother) for the PKK.

replacement may assume the power, privileges, and responsibilities associated with that office with relative ease. We acknowledge different leaders may command varying degrees of respect, but argue that some minimal level of power and prestige is conferred on the replacement simply through the title they inherit.

The following hypotheses summarize two empirical expectations that flow from the preceding discussion. The first builds on the assertion that leaders matter, and that killing or capturing a leader has a negative influence on the lifespan of that group. We expect to find support for this hypothesis because it represents a replication of Price (2012) who finds an effect. Our first original contribution, in the second hypothesis, is that group characteristics condition this effect. In particular, the more institutionalized a group, the more robust it will be to surviving leadership decapitation.

Hypothesis 1. *Terrorist groups that suffer leadership decapitation are more likely to end than those that do not.*

Hypothesis 1a. *Conditional on suffering leadership decapitation, more institutionalized groups are less likely to end than less institutionalized groups.*

We further depart with much of the prior literature by emphasizing that the mode of decapitation determines whether institutionalization makes a group more robust. In short, institutionalized groups are robust to having their leader killed, but more vulnerable to having their leader captured. While scholars have long recognized that killing or capturing a leader may have differential effects on subsequent organizational performance (D'Alessio 2014, Johnston 2012, Jordan 2009), few systematically test it.[6] Capturing a leader allows counter-terrorism investigators to collect intelligence beyond that found on the scene (Johnston 2012, 76). Such

[6] For a notable exception, see also Phillips (2015) for the differential effect of killing versus capturing leadership in criminal organizations.

methods, proved effective against the Italian "Red Brigades" in the 1970s and 1980s, and its successor group, the "Red Brigades Communist Combatant Party" (Irrera 2014). Additionally, some policy-oriented work has criticized Obama's drone campaign as inhibiting human intelligence collection since counter-terrorism forces cannot question a dead terrorist (Thiessen 2010).

Killing the leader of an institutionalized group means counter-terrorism forces learn nothing further about that group's structure. Capturing the leader of an institutionalized group, however, may provide a wealth of information. Leaders of more institutionalized groups likely have a better knowledge of their groups than leaders of less institutionalized groups, including the locations and identities of terrorist cells, middle managers, and their successors. Interviewers can potentially extract this information and use it against an institutionalized group. Capturing the leader of a less institutionalized group, by comparison, provides less information since the various cells are more likely compartmentalized and operating with greater autonomy. This leads to a qualification of the second hypothesis.

Hypothesis 1b. *Conditional on suffering leadership decapitation, more institutionalized groups are less likely to end than less institutionalized groups if the leader is killed.*

The preceding discussion focused primarily on one of the ultimate consequences of leadership decapitation: time until a group ends. There exist, however, other metrics of whether leadership decapitation is successful. In particular, we are interested in the "success" rate of a group's attacks after suffering leadership decapitation.[7] We hypothesize that, just as with the

[7]Specifically, we opt for the Global Terrorism Database's conceptualization that an attack is successful if the intended goal of the attack is met. For example, an assassination is successful if the targeted individual is killed. Bombings are successful is the intended target is struck by the explosive(s).

lifespan of the group, there is a differential effect of the mode of leadership decapitation on success rate. Further, the magnitude of this effect varies with the degree of institutionalization.

We begin with the assertion that terrorist groups that suffer leadership decapitation also suffer a reputation cost. Terrorist groups compete with the state for constituents since constituents are the means by which such groups may gain political concessions (see Wagstaff and Jung 2017). Without constituents, groups will quickly run out of resources and recruits. We also assume that constituents want to be on the winning side (or at least a side capable of demonstrating strength). If, for example, they fight for the state-challenger and that group loses, they may be subject to further persecution from the state. If a group's leader is captured or killed, that sends a negative message to potential constituents about the viability of that group. The groups that suffer leadership decapitation take action to recover their reputations via successful attacks. By accomplishing their objectives, groups send a signal that they are still viable. Crucially, however, the mode of leadership decapitation and group characteristics determine the group's ability to rebound after leadership change.

It is possible killing a leader may make a group more successful, especially when the group is institutionalized, for three reasons. First, the surviving leadership is likely to become more cautious after a leader is killed in order to avoid the same fate. As such, they spend time ensuring operational security and making adequate preparations for attacks. Second, the leadership more carefully selects targets and timing to maximize the likelihood of success. Third, institutionalization facilitates the coordination required to successfully accomplish reconnaissance, disseminate intelligence, organize and transport the required logistics, train the terrorist agents, as well as coordinate and time the attack. Killing a leader prevents counter-terrorism forces from penetrating the institutions sufficiently to disrupt these operations.

Capturing a leader, on the other hand, is not likely to make a group more successful. While such groups have the same incentives as those whose leader is killed, leadership capture may prevent the operations required to execute successful attacks. Capturing a leader facilitates intelligence collection as discussed previously. This enables counterterrorism forces to begin dismantling the organization more effectively than had the leader been killed. As key nodes in the terrorist network are identified and removed, terrorist agents receive less direction and logistical support for operations. Furthermore, zealous fighters, who may become tired of waiting and worried about the more effective counter-terrorism efforts, may be inclined to launch an attack before they are identified. These factors, combined with the desire to be more successful, have an indeterminate effect of the group's success rate after leadership capture. This discussion leads to the following hypotheses.

Hypothesis 2. *Killing a leader increases the success rate of that group.*

Hypothesis 2a. *The effect of killing a leader on the success rate of that group <u>increases in that group's level of institutionalization.</u>*

The remainder of the paper subjects these hypotheses to a number of empirical tests using longitudinal data on terrorist public service provision and Price's (2012) data on leadership decapitation between 1970 and 2008. As we argue below, the level of terrorist public service provision (e.g., education, healthcare) proxies for the group's level of institutionalization. The results support the hypotheses detailed above and underscore the importance of understanding how various methods of leadership decapitation and group structures interact. To examine the robustness of these findings we leverage an alternative proxy for institutionalization from Tokdemir and Akcinaroglu (2016)—the forcible extraction of taxes. The results are robust and are reported in the appendix (Appendix Tables A-9 through A-12).

Data and Research Design

In this section we introduce the data.[8] The data on leadership decapitation and lifespan come from Price (2012), data on institutionalization (measured via service provision) come from Heger et al. (2017), and data on attack success rates are based on the Global Terrorism Database at the University of Maryland (National Consortium for the Study of Terrorism and Responses to Terrorism (START) 2016). Before outlining our identification strategy, we provide a number of descriptive statistics. In particular, we are worried about selection bias as to which groups are targeted and, beyond this, selection into either the leader being killed or captured. The empirical strategy we outline below leverages event history, fractional logit, negative binomial, and OLS modeling.

Dependent Variables: Lifespan and Success

The first set of hypotheses seeks to examine the influence of leadership decapitation on the continued existence of the targeted group. We measure this using a simple count of the years of the group's existence. A group ceases to exist when its violent campaign ends or the group disbands. The unit of observation, then, is the group-year. The sample contains information across 171 groups and covers the years between 1969 and 2008. The mean number of years a group "lives" in the data set is 18.4.

The second set of hypotheses focuses on the group's success rate. An attack is considered a success if it accomplishes its stated goals. An assassination is successful if the target dies; a bombing is successful if the bomb detonates on target; a hijacking is successful if the vehicle is commandeered (see National Consortium for the Study of Terrorism and Responses to Terrorism

[8] Descriptive statistics may be found in Appendix Table A-13.

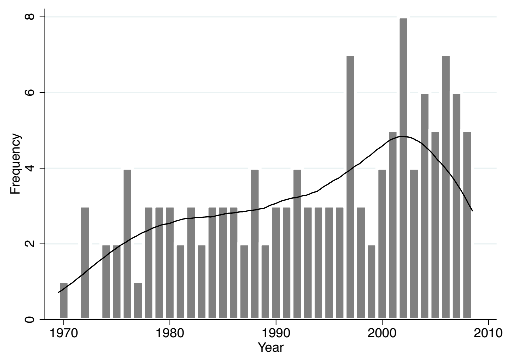
(START) 2016, for further discussion). Groups are generally successful. The mean annual success rate is about 92%. Terrorist groups also appear to become more successful over time. The mean success rate was 89% in 1990, 91% in 1995, 93% in 2000, and 94% in 2005.[9]

Independent Variables

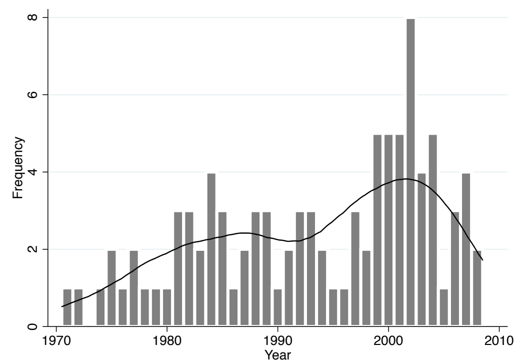
We highlight four distinct independent variables. The first is any leadership decapitation, the second is leadership capture, the third is leadership fatality, and the last is the institutionalization of the group. All leadership decapitation variables come from Price (2012), and the institutionalization data come from TIOS 2.0 (Heger and Jung 2017). The general leadership decapitation variable is dichotomous and equals 1 if a leader is killed or captured in that or any previous year, and 0 otherwise. The hypotheses are concerned with the long-run effect of leadership decapitation and, therefore, it is important to understand if the group has ever suffered leadership decapitation. The variables that indicate leadership capture and fatality are coded similarly. The variable that indicates whether a leader has been captured is dichotomous, equaling 1 in the group-year the leader is captured and all subsequent group-years and equaling 0 otherwise. The variable that indicates whether a leader has been killed is dichotomous, equaling 1 in the group-year the leader is killed and all subsequent group-years and 0 otherwise. In the dataset there are a total of 522 group-years in which a group has suffered a leader fatality and 551 group-years in which a group has suffered a captured leader.

[9] Due to data limitations, there are only 860 observations of a group's success rate.

Figure 1: Trends in Leadership Decapitation



(a) Leaders Killed



(b) Leaders Captured

Figures 1a and 1b display the yearly frequency of leadership decapitation through fatality and capture, respectively. Leadership fatality occurs much more often than leadership capture. This is unsurprising given the ease of killing a leader relative to capturing a leader. Killing a leader can be as "easy" as a missile strike, while capturing a leader requires more planning and execution to succeed. Capturing a leader is also more likely to endanger friendly counterterrorism forces. Furthermore, it may be politically advisable to kill rather than capture a terrorist leader.[10] Lastly, note that leadership decapitation increases around 2001. This is likely due to the increased emphasis on global counter-terrorism in the wake of 9/11.

We proxy institutionalization with an indicator of service provision for three reasons. First, service provision requires infrastructure to deliver the services and a bureaucracy to manage the provision, contributing to institutionalization. Groups must develop standard operating procedures to deliver services efficiently. Second, the relationship between service provision and institutionalization is endogenous. Providing services requires creating the

[10] Consider the bin Laden raid. The debate surrounding the decision to kill bin Laden and dispose of his body at sea illustrates how politics can influence the decision to kill or capture terrorist leaders.

described infrastructure. More institutionalized groups are also more likely to provide services, since the cost to providing services is lower. These groups do not have to create new institutions to provide services, but may use existing structures. Finally, services data has the benefit of temporal variation. Our approach is able to track changes at the group-year level. This enables a more fine-grained examination of group structure than previously possible.

We use data from TIOS (Heger and Jung 2017) to capture terrorist group service provision. The TIOS data set is the first to provide a longitudinal measure of terrorist and insurgent group service provision across more than 400 groups and more than 40 years.[11] This measure captures evidence of terrorist service provision across 21 categories of service provision, including sewage, infrastructure, education, healthcare, and media.[12] The data is machine coded by first gathering all English language news articles for all terrorist groups listed in Cronin (2011). The documents are then collated into group-years and the variables are the logged sums of key words.

Figure 2: Distribution of Services Data

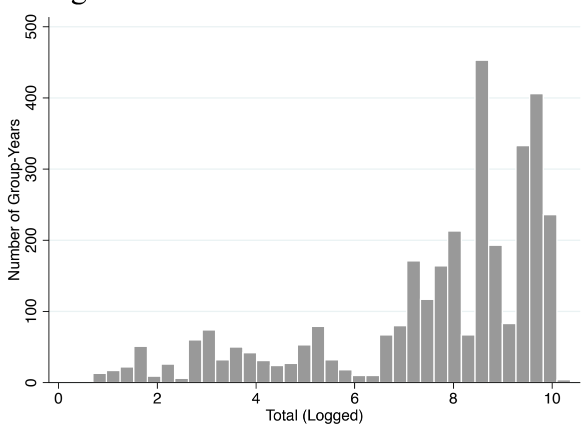


Figure 2 displays the number of group-years across the different levels of service provision. The mean level of logged service provision group-year is 7.6 and the median is 8.5.

---

[11] See Heger and Jung (2017) for discussion of data collection. Extensive attribution checks have been conducted to ensure, despite the noise, that the metric is actually picking up terrorist or insurgent provision. It does. Regardless, the authors recommend logging the measure to reduce the effect of measurement error.

[12] See Wagstaff and Jung (2017) for a full list of these categories.

An important takeaway from this figure is that the groups in this sample engage in a high degree of service provision. This gives us greater confidence that we will be able to track fluctuations in institutionalization than if the values clustered close to zero. The amount of change possible as the level of service provision approaches zero necessarily declines (due to a "flooring" effect), impeding our ability to capture "deinstitutionalization" of already "deinstitutionalized" groups. We caution against using this as a precise measure, but instead take this as rough indication of service provision and, consequently, of the degree of a group's institutionalization.

Control Variables

We include a number of control variables in our analyses. All variables come from the World Bank's World Development Indicators unless otherwise noted. First, we include the *GDP/Capita* for the state in which the group (or at least the headquarters) resides. GDP/Capita proxies for state capacity. The greater this capacity, the better the state can combat the terrorist group. This likely reduces the amount of services a group is able or willing to provide. Groups may also take advantage of state-provided services, such as healthcare, rather than provide their own. Additionally, more robust counter-terrorism forces increase the odds of a successful leadership decapitation. In general, a more robust counter-terrorism capacity has a negative impact on the longevity and success rate of a terrorist group, and a positive impact on the likelihood that the state launches a decapitation strike.

We also include the *Unified Democracy Score* (Pemstein et al. 2010) of the state in which the group's main base of operations resides to measure regime type. More democratic states may be more restrained in their ability to target leadership (notwithstanding the US drone programs). Public outcry may prevent leaders from, for example, using torture to extract information. Conversely, more democratic states may be more likely to conduct leadership decapitation under pressure from constituents for action. Groups may also "live" longer in democratic states because such states have less invasive police services, enabling them to stay hidden. The general restrictions on policing increase the likelihood that an attack is successful since the perpetrators can avoid detection longer.

Natural Resource Revenue/GDP influences the ability of states to conduct leadership decapitation strikes, the longevity of a terrorist group, and the group's success rate. Much of this effect hinges on who owns the resources, but the general idea is that both the state and terrorist group are able to exploit natural resource wealth. States that have access to natural resources should also be in a better position to fund counter-terrorism efforts. They are also better able to resist calls from constituents for action against terrorist groups. Groups that have access to natural resources are more robust since they have a deeper reservoir of resources from which to draw. These resources facilitate funding and equipping terrorist activity, which increases the likelihood of success.

Remittances Received has a similar effect to natural resource wealth. States whose populations receive large amounts of remittances may face less demand less from their constituents. Individuals can use these remittances to, for example, fund educational- and healthcare-related expenses without government support. The government can then devote more funds to counter-terrorism efforts. On the other hand, some remittances also go to fund terrorist activity. This is particularly true of terrorist groups that claim to represent particular people groups since these potential or actual "constituents" may contribute to these groups (e.g., remittance flows to the IRA). This makes the group more robust. Likewise, groups can use these funds to execute more sophisticated attacks with a higher degree of success with the extra resources.

Finally, we include *Military Expenditure/GDP* to control more directly for the strength of state counter-terrorism forces. Such forces have the resources to more effectively identify group leaders and conduct leadership decapitation strikes. This also reduces the longevity of groups that are subjected to more vigorous counter-terrorism operations beyond leadership decapitation. Furthermore, better-funded counter-terrorism forces will be better able to identify potential targets and interdict an attack before it can succeed. We cluster all standard errors at the group level since the errors are likely to be highly correlated within unit.

An immediate concern is that there is selection bias as to which groups states target. Table 1 assuages this concern. This table compares two groups, those terrorist groups that do not suffer leadership decapitation (column 2) and those terrorist groups that do (column 3), across observable traits. The best comparison would be to compare all groups that the state wants to decapitate, regardless of success or actual attempt, but we are not aware of any such data.[13] This method likely approximates this comparison.

Table 1: Selection Bias in Targeting?

Variable	Not Decapitated Mean	Decapitated Mean	P-Value
Total Services (logged)	7.48	7.60	0.71
% Success	0.89	0.88	0.90
Attacks/Year	26.46	30.29	0.80
Fatalities/Attack	1.49	0.48	0.29
% Claimed	0.50	0.44	0.60
GDP/Capita	8,493.03	7,111.63	0.32
Unified Democracy Score	0.42	0.29	0.29
Natural Resource Revenue/GDP	5.14%	6.40%	0.34
Remittances Received	1.31%	1.77%	0.08
Military Expenditures/GDP	3.59%	4.00%	0.44

[13] Additionally, any such data would also raise concerns about how complete the data are and whether the available represented a random sample of the (unobservable) population of groups states want to target.

In calculating the means for each group in Table 1, we drop all group-years during and after a leadership decapitation. Including these years would bias the mean calculation since the comparison would include values that are likely affected by the decapitation itself. In sum, the table shows that there are no major differences between groups that are not targeted for leadership decapitation and those that are. Column 1 in Table 1 shows the variable and column 4 provides the two-tailed t-test p-value. In other words, the fourth column is the probability that we would observe a difference between the two means of at least the magnitude that we do. There appears to be a difference only in the level of remittances states receive. States that target groups appear to receive more remittances than those that do not, but in general there does not appear to be much selection bias.

A related concern, especially given our interest in the differential effect of decapitation mode, is that there is a systematic difference between groups that suffer leadership fatality and groups that suffer leadership capture. Table 2 compares groups that suffer leadership fatality (column 2) and leadership capture (column 3). The remaining structure parallels that of Table 1. There does not appear to be systematic bias among our independent variables of interest.

Table 2: Selection Bias in Decapitation *Mode*?

Variable	Kill Mean	Capture Mean	P-Value
Total Services (logged)	7.40	7.77	0.52
% Success	0.95	0.84	0.27
Attacks/Year	16.60	40.07	0.52
Fatalities/Attack	0.46	0.49	0.91
% Claimed	0.51	0.39	0.56
GDP/Capita	4,279.68	9,514.50	0.03
Unified Democracy Score	− 0.06	0.59	0.00
Natural Resource Revenue/GDP	10.17%	3.19%	0.03
Remittances Received/GDP	2.40%	1.33%	0.10
Military Expenditures/GDP	4.48%	3.57%	0.40

Table 2 shows some interesting differences between groups that suffer leadership fatality and groups that suffer leadership capture among the control variables. Groups that suffer leadership capture are more likely than groups that suffer leadership fatality to reside in states with higher GDP/Capita and levels of democracy, but lower natural resource revenue, remittance levels, and military expenditures as a percent of GDP. We remain agnostic about the reasons behind these differences, but would like to point out that the difference in the level of democracy is particularly interesting. Perhaps it could be due to democratic norms not to kill, but at the same time capturing terrorist leaders facilitates torture. We leave this investigation to future work.

Differences in Behavior?

Before turning to the main analyses, we investigate a few outcomes to see whether there exists any evidence of a differential impact of decapitation mode. To do this, we used the Global Terrorism Database to create three dependent variables. The first is simply a count of the number of attacks a group perpetrates per year. The second takes the mean of the number of fatalities per attack each group-year. The third is the percent of the attacks the group is suspected of perpetrating that the group actually claims. This initial probe is meant only to see if there appears to be a differential effect of not only the mode of leadership decapitation, but also if there is any evidence that institutionalization matters. Given that we use fractional logit and negative binomial models, we present the change in predicted proportions and counts in Table 4. We estimated all regressions with the full battery of controls and clustered standard errors on the group.[14]

Table 3: Decapitation on Various Outcomes

[14] The regression results can be found in Appendix Tables A-1 through A-3.

Outcome	Sample	Kill	Capture	Either
# Attacks/Year	Full Sample	− 4.04	+ 5.37	+ 0.03
(Median = 4)	Log(Provision) < 8.5	− 3.72	+ 3.87	+ 0.02
	Log(Provision) ≥ 8.5	− 4.06	+ 8.02	+ 0.04
Fatalities/Event	Full Sample	+ 0.79	− 0.34	+ 0.21
(Median = 0.19)	Log(Provision) < 8.5	− 0.15	+ 0.32	+ 0.35
	Log(Provision) ≥ 8.5	+ 2.09	− 1.20	+ 0.18
Probability Claim	Full Sample	− 0.09	− 0.04	− 0.13
(Mean = 0.37)	Log(Provision) < 8.5	− 0.08	− 0.13	− 0.20
	Log(Provision) ≥ 8.5	− 0.08	+ 0.04	− 0.03

Probability Claim estimated with fractional logit models; # Attacks/Year and Fatalities/Event estimated with negative binomial models. All models estimated with robust standard errors clustered on the group. The median of Logged Provision is 8.5. Results robust to linear model estimation.

Table 3 presents evidence there is a differential effect of decapitation mode. In the full sample where the dependent variable is the number of attacks per year, killing a leader reduces the number of attacks significantly (between 3 and 4 attacks per annum). Capturing a leader on the other hand dramatically increases the number of attacks (between 5 and 6 per annum). The final column shows the aggregate effect of any leadership decapitation is to increase the frequency of attacks. Neglecting to disaggregate by mode of decapitation, however, hides the fact that killing a leader dramatically reduces the number of attacks. Rows two and three show the results for less and more institutionalized groups, respectively. While institutionalization does not appear to increase the effect of killing a leader, it dramatically increases the frequency of attacks after capturing a leader, more than doubling it.

There is, likewise, a differential impact on the lethality of the attacks. In the full sample, killing a leader appears to increase the number of fatalities per attack. After capturing a leader, by contrast, the number of fatalities per attack decreases. The level of institutionalization also appears to moderate this effect, especially after killing a leader. Groups only appear to become more lethal after their leader is killed *if they are relatively institutionalized*. There is only a moderate effect of institutionalization after the leader is captured. Perhaps this is indicative of a beneficial impact of institutionalization when a leader is killed, but not when the leader is captured.

This analysis supports the idea of a differential impact of leadership decapitation and a moderating effect of institutionalization. If our intelligence gathering story is true---that capturing a leader allows for better intelligence gathering and dismantling of a group---then it should also be the case that such groups will exhibit other pathologies. After a group's leader is captured, these results depict groups struggling to launch attacks and, the more institutionalized the group, the less capable they appear to be. Interestingly, there is no differential effect of decapitation mode on the probability that a group claims an attack. However, increasing institutionalization does appear to increase the willingness of groups to claim an attack as such groups might both be better able to withstand increased pressure after claiming an attack as well as have institutions that coordinate a media campaign with the violent attacks.

Analysis

We now turn to the primary analyses. We first establish that leadership decapitation exerts a negative influence on the lifespan of the group, no matter the mode of removal. We then show how institutionalization moderates this relationship. After this, we turn to examining the effect of leadership decapitation on the success rate of each group. In sum, we find support for each of our hypotheses.

Group lifespan

Figure 3 shows the results of Cox Proportional Hazard models that demonstrate the negative influence of leadership decapitation on the lifespan of the group. The "failure" is the group ending, regardless of the means through which they ended. They could end due to the state destroying them or simply fading from the political scene. This provides a more conservative test of the effect of leadership decapitation in the sense that groups that linger and simply fade after suffering decapitation will bias the results against our hypothesis.

Using Cox Proportional Hazard models also allows for right-censoring in the data. Our data necessarily do not include the entire lifespans of all groups. In other words, we do not know exactly how long all groups in the data (will) live. Using logit or linear models would yield biased estimates because it would treat all groups still alive at the end of the data's temporal range as having survived. If more groups that did (not) suffer leadership decapitation last until the end of the data set then that would increase the likelihood of a false negative (positive). Censoring allows for the possibility that all groups in the data set will fail if observed long enough. The results presented here include all control variables and robust standard errors clustered on the group. The regression results are displayed in Appendix Table A-4.

Figure 3: Leadership Decapitation

(a) Decapitation

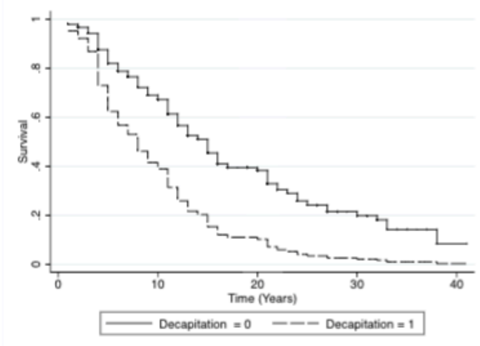


Figure 3a displays the survival rate of groups that suffer any leadership decapitation. Figure 3b displays the survival rate of groups whose leader is killed. Figure 3c displays the survival rate of groups whose leader is captured. All figures estimated with Cox Proportional Hazard models. Results can be found in the appendix.

(b) Kill (c) Capture

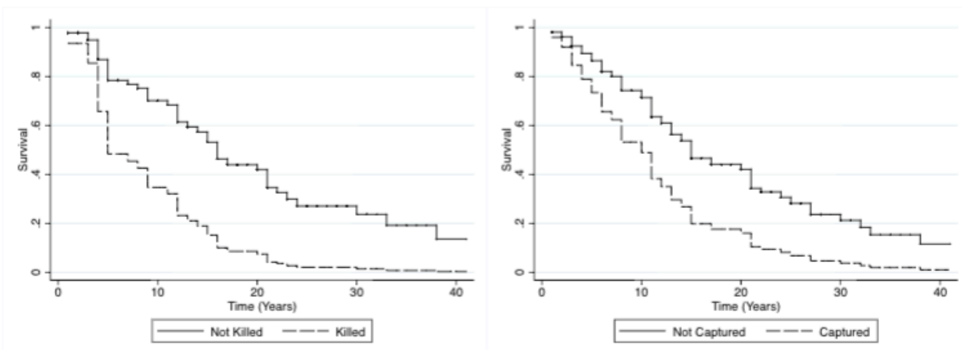


Figure 3a displays the survival rate for groups that suffer any type of leadership decapitation. There exists a clear negative effect – good news for counter-terrorism efforts. The effect of leadership decapitation grows until about 15 years after decapitation, at which point the likelihood that a group that suffers leadership decapitation survives to the next year is half that of a group that did not. While 15 years is a long time, recall that the mean lifetime of a group in the data set is roughly 18 years. So, this effect is substantively meaningful.

We next disaggregate the data to show the effect of leadership fatality (Figure 3b) and leadership capture (Figure 3c) on the group's lifespan. These figures show that there is no large difference between killing or capturing a leader on group survival. The effect of killing appears more dramatic earlier after decapitation, but any difference ends there. The takeaway is that decapitation expedites a group's demise, regardless of the mode.

Stopping there, however, leaves us only with a shallow understanding of the effect of leadership decapitation. Our main hypotheses concern the effect of group structure on the effectiveness of leadership decapitation. Recall that Hypothesis 1a is that institutionalization will decrease the effect of leadership decapitation. Hypotheses 1b is that institutionalization will decrease the effect of leadership decapitation when the leader is killed. Figure 4 displays the survival curves for the Cox Proportional Hazard models that examine these relationships.[15] In sum, we find only limited support for Hypothesis 1a, but strong support for Hypothesis 1b. All models contain the full battery of controls and can be found in Appendix Table A-5.

Figure 4: Institutionalization and Group Survival after Leadership Decapitation

(a)

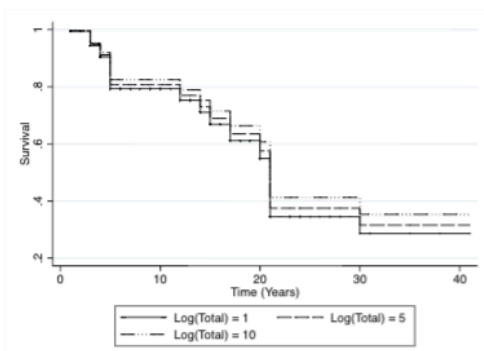
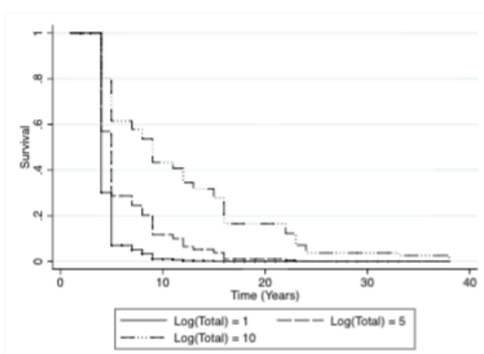
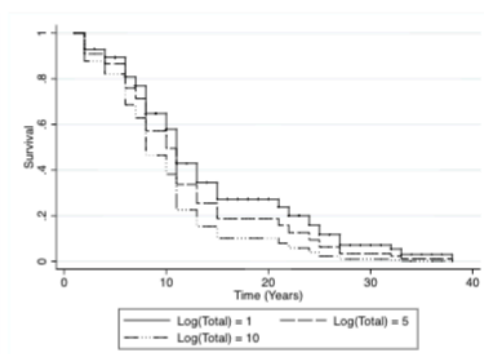


Figure 4a displays the survival rate of groups that have never suffered leadership decapitation. Figure 4b displays the same for those that have had their leader killed sometime in the past. Figure 4c displays the same for that that have had their leader captured in the past. All figures estimated with Cox Proportional Hazard models.

(b)



(c)



[15] As above, we favor these models because they flexibly account for right-censoring in the data and reduce the resulting bias.

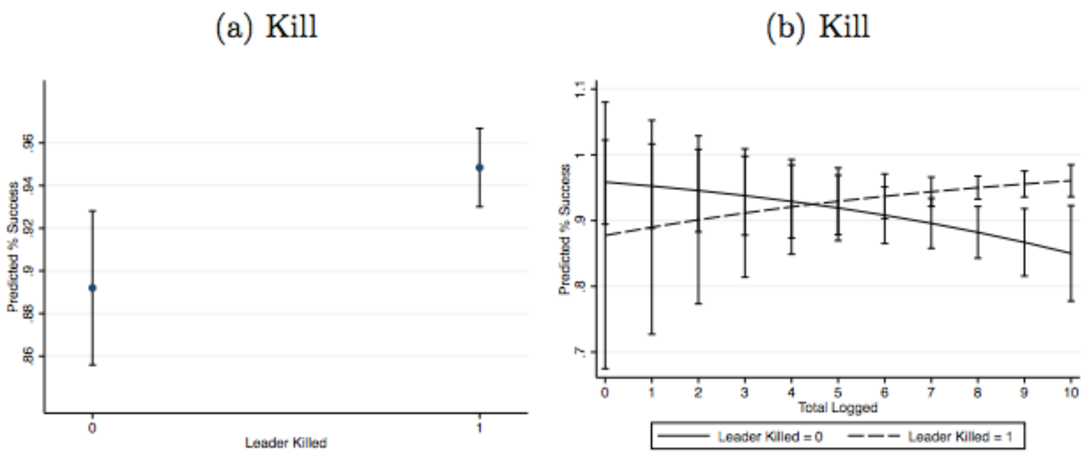
Figure 4a shows the survival curves for those groups that have suffered any leadership decapitation across degrees of institutionalization. The evidence is only suggestive of a moderating effect. While it does appear that more institutionalized groups survive longer after leadership decapitation, the moderating effective of institutionalization is statistically and substantively insignificant. We suspect that this may be due to the small sample size, but we cannot say with confidence that this evidence supports Hypothesis 1a.

Once we disaggregate based on mode of decapitation, however, the difference is stark – even with the restricted sample size. We re-estimate the analysis in Figure 4a on two different sub-samples: only those groups that have suffered a leader fatality (Figure 4b) and leader capture (Figure 4c). The difference is clear. Institutionalization moderates effect of leadership fatality on the group's lifespan, mitigating the detrimental (for the terrorist group) effect of leader fatality. Among the least institutionalized groups, the effect of leader fatality is dramatic. Such groups are unlikely to survive beyond five years. Highly institutionalized groups, on the other hand, do not reach the same near-zero probability of survival until almost 25 years. These findings provide robust support for Hypothesis 1b. Figure 4c confirms the argument that institutionalization cannot insulate groups that suffer leader capture. The effect of institutionalization is neither statistically nor substantively significant.

Attack success

We next consider Hypotheses 2 and 2a. Recall that Hypothesis 2 posits that killing a leader will increase the subsequent success rate of that group. This occurs because of the need for the group to recover its reputation coupled with increased caution. Hypothesis 2a posits that more institutionalized groups will be better able to control terrorist agents in the wake of a leader fatality and so the relationship between leader fatality and success rate will be greater for more institutionalized groups.

Figure 5: Institutionalization and Success Rate



In evaluating these hypotheses, we use fractional logit models because our dependent variable is the proportion of attacks that are successful.[16] The sample excludes all group-years for which the group has already suffered leadership capture. This allows for a comparison of those group-years in which the group has suffered leadership fatality with those group-years in which the group has never suffered any leadership decapitation. Failing to exclude these years would result in comparing those group-years where the group has suffered leadership capture with those group-years in which the group has never suffered any leadership decapitation and those group-years in which the group has already suffered leadership capture. We display the results using the full battery of controls with robust standard errors clustered on the group. Figure 5 displays the predicted proportion of successful attacks. We first estimate fractional logit models where the independent variable of interest is a dichotomous indicator of whether the group has ever suffered a leadership fatality. Figure 5a displays the predicted proportion of successful attacks with 95% confidence intervals. This evidence confirms Hypothesis 2, that

[16] Results can be found in Appendix Table A-6.

groups that suffer leadership fatality are more successful. The predicted proportion when the group has not suffered a leader fatality is roughly 0.89. This number increases to roughly 0.95 after the group suffers a leader fatality.

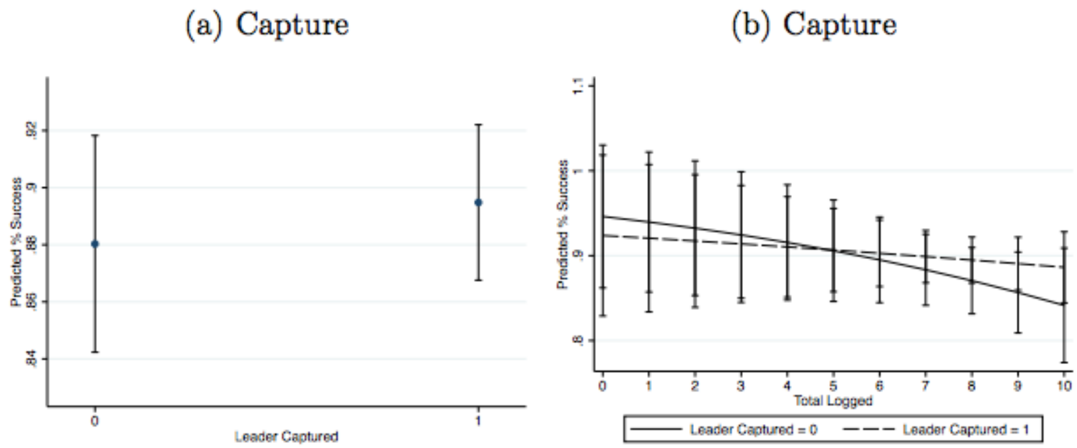
To evaluate Hypothesis 2a, we interact the dichotomous indicator from Figure 5a with our measure of institutionalization – logged service provision. We then plot the predicted proportion of successful attacks (and the 95% confidence interval) across different levels of institutionalization in Figure 5b. The dashed line displays the various predicted proportions if the leader has been killed and the solid line displays the various predicted proportions if the leader has not been killed. This figure shows that killing a leader increases the group's success rate only among the relatively institutionalized groups. In understanding Figure 5b, recall that the median logged service provision is about 8.5. The difference in success rate becomes statistically significant around 8, and grows with the level of institutionalization. For the most institutionalized groups the proportion of successful attacks given no leadership fatality is about 0.85 and the proportion of successful attacks given leadership fatality is about 0.95. These findings support Hypothesis 2a, that the positive influence of leadership fatality on success rate will exist only for relatively institutionalized groups. This occurs because such groups have the infrastructure to continue coordinating and supporting their violent campaigns even when the individual leader is killed.

Finally, though we did not generate hypotheses about the after effects of capturing a leader on success rate, we did speculate that it would be null (or at least different than after killing a leader). Recall that we argued capturing a leader allows counter-terrorism forces to infiltrate terrorist groups more effectively and disrupt operations. Institutionalization becomes a liability and, unlike after killing a leader, will not mitigate the negative effect on the group's violent operations.

We take the same approach as when we evaluated Hypotheses 2 and 2a. Fractional logit models are again appropriate because the dependent variable is a proportion inclusive of 0 and 1. The results are robust to linear model specification. The sample excludes all group-years for which the group has already suffered leadership fatality. This allows for a comparison of those group-years in which the group has suffered leadership capture with those group-years in which the group has never suffered any leadership decapitation. Failing to exclude these years would result in comparing those group-years where the group has suffered leadership capture with those group-years in which the group has never suffered any leadership decapitation and those group-years in which the group has already suffered leadership fatality. We display the results from the models that contained the full battery of controls with robust standard errors clustered on the group.[17] Figure 6 displays the predicted proportion of successful attacks. We first estimate a fractional logit model where the independent variable of interest is a dichotomous indicator of whether the group has ever suffered leadership capture. Figure 6a displays the predicted proportion of successful attacks with 95% confidence intervals. This evidence supports our speculation of a null result. There is no evidence that leadership capture reduces the success rates of a group's attacks.

[17] Results can be found in Appendix Table A-7.

Figure 6: Institutionalization and Success Rate



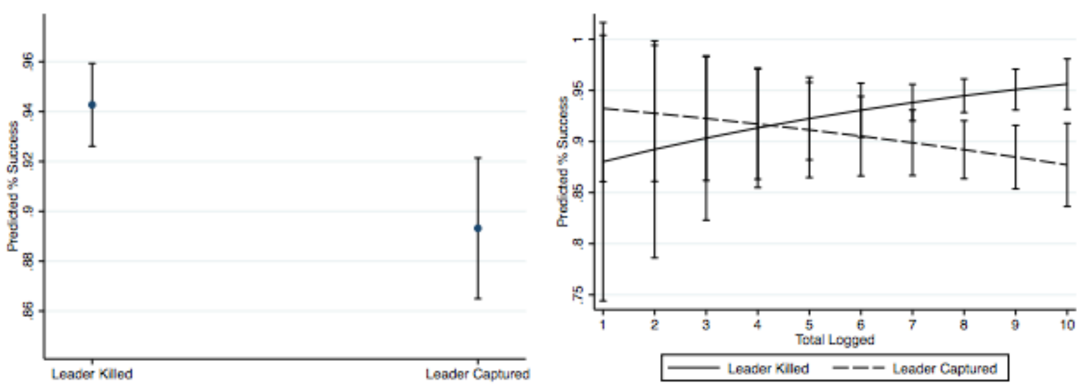
To evaluate the effect of institutionalization, we interact the dichotomous indicator from Figure 6a with logged service provision coverage as before. We then plot the predicted proportion of attacks that are successful (and their 95% confidence intervals) across different levels of institutionalization in Figure 6b. The dashed line displays the various predicted proportions if the leader has been captured and the solid line displays the various predicted proportions if the leader has not been captured. This figure shows that there is no difference in success rate between groups whose leader has been captured and those whose leader has not. This null result is holds regardless of the level of institutionalization.

The evidence presented so far provides strong support for the idea that the mode of leadership decapitation has a differential impact on subsequent terrorist group survival and behavior. We may still be concerned, however, that selection bias may be influencing the results presented above. Perhaps there is some unobservable that determines which groups the state targets. Perhaps states target groups that are particularly vulnerable for leadership decapitation.

To address this concern, we re-estimate our analyses on only those groups that have already suffered some form of leadership decapitation.[18] Figure 7 displays the predicted proportion of attacks that are successful and the associated 95% confidence intervals. The independent variable in Figure 7a is a dichotomous variable that equals 1 if the group has suffered leadership capture and 0 if the group has suffered leadership fatality. This figure reconfirms the finding that, in general, groups that suffer leadership fatality are more successful than those that suffer leadership capture.

Figure 7: Selection Bias, Institutionalization, and Success Rate

(a) Any Decapitation (b) Any Decapitation



If the claim that group structure, and in particular institutionalization, conditions the effect of leadership decapitation differentially, then it should also be the case the it should moderate the success rate in this sample. To examine this possibility, we interact the dichotomous variable from Figure 7a with our measure of institutionalization – logged service provision. Figure 7b displays the predicted proportion of attacks that are successful across different levels of institutionalization by mode of decapitation. The solid line represents the predict proportions for groups whose leader has been killed and the dashed line represents the

[18] Results can be found in Appendix Table A-8.

same for those groups whose leader has been captured. This figure confirms the differential effect of institutionalization. There appears to be no difference in the rate of success among the less institutionalized groups, but the difference becomes apparent for the more institutionalized groups. These results provide strong evidence that the group's institutions can have a powerful influence over the effect of leadership decapitation on group operations.

To determine whether these results are simply an artifact of our proxy for institutionalization (service provision), we reran the same analyses using a different proxy. Specifically, we used the Reputation of Terror Groups Dataset's (Tokdemir and Akcinaroglu 2016) measure of whether a group forcibly extracts tax revenue from the population it controls. Such extraction requires the same sort of institutions discussed above. This variable is a dichotomous indicator that equals 1 when the group extracts taxes and 0 otherwise. There are a total of 694 group-years in which groups extract taxes and 370 in which they do not. We replicate Figures 4 through 7 in Appendix Figures A-1 through A-4. Despite the loss of power through listwise deletion, the results remain the same and reinforce the notion that mode of decapitation and group structure exert a powerful influence on the success or failure of leadership decapitation tactics.

What happens to institutionalization after decapitation?

Having documented evidence of how institutionalization does, or does not, insulate terrorist groups from certain modes of leadership removal above, a natural next step is to examine if groups change their institutionalization strategies in the wake of leadership removal. We do not present these as definitive evidence, but as suggestive of the dynamic response of terrorist organizations to counterterrorism efforts (in this case, leadership removal). In Table 4, we offer some evidence on these post-removal dynamics. Taken together, the results from Table

4 offer a consistent story about the differential effects of leadership removal by and for terrorist group institutionalization.

Table 4: Decapitation on Subsequent Service Provision

	Logged Service Provision			*Logged Service Provision*^{2}			*Logged Service Provision*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Any Removal	-0.129			-0.448*			-0.131		
	(0.133)			(0.236)			(0.0946)		
Leader Killed		0.0673			0.0189			0.00294	
		(0.168)			(0.317)			(0.122)	
Leader Captured			-0.267			-0.726**			-0.206*
			(0.166)			(0.304)			(0.115)
Service Provision				12.35***	12.35***	12.35***			
				(0.0911)	(0.0911)	(0.0911)			
Lagged Service Provision							0.312***	0.312***	0.311***
							(0.0240)	(0.0240)	(0.0241)
Constant	7.661***	7.609***	7.664***	-30.65***	-30.82***	-30.66***	5.312***	5.262***	5.312***
	(0.0828)	(0.0731)	(0.0752)	(0.738)	(0.731)	(0.740)	(0.198)	(0.192)	(0.196)
Observations	3,273	3,273	3,273	3,273	3,273	3,273	3,102	3,102	3,102
R-squared	0.001	0.000	0.002	0.966	0.966	0.966	0.101	0.100	0.101

Results estimated with OLS models
Robust standard errors clustered on group in parentheses
*** p<0.01, ** p<0.05, * p<0.1

These regressions seek to understand how the institutionalization of the group changes after that group suffers a decapitation. Models 1-3 focus on the most basic relationship: the effect of leadership decapitation on logged service provision. In models 4-6 the dependent variable is logged service provision squared to probe further the linkages between losing a leader and subsequent levels of institutionalization. In Models 7-9, the dependent variable is again provision (not squared) to probe further the linkages between losing a leader and subsequent levels of institutionalization. The key difference is that these regressions control for the lagged provision in the prior period, to account for some measure of institutional inertia. Taken together, these results suggest that groups whose leader is killed shore up institutionally and that groups whose leader is captured de-institutionalize. The directions are consistent with our theoretical story that there are differential effects of leadership removal by type and level of institutionalization, and that institutions are a greater liability after a leader is captured. These results suggest that terrorist organization "recovery" strategies may similarly vary, and point to potentially fruitful directions for future research.

Conclusion

This paper sought to bring clarity to some of the seemingly conflicting findings of the literature on leadership decapitation. Scholars disagree over whether leadership decapitation is an effective counter-terrorism tactic, often using different metrics of success. In this paper, we examined a broad array of counter-terrorism outcomes. We theorize that whether leadership decapitation works depends upon the mode of decapitation and the structure of the group. Groups that suffer leadership fatality launch fewer attacks per year, kill more people per attack, are more likely to fail, and are generally more successful in conducting their attacks. Groups that suffer leadership capture launch more attacks per year, kill fewer people per attack, are more likely to fail, but no more or less successful in conducting their attacks. Using a novel indicator of institutionalization, we find strong evidence that group structure conditions these relationships. Most importantly, relatively institutionalized groups are more likely to survive having their leader killed, actually becoming more successful in conducting their attacks.

These results suggest the need for counter-terrorism forces to take group structure seriously when contemplating leadership decapitation. The good news is that, consistent with Johnston (2012), leadership decapitation *does* appear to bring a swifter end to the targeted group. The mode of leadership decapitation matters a great deal, especially when considered in conjunction with group structure. In particular, more institutionalized groups appear to be more robust to having their leader killed. Furthermore, killing the leader of an institutionalized group may actually make the group more lethal and successful. These findings, when taken together, point to the need to capture leaders of institutionalized, bureaucratized groups. Such a tactic aids intelligence collection and allows counter-terrorism forces to infiltrate the group more effectively.

This article leaves some important questions unanswered and points to new areas for future exploration. For example, we have left unanswered exactly how and why states select the mode of decapitation other than to say that it likely involves logistics and politics. We did briefly consider it in the discussion about selection bias, but current data limitations prevented a deeper understanding of this decision calculus. Isolating leaders and their location for capture is likely more intensive of human intelligence and requires a presence on the ground. We have also left unexamined whether particular types of decapitation are more effective in preventing the resurgence of terrorist organizations beyond asserting that the removal of highly charismatic leaders is more likely to cause that leader's group to fracture. This important question, however, required more sustained attention and is, therefore, left for future exploration.

Lastly, future work should examine the full range of options available to state leaders. We have here examined only one potential avenue states may take in combating terrorist groups—leadership decapitation. But states have a variety of counter-terrorism tactics at their disposal, such as assimilating the group, allowing the group to have a political party to express their concerns non-violently, and granting political concessions. The potential unintended consequences to leadership decapitation should inform the decision to opt for an alternative tactic or to use them in combination. Researchers could develop more sophisticated theories for how leaders choose from the wider range of available counter-terrorism tactics.

References

Abrams, Max and Philip B.K. Potter. 2015. "Explaining Terrorism: Leadership Deficits and Militant Group Tactics." *International Organization* 69:311–342.

Bahney, Benjamin, Radha Iyengar, Patrick Johnston, Danielle Jung, Howard Shatz and Jake Shapiro. 2013. "Insurgent Compensation: Evidence from Iraq" *American Economic Review* 103(3):518-522

Bass, Bernard M. 1990. "From Transactional to Transformational Leadership: Learning to Share the Vision." *Organizational Dynamics* 18(3):19–31.

Berman, Eli. 2009. *Radical, Religious and Violent*. Cambridge: MIT Press.

Bernhard, William, J. Lawrence Broz and William Roberts Clark. 2002. "The Political Economy of Monetary Institutions." *International Organization* 56(4):693 – 723.

Bersom, Yair and Bruce J. Avolio. 2004. "Transformational Leadership and the Dissemination of Organizational Goals: A Case Study of a Telecommunication Firm." *The Leadership Quarterly* 15:625–646.

Boix, Charles and Milan W. Svolik. 2013. "The Foundations of Limited Authoritarian Government: Institutions, Commitment, and Power-Sharing in Dictatorships." *American Journal of Political Science* 75(2):300 – 316.

Büthe, Tim and Helen V. Milner. 2008. "The Politics of Foreign Direct Investment into Developing Countries: Increasing FDI through International Trade Agreements?" *American Journal of Political Science* 52(4):741 – 762.

Byman, Daniel. 2006. "Do Targeted Killings Work?" *Foreign Affairs* 85(2):95–111.

Carley, Kathleen, Ju-Sung Lee and David Krackhardt. 2002. "Destabilizing Networks." *Connections* 24(2):79–92.

Clemens, Elisabeth S. and James M. Cook. 1999. "Politics and Institutionalism: Explaining Durability and Change." *Annual Review of Sociology* 25:441–466.

Cremer, David De and Daan van Knippenberg. 2002. "How Do Leaders Promoted Cooperation? The Effects of Charisma and Procedural Fairness." *Journal of Applied Psychology* 87(5):858–66.

Cronin, Audrey Kurth. 2011. *How Terrorism Ends: Understanding the Decline and Demise of Terrorist Campaigns*. Princeton University Press.

D'Alessio, Stewart J. 2014. "Does Targeted Capture Reduce Terrorism?" *Studies in Conflict & Terrorism* 37(10):881–894.

Deibert, Ronald J. and Janice Gross Stein. 2002. "Hacking Networks of Terror." *Dialogue-IO* 1(1):1–14.

Dishman, Chris. 2005. "The Leaderless Nexus: When Crime and Terror Converge." *Studies in Conflict & Terrorism* 28:237 – 252.

Freeman, Michael. 2014. "A Theory of Terrorist Leadership (and its Consequences for Leadership Targeting." *Terrorism and Political Violence* 26(4):666–687.

Hafez, Mohammed and Joseph M. Hatfield. 2006. "Do Targeted Assassinations Work? A Multivariate Analysis of Israel's Controversial Tactic During Al-Aqsa Uprising." *Studies in Conflict and Terrorism* 29(4):359 – 382.

Heger, Lindsay, Danielle Jung and Wendy H. Wong. 2012. "Organizing for Resistance: How Group Structure Impacts the Character of Violence." *Terrorism and Political Violence* 24(5):743–768.

Heger, Lindsay L. 2014. "Votes and Violence: Pursuing Terrorism While Navigating Politics." *Journal of Peace Research* 52(1):32–45.

Heger, Lindsay L. and Danielle F. Jung. 2017. "Negotiating with Rebels: The Effect of Rebel Service Provision on Conflict Negotiations." *The Journal of Conflict Resolution* 61(6):1203-1229

Hubbard, Ben. 2014. "The Franchising of Al Qaeda." The New York Times Accessed 25 January 2014. URL: http://www.nytimes.com/2014/01/26/sunday-review/the-franchising-ofal-qaeda.html? r=0.

Irrera, Daniela. 2014. "Learning from the Past: Case of the Red Brigades in Italy." *Counter Terrorist Trends and Analysis* 6(6):16–20.

Johnston, Patrick. 2012. "Does Decapitation Work? Assessing the Effectiveness of Leadership Targeting in Counterinsurgency Campaigns." *International Security* 36(4):47– 79.

Johnston, Patrick, Jacob N Shapiro, Howard J Shatz, Benjamin Bahney, Danielle F. Jung, Patrick K. Ryan and Jonathan Wallace. 2016. *Foundations of the Islamic State: Management, Money, and Terror in Iraq*, 2005-2010. Santa Monica: RAND.

Jones, Benjamin F. and Benjamin A. Olken. 2005. "Do Leaders Matter? National Leadership and Growth Since World War II." *The Quarterly Journal of Economics* 120(3):835–864.

Jordan, Jenna. 2009. "When Heads Roll: Assessing the Effectiveness of Leadership Decapitation." *Security Studies* 18:719 – 755.

Jordan, Jenna. 2014. "Attacking the Leader, Missing the Mark: Why Terrorist Groups Survival Decapitation Strikes." *International Security* 38(4):7–38.

Jung, Danielle F. 2017 "Determinants of rebel organizational structure and the effects of counter-insurgency: Population Dynamics and Organizational Ecology in Rebellion." working paper.

Kaplan, Edward H., Alex Mintz, Shaul Mishal and Claudio Samban. 2005. "What Happened to Suicide Bombings in Israel? Insights for a Terror Stock Model." *Studies in Conflict and Terrorism* 28:225–235.

Kirkpatrick, Shelley A. and Edwin A. Locke. 1991. "Leadership: Do Traits Matter?" *Academy of Management Review* 5(2):48–60.

Langdon, Lisa, Alexander J. Sarapu and Matthew Wells. 2004. "Targeting the Leadership of Terrorist and Insurgent Movements: Historical Lessons for Contemporary Policy Makers." *Journal of Public and International Affairs* 15(Spring):59–78.

Levitsky, Steven and Mar´ıa Victoria Murillo. 2009. "Variation in Institutional Strength." Annual Review of Political Science 12:115–133.

Lieberson, Stanley and James F. O'Conner. 1972. "Leadership and Organizational Performance: A Study of Large Corporations." *American Sociological Review* 37(2):117–130.

Long, Austin. 2010. "Assessing the Success of Leadership Targeting." CTC Sentinel 3(11/12):19–21.

Milgrom, Paul R., Douglass C. North and Barry R. Weingast. 1990. "The Role of Institutions in the Revival of Trade: The Law Merchant, Private Judges, and the Champagne Fairs." *Economics and Politics* 2(1):1–23.

National Consortium for the Study of Terrorism and Responses to Terrorism (START). 2016. Global Terrorism Database [Data file]. Accessed: 17 November 2016. URL: https://www.start.umd.edu/gtd.

Nepstad, Sharon Erickson and Clifford Bob. 2006. "When Do Leaders Matter? Hypotheses on Leadership Dynamics in Social Movements." *Mobilization: An International Journal* 11(1):1–22.

North, Douglass. 1990. *Institutions, Institutional Change in Economic History*. New York: Cambridge University Press.

North, Douglass C. and Barry R. Weingast. 1989. "Constitutions and Commitment: The Evolution of Institutional Governing Public Choice in Seventeenth-Century England." *The Journal of Economic History* 49(4):803–832.

Pape, Robert A. 1996. *Bombing to Win*. Ithaca, NY: Cornell University Press.

Pape, Robert A. 2003. "The Strategic Logic of Suicide Terrorism." *American Political Science Review* 97(3):343–361.

Pemstein, Daniel, Stephen A. Meserve and James Melton. 2010. "Democratic Compromise: A Latent Variable Analysis of Ten Measures of Regime-Type." *Political Analysis* 18(4):426 – 449.

Pfeffer, Jeffrey. 1977. "The Ambiguities of Leadership." *Academy of Management Review* 12(1):104–112.

Phillips, Brian J. 2015. "How Does Leadership Decapitation Affect Violence? The Case of Drug Trafficking Organizations in Mexico." *The Journal of Politics* 77(2):324–336.

Price, Bryan C. 2012. "Targeting Top Terrorists: How Decapitation Contributes to Counterterrorism." *International Security* 36(4):9 – 46.

Sageman, Marc. 2004. *Understanding Terror Networks*. Philadelphia, PA: University of Pennsylvania Press.

Shamir, Boas, Robert J. House and Michael B. Arthur. 1993. "The Motivational Effects of Charistmatic Leadership: A Self-Concept Based Theory." *Organization Science* 4(4):577– 594.

Shapiro, Jacob. 2013. *The Terrorist's Dilemma: Managing Violent Covert Organizations*. Princeton, NJ: Princeton University Press.

Shapiro, Jacob N. and Danielle F. Jung. 2014. "The Terrorist Bureaucracy: Inside the Files of the Islamic State in Iraq." Online; posted 14 December 2014. URL: https://www.bostonglobe.com/ideas/2014/12/14/the-terrorist-bureaucracy-inside- files-islamic-state-iraq/QtRMOARRYows0D18faA2FP/story.html

Staniland, Paul. 2014. *Networks of Rebellion: Explaining Insurgent Cohesion and Collapse*. Ithaca, NY: Cornell University Press.

Thiessen, Marc A. 2010. "Dead Terrorists Tell No Tales: Is Barak Obama killing too many bad buys before the U.S. can interrogate them?" Online; posted 8 February 2010. URL: http://foreignpolicy.com/2010/02/08/dead-terrorists-tell-no-tales/

Tokdemir, Efe and Seden Akcinaroglu. 2016. "Reputation of Terror Groups Dataset: Measuring Popularity of Terror Groups." *Journal of Peace Research* 53(2):268 – 277.

Vera, Dusya and Mary Crossman. 2004. "Strategic Leadership and Organizational Learning." *Academy of Management Review* 29(2):222–240.

Wagstaff, William A. and Danielle F. Jung. 2017. "Competing for Constituents: Trends in Terrorist Service Provision." *Terrorism and Political Violence*.

Appendix

Table A-1: Predictors of Attack Frequency

	Dependent variable: # Events/Year								
	(Full Sample)	(Low Inst.)	(High Inst.)	(Full Sample)	(Low Inst.)	(High Inst.)	(Full Sample)	(Low Inst.)	(High Inst.)
Leader Killed	-0.285 (0.247)	-0.270 (0.268)	-0.286 (0.361)						
Leader Captured				0.341 (0.284)	0.254 (0.360)	0.462 (0.332)			
Leader Decapitation							0.183 (0.315)	0.103 (0.431)	0.314 (0.345)
GDP/Capita	-6.18e-05*** (1.29e-05)	-7.40e-05*** (1.49e-05)	-4.11e-05* (2.44e-05)	-6.72e-05*** (1.28e-05)	-7.96e-05*** (1.55e-05)	-4.35e-05* (2.36e-05)	-6.97e-05*** (1.20e-05)	-7.98e-05*** (1.52e-05)	-5.12e-05** (2.11e-05)
Population	-2.00e-09*** (4.77e-10)	-2.20e-09*** (4.28e-10)	-1.73e-09*** (5.99e-10)	-2.07e-09*** (4.45e-10)	-2.29e-09*** (4.20e-10)	-1.77e-09*** (5.45e-10)	-2.07e-09*** (4.97e-10)	-2.26e-09*** (4.61e-10)	-1.81e-09*** (6.10e-10)
Unified Democracy Score	0.00661 (0.330)	0.139 (0.439)	-0.291 (0.457)	-0.0267 (0.295)	0.138 (0.410)	-0.435 (0.503)	0.0488 (0.309)	0.157 (0.432)	-0.259 (0.430)
Total Service Provision (logged)	0.0705* (0.0428)	0.135** (0.0539)	0.0811 (0.194)	0.0579 (0.0435)	0.118** (0.0488)	0.0355 (0.205)	0.0589 (0.0410)	0.122*** (0.0466)	0.0586 (0.201)
Resources/GDP	-0.0151 (0.0133)	-0.00934 (0.0147)	-0.0282* (0.0168)	-0.0169 (0.0133)	-0.0103 (0.0153)	-0.0336** (0.0166)	-0.0185 (0.0129)	-0.0119 (0.0144)	-0.0360** (0.0162)
Remittances/GDP	-0.0930*** (0.0205)	-0.0959*** (0.0276)	-0.0950*** (0.0266)	-0.103*** (0.0202)	-0.108*** (0.0234)	-0.104*** (0.0246)	-0.109*** (0.0201)	-0.109*** (0.0268)	-0.115*** (0.0267)
Mil Exp/GDP	-0.0827** (0.0418)	-0.0979*** (0.0367)	-0.0798 (0.0520)	-0.0808** (0.0369)	-0.0972*** (0.0338)	-0.0823* (0.0474)	-0.0893** (0.0408)	-0.105*** (0.0372)	-0.0893* (0.0509)
Alpha Logged	3.700*** (0.485)	0.386*** (0.534)	0.302*** (0.0926)	0.357*** (0.102)	0.384*** (0.598)	3.885* (2.038)	3.745*** (0.0959)	0.389*** (0.515)	0.298*** (1.981)
Constant	0.363*** (0.0893)	3.437*** (0.123)	3.553* (1.903)	3.696*** (0.531)	3.478*** (0.134)	0.286** (0.112)	0.365*** (0.508)	3.523*** (0.126)	3.694* (0.105)
Observations	390	207	183	390	207	183	390	207	183

*p<0.1; **p<0.05; ***p<0.01
Results estimated by panel negative binomial models
Robust standard errors clustered on group with degree of freedom correction (HC1) reported in parentheses

Table A-2: Predictors of Attack Lethality

	Dependent variable: # Fatalities/Attack								
	(Full Sample)	(Low Inst.)	(High Inst.)	(Full Sample)	(Low Inst.)	(High Inst.)	(Full Sample)	(Low Inst.)	(High Inst.)
Leader Killed	0.802*	0.227	1.457**						
	(0.473)	(0.393)	(0.636)						
Leader Captured				-0.433	0.500	-1.403***			
				(0.420)	(0.493)	(0.464)			
Leader Decapitation							0.268	0.630	0.163
							(0.375)	(0.417)	(0.481)
GDP/Capita	-6.29e-05*	-4.88e-05	-0.000106***	-5.44e-05	-4.42e-05	-9.99e-05**	-5.26e-05	-5.16e-05	-8.47e-05*
	(3.43e-05)	(4.25e-05)	(3.52e-05)	(3.55e-05)	(3.77e-05)	(4.74e-05)	(3.22e-05)	(4.08e-05)	(4.40e-05)
Population	1.40e-09**	1.41e-09*	1.31e-09*	1.44e-09**	1.77e-09**	9.35e-10	1.65e-09**	1.43e-09**	1.45e-09*
	(6.79e-10)	(7.39e-10)	(7.32e-10)	(7.05e-10)	(7.59e-10)	(8.52e-10)	(6.52e-10)	(7.12e-10)	(8.37e-10)
Unified Democracy Score	-0.219	-0.0686	-0.0524	-0.304	-0.0576	-0.0581	-0.411	-0.0630	-0.556
	(0.542)	(0.647)	(0.527)	(0.585)	(0.606)	(0.679)	(0.627)	(0.617)	(0.927)
Total Service Provision (logged)	0.125**	0.0430	0.383	0.133**	0.0215	0.252	0.138**	0.0146	0.292
	(0.0621)	(0.0614)	(0.344)	(0.0664)	(0.0596)	(0.319)	(0.0691)	(0.0532)	(0.386)
Resource/GDP	0.0121	-0.00406	0.0196	0.0109	0.00624	0.0207	0.00936	-0.00420	0.00528
	(0.0162)	(0.0162)	(0.0187)	(0.0157)	(0.0167)	(0.0171)	(0.0179)	(0.0117)	(0.0226)
Remittances/GDP	-0.0167	0.0191	-0.0860*	0.0131	0.0441	-0.0244	0.0145	0.0180	-0.0233
	(0.0474)	(0.0430)	(0.0480)	(0.0492)	(0.0420)	(0.0800)	(0.0468)	(0.0390)	(0.0806)
Mil Exp/ GDP	-0.0113	0.00966	0.00149	-0.0204	0.0392	-0.00772	-0.00346	0.0348	0.00986
	(0.0505)	(0.0561)	(0.0556)	(0.0523)	(0.0469)	(0.0567)	(0.0472)	(0.0498)	(0.0610)
Alpha Logged	-0.753	0.456***	1.029***	0.923***	0.456***	-1.074	0.939***	-0.710	-1.789
	(0.535)	(0.587)	(0.150)	(0.623)	(0.137)	(0.178)	(0.588)	(0.606)	(0.184)
Constant	0.890***	-0.441	-3.083	-0.475	-0.778	1.045***	-0.876	0.413***	1.140***
	(0.136)	(0.175)	(3.155)	(0.156)	(0.654)	(2.963)	(0.162)	(0.145)	(3.670)
Observations	387	206	181	387	206	181	387	206	181

*p<0.1; **p<0.05; ***p<0.01
Results estimated by panel negative binomial models
Robust standard errors clusetered on group with degree of freedom correction (HC1) reported in parentheses

Table A-3: Predictors of Claiming Attack

	Dependent variable: % Attacks Attributed Claimed/Year								
	(Full Sample)	(Low Inst.)	(High Inst.)	(Full Sample)	(Low Inst.)	(High Inst.)	(Full Sample)	(Low Inst.)	(High Inst.)
Leader Killed	-0.368 (0.497)	-0.320 (0.662)	-0.326 (0.612)						
Leader Captured				-0.165 (0.340)	-0.517 (0.481)	0.173 (0.406)			
Leader Decapitation							-0.528* (0.304)	-0.808* (0.431)	-0.110 (0.300)
GDP/Capita	8.61e-05*** (2.23e-05)	5.52e-05** (2.44e-05)	0.000115*** (2.64e-05)	8.71e-05*** (2.23e-05)	5.71e-05** (2.60e-05)	0.000115*** (2.61e-05)	9.09e-05*** (2.11e-05)	6.20e-05*** (2.27e-05)	0.000118*** (2.80e-05)
Population	7.02e-10 (4.76e-10)	-5.84e-10 (4.91e-10)	1.37e-09** (5.59e-10)	6.97e-10* (4.11e-10)	-5.19e-10 (5.92e-10)	1.39e-09** (5.50e-10)	7.07e-10 (4.35e-10)	-4.41e-10 (5.54e-10)	1.38e-09*** (5.19e-10)
Unified Democracy Score	-0.0787 (0.493)	0.760 (0.708)	-0.859* (0.496)	-0.123 (0.497)	0.683 (0.711)	-0.882* (0.487)	-0.115 (0.491)	0.729 (0.726)	-0.895* (0.498)
Total Service Provision (logged)	0.0608 (0.0803)	-0.00756 (0.114)	0.485 (0.400)	0.0671 (0.0793)	0.00390 (0.109)	0.505 (0.379)	0.0812 (0.0786)	0.0390 (0.116)	0.513 (0.369)
Resource/GDP	0.0190 (0.0194)	0.0254 (0.0237)	0.00600 (0.0252)	0.0141 (0.0203)	0.0140 (0.0231)	0.00331 (0.0235)	0.0182 (0.0196)	0.0247 (0.0214)	0.00408 (0.0247)
Remittances/GDP	0.0287 (0.0329)	0.0197 (0.0489)	0.0192 (0.0470)	0.0120 (0.0242)	-0.00206 (0.0383)	0.00921 (0.0341)	0.0271 (0.0260)	0.0266 (0.0399)	0.00977 (0.0370)
Mil Exp/GDP	0.340*** (0.0937)	0.411*** (0.130)	0.294*** (0.105)	0.312*** (0.0772)	0.358*** (0.0971)	0.283*** (0.0915)	0.319*** (0.0722)	0.379*** (0.0877)	0.276*** (0.0871)
Constant	-2.783*** (0.731)	-2.649*** (0.997)	-6.386* (3.450)	-2.684*** (0.734)	-2.306*** (0.887)	-6.641** (3.259)	-2.633*** (0.708)	-2.477*** (0.862)	-6.569** (3.301)
Observations	235	120	115	235	120	115	235	120	115

*p<0.1; **p<0.05; ***p<0.01
Results estimated by panel fractional logit models
Robust standard errors clustered on group with degree of freedom correction (HC1) reported in parentheses

Table A-4: Predictors of Group Failure

	Failure: Group End		
Leader Decapitation	0.864***		
	(0.281)		
Leader Killed		1.095***	
		(0.353)	
Leader Captured			0.751***
			(0.288)
GDP/Capita	3.15e-05***	2.15e-05	3.43e-05**
	(1.19e-05)	(1.79e-05)	(1.56e-05)
Population	2.95e-10	-3.55e-10	6.61e-10
	(3.19e-10)	(3.67e-10)	(4.04e-10)
Unified Democracy Score	-0.376	-0.116	-0.519
	(0.288)	(0.385)	(0.353)
Resources/GDP	0.0106	0.0175	0.0216*
	(0.00946)	(0.0138)	(0.0116)
Remittances/GDP	0.0121	0.0117	0.0103
	(0.0236)	(0.0274)	(0.0730)
Mil Exp/GDP	-0.139***	-0.168**	-0.183**
	(0.0515)	(0.0762)	(0.0769)
Observations	687	477	520

*p<0.1; **p<0.05; ***p<0.01
Results estimated by cox proportional hazard models
Robust standard errors clustered on group with degree of freedom correction (HC1) reported in parentheses

Table A-5: Predictors of Group Failure

	Failure: Group End		
	(No Decapitation)	(Leader Killed)	(Leader Captured)
Total Service Provision (logged)	-0.0203	-0.189***	0.0630
	(0.0760)	(0.0527)	(0.110)
GDP/Capita	1.87e-05	3.89e-05	2.57e-05
	(2.50e-05)	(2.70e-05)	(2.25e-05)
Population	-3.41e-09	-4.72e-10	7.31e-10
	(2.18e-09)	(5.64e-10)	(7.12e-10)
Unified Democracy Score	-0.798	0.0176	-0.365
	(0.595)	(0.610)	(0.549)
Resources/GDP	0.0541	0.0156	0.0233
	(0.0441)	(0.0206)	(0.0171)
Remittances/GDP	0.0673	0.0307	-0.0310
	(0.146)	(0.0336)	(0.0821)
Mil Exp/GDP	-0.298***	-0.115	-0.0843
	(0.115)	(0.104)	(0.0794)
Observations	310	167	210

*p<0.1; **p<0.05; ***p<0.01
Results estimated by cox proportional hazard models
Robust standard errors clustered on group with degree of freedom correction (HC1) reported in parentheses

Table A-6: Predictors of Attack Success

	Dependent Variable:	
	% Attacks that are Successful/Year	
Leader Killed	0.821***	-1.207
	(0.317)	(1.266)
Total Service Provision (logged)		-0.145
		(0.104)
Killed * Provision (logged)		0.271*
		(0.157)
GDP/Capita	-6.04e-06	-2.74e-06
	(2.54e-05)	(2.81e-05)
Population	8.23e-10	1.08e-09
	(9.85e-10)	(9.86e-10)
Unified Democracy Score	-0.953**	-1.100***
	(0.451)	(0.415)
Resources/GDP	-0.0263	-0.0286
	(0.0216)	(0.0212)
Remittances/GDP	0.0122	0.00196
	(0.0421)	(0.0438)
Mil Exp/GDP	-0.00724	-0.00379
	(0.0689)	(0.0672)
Constant	2.938***	4.078***
	(0.532)	(1.035)
Observations	236	236

*p<0.1; **p<0.05; ***p<0.01
Results estimated by fractional logit models
Robust standard errors clustered on group with degree of freedom correction (HC1) reported in parentheses

Table A-7: Predictors of Attack Success

	Dependent Variable: % Attacks that are Successful/Year	
	(a)	(b)
Leader Captured	0.151 (0.232)	-0.381 (1.104)
Total Service Provision (logged)		-0.124 (0.104)
Killed * Provision (logged)		0.0782 (0.137)
GDP/Capita	-2.64e-05 (1.82e-05)	-2.75e-05 (1.98e-05)
Population	1.25e-10 (5.13e-10)	2.60e-10 (5.08e-10)
Unified Democracy Score	-0.530 (0.369)	-0.564 (0.385)
Resources/GDP	-0.0184 (0.0187)	-0.0186 (0.0192)
Remittances/GDP	0.0277 (0.0559)	0.0181 (0.0583)
Mil Exp/GDP	0.00218 (0.0561)	0.00628 (0.0570)
Constant	2.764*** (0.400)	3.695*** (0.965)
Observations	297	297

*p<0.1; **p<0.05; ***p<0.01
Results estimated by fractional logit models
Robust standard errors clustered on group with degree of freedom correction (HC1) reported in parentheses

Table A-8: Predictors of Attack Success

	Dependent Variable: *% Attacks that are Successful/Year*	
	(a)	(b)
Leader Captured (vs Killed)	-0.695***	0.849
	(0.222)	(0.985)
Total Service Provision (logged)		0.124
		(0.103)
Captured * Provision (logged)		-0.200
		(0.125)
GDP/Capita	-4.33e-05**	-4.60e-05**
	(1.93e-05)	(2.13e-05)
Population	1.60e-10	2.16e-10
	(4.62e-10)	(4.71e-10)
Unified Democracy Score	0.382	0.429
	(0.401)	(0.432)
Resources/GDP	0.0329*	0.0355**
	(0.0175)	(0.0174)
Remittances/GDP	0.0284	0.0226
	(0.0289)	(0.0295)
Mil Exp/GDP	0.0292	0.0376
	(0.0349)	(0.0335)
Constant	3.425***	1.744**
	(0.558)	(0.879)
Observations	252	252

*p<0.1; **p<0.05; ***p<0.01
Results estimated by fractional logit models
Robust standard errors clustered on group with degree of freedom correction (HC1) reported in parentheses

Figure A-1: Institutionalization and Surviving Leadership Decapitation Replication

(a)

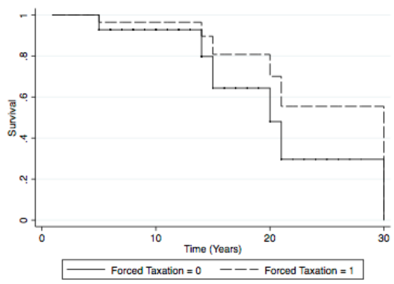
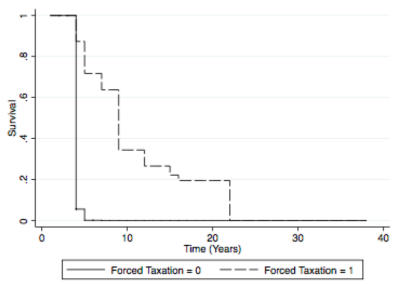
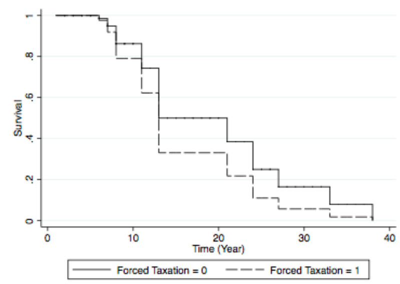


Figure 5a displays the survival rate of groups that have never suffered leadership decapitation. Figure 5b displays the same for those that have had their leader killed sometime in the past. Figure 5c displays the same for that that have had their leader captured in the past. All figures estimated with Cox Proportional Hazard models.

(b)



(c)



Due to listwise deletion and issues with standard error calculation, the replication Figure A-1a was estimated without control variables. Even so, the figure replicates the null finding in Figure 5a. Regression results reported in Table A-8.

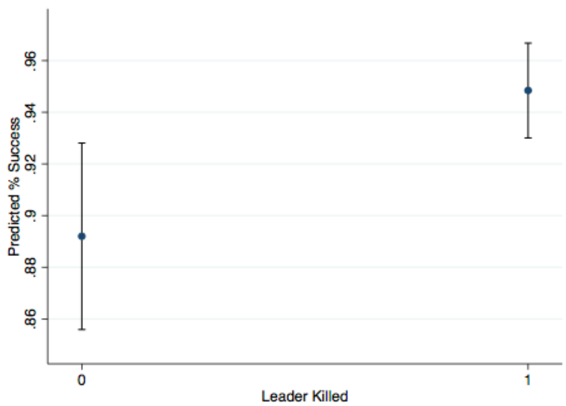
Table A-9: Predictors of Group Failure

	Failure: Group End		
	(No Decapitation)	(Leader Killed)	(Leader Captured)
Forced Taxation	-0.723	-3.063**	0.467
	(0.726)	(1.196)	(0.919)
GDP/Capita		4.78e-05	0.000
		(0.000)	(0.000)
Population		-3.17e-09*	1.41e-09
		(1.89e-09)	(1.43e-09)
Unified Democracy Score		1.689	-1.404
		(1.673)	(1.878)
Resources/GDP		0.0350	0.0465**
		(0.044)	(0.022)
Remittances/GDP		-0.0416	0.077
		(0.153)	(0.129)
Military Exp/GDP		-0.406**	0.119
		(0.182)	(0.192)
Observations	274	68	139

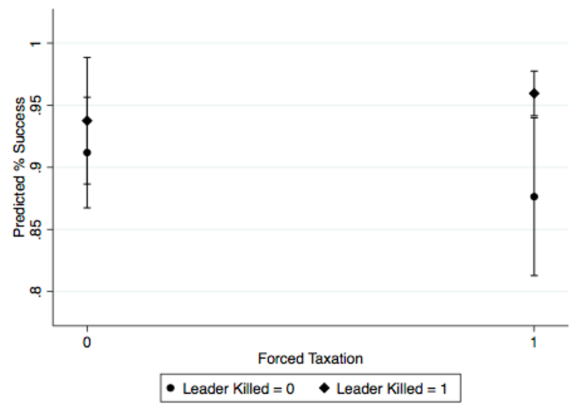
*** p<0.01, ** p<0.05, * p<0.1
Results estimated by cox proportional hazard models
Robust standard errors in parentheses with degree of freedom correction (HC1) reported in parentheses

Figure A-2: Institutionalization and Success Rate Replication

(a) Kill



(b) Kill



Regression results reported in Table A-9.

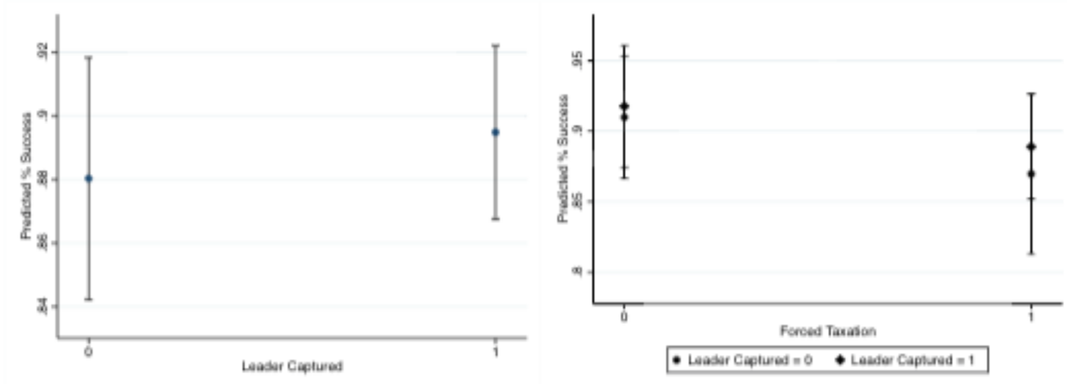
Table A-10: Predictors of Attack Success

	Dependent Variable: % Attacks that are Successful/Year	
	(a)	(b)
Leader Killed	0.781**	0.544
	(0.319)	(0.493)
Forced Taxation		0.0304
		(0.556)
Killed * Forced Taxation		0.374
		(0.678)
GDP/Capita	8.81e-07	1.39e-06
	(2.64e-05)	(3.67e-05)
Population	1.10e-09	8.54e-10
	(1.07e-09)	(1.09e-09)
Unified Democracy Score	-0.750	-0.903**
	(0.466)	(0.440)
Resources/GDP	-0.0136	-0.0319
	(0.0247)	(0.0338)
Remittances/GDP	0.0498	0.124
	(0.0675)	(0.126)
Mil Exp/GDP	0.0164	0.0182
	(0.0786)	(0.0978)
Constant	2.408***	2.545**
	(0.689)	(1.208)
Observations	237	221

*** $p<0.01$, ** $p<0.05$, * $p<0.1$
Results estimated using fractional logit models
Robust standard errors clustered on group with degree of freedom correction (HC1) reported in parentheses

Figure A-3: Institutionalization and Success Rate Replication

(a) Capture (b) Capture



Regression results presented in Table A-11.

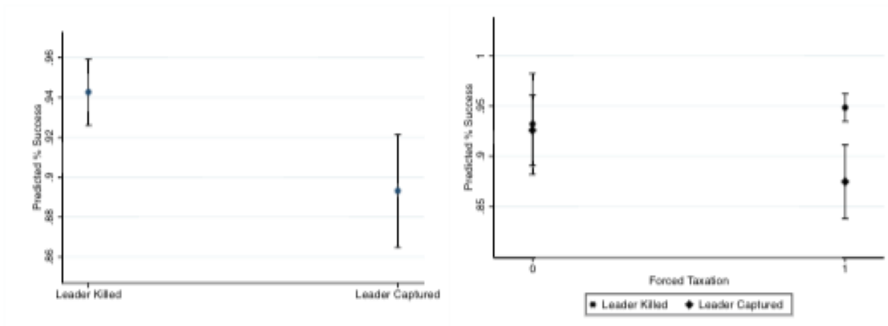
Table A-11: Predictors of Attack Success

	Dependent Variable: % Attacks that are Successful/Year	
	(a)	(b)
Leader Captured	0.193 (0.228)	0.324 (0.381)
Forced Taxation		-0.131 (0.476)
Captured * Forced Taxation		-0.179 (0.522)
GDP/Capita	-2.35e-05 (1.83e-05)	-2.47e-05 (1.90e-05)
Population	2.28e-10 (5.24e-10)	1.92e-10 (5.42e-10)
Unified Democracy Score	-0.404 (0.363)	-0.566* (0.339)
Resources/GDP	-0.0112 (0.0199)	-0.0182 (0.0239)
Remittances/GDP	0.0606 (0.0637)	0.0942 (0.0693)
Mil Exp/GDP	0.0198 (0.0630)	0.00371 (0.0776)
Constant	2.413*** (0.507)	2.760*** (0.808)
Observations	298	294

*** p<0.01, ** p<0.05, * p<0.1
Results estimated using fractional logit models
Robust standard errors clustered on group with degree of freedom correction (HC1) reported in parentheses

Figure A-4: Selection Bias, Institutionalization, and Success Rate Replication

(a) Any Decapitation (b) Any Decapitation



Regression results reported in Table A-12.

Table A-12: Predictors of Attack Success

	Dependent Variable: % Attacks that are Successful/Year	
	(a)	(b)
Leader Captured (vs Killed)	-0.123	-0.0977
	(0.500)	(0.423)
Forced Taxation		0.302
		(0.419)
Captured * Forced Taxation		-0.911**
		(0.438)
GDP/Capita	-3.78e-05*	-4.45e-05**
	(1.96e-05)	(1.91e-05)
Population	3.84e-10	2.17e-10
	(5.94e-10)	(3.99e-10)
Unified Democracy Score	0.506	0.214
	(0.400)	(0.402)
Resources/GDP	0.0539*	0.0262
	(0.0278)	(0.0195)
Remittances/GDP	0.0708	0.0502
	(0.0457)	(0.0454)
Mil Exp/GDP	0.0805	-0.0152
	(0.0668)	(0.0501)
Constant	1.854	2.906***
	(1.341)	(0.689)
Observations	253	235

*** $p<0.01$, ** $p<0.05$, * $p<0.1$
Results estimated using fractional logit models
Robust standard errors clustered on group with degree of freedom correction (HC1) reported in parentheses

Table A-13: Descriptive Statistics

Variable	N	Mean	St. Dev.	Min	Max
Duration	3,273	12.66	9.72	0.00	41.00
% Success	860	0.92	0.19	0.00	1.00
Attacks/Year	860	19.60	47.93	1.00	509.00
Fatalities/Attack	855	1.90	8.17	0.00	129.50
% Claimed	480	0.37	0.40	0.00	1.00
Ever Captured	3,273	0.17	0.38	0.00	1.00
Ever Killed	3,273	0.16	0.37	0.00	1.00
Log(Service Provision)	3,273	7.62	2.29	0.69	10.37
GDP/Capita	2,970	8,379.12	11,372.53	65.47	61,313.58
Unified Democracy Score	3,235	0.39	0.88	− 2.04	2.00
Natural Resource Revenue/GDP (%)	2,926	6.13	12.07	0.00	92.02
Remittances Received/GDP (%)	2,486	2.43	4.13	0.00	26.68
Military Expenditures/GDP (%)	2,153	3.47	3.23	0.00	39.61

Table A-14: Robustness check on selection problem

	Failure: Group End
Johnston Decapitation	35.20***
	(0.953)
Observations	40

*p<0.1; **p<0.05; ***p<0.01
Results estimated by cox proportional hazard models
Robust standard errors clustered on group with degree of freedom correction (HC1) reported in parentheses

These results utilize Johnston's (2012) data on leadership decapitation, which restricts the sample to only those group-years during which an *attempt* or success was made to kill or capture a group's leader. This limits the sample to only 40 after the merge. The independent variable is Johnston's (2012) indicator of successful leadership decapitation. The results show that successful decapitation accelerates a groups demise, even in such a limited sample.