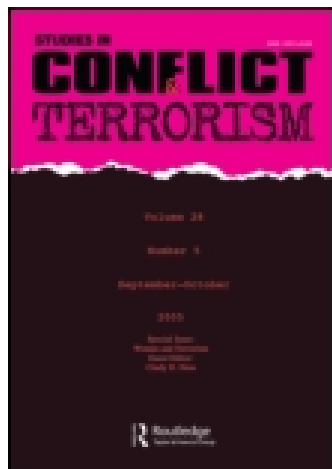


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Assessing the Abu Sayyaf Group's Strategic and Learning Capacities

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Research Note

Assessing the Abu Sayyaf Group's Strategic and Learning Capacities

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It remains unclear whether the Abu Sayyaf Group (ASG) is a well-structured terror organization that poses a strategic threat, or a loosely organized collection of bandits that poses limited risk. Efforts to assess the nature of the organization are complicated by flaws in existing datasets on Violent Non-State Actors (VNSAs). ASG's role in kidnappings serves as a test-case to estimate incongruities among four major datasets on VNSAs. Original data collected at the agent level provides an additional point of comparison and also serves to test the efficacy of ASG's knowledge-dissemination structures, which are key in determining VNSAs' strategic capacities.

Tell me and I forget, teach me and I may remember, involve me and I learn.¹

—Benjamin Franklin

Scholars debate the danger posed by the Abu Sayyaf Group (ASG), a Violent Non-State Actor (VNSA)² operating primarily in the Southern Philippines. Some analysts argue that ASG is a reasonably well-defined component of the *Salafist* extremist movement and constitutes a strategic threat in Southeast Asia.³ Others contend that the group is a loose confederation of bandits with no strategic aims beyond maintaining a climate of lawlessness in the Southern Philippines.⁴ The consequences of this disagreement range beyond the obvious theoretical implications and affect counterterrorism policy, since different approaches

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are appropriate to combat a strategically oriented organization versus a haphazard collection of outlaws. Because qualitative studies have dominated research on ASG, subsequent inquiries need to include quantitative methods, which can offer additional evidence to support one of the two mutually exclusive theories about the nature of the Filipino VNSA.

Unfortunately, shortcomings in widely used databases on VNSAs undermine the potential of most quantitative approaches. This article conducts a formal estimation of ASG's involvement in organized violence in order to probe the extent of discord among four prominent open-source databases on VNSAs: (1) the Worldwide Incident Tracking System (WITS), formerly maintained by the U.S. National Counterterrorism Center; (2) the Global Terrorism Database (GTD), maintained by the National Consortium for the Study of Terrorism and Responses to Terrorism; (3) the Armed Conflict Database (ACD), maintained by the International Institute for Strategic Studies; and (4) data maintained by the Jane's Terrorism and Insurgency Center (JTIC). The coverage offered by these "big four" databases is so divergent that it is difficult to believe they attempted to characterize the same phenomenon.

Since the deficiencies inherent to existing databases preclude typical quantitative studies of ASG, this article also explores an alternative method, which uses original data and network science to assess aspects of ASG's strategic capabilities. More specifically, network simulations of agent-level data serve to measure the extent to which ASG's observed pattern of disseminating hands-on operational knowledge differs from random. Evidence obtained from this experiment suggests that ASG does a poor job of training members in important skills and abilities—a finding congruent with the conclusion that ASG is a loosely structured bandit group.

Six sections follow this introduction. The first section provides background on ASG. The second section discusses discord among the big four databases and estimates the extent of their divergence, before outlining this study's approach to data collection. The third section turns toward theory and contextualizes this study's attempt to test ASG's knowledge-dissemination capacity within the broader literature on organizational learning among VNSAs. Methodology is the subject of the fourth section, which describes this study's approach to measurement and testing. The fifth section presents results, before the sixth section offers conclusions.

Background

When recounted in brief, ASG's history suggests the group has the characteristics of a formal Islamist terror organization. ASG was founded circa 1991 by Aburajak Janjalani,⁵ a native of the Southern Philippines, shortly after he returned home from the Soviet–Afghan War. He named the group in honor of his mentor, Abdul Rasool Sayyaf, a legendary Afghan *mujahideen* who had held operational and financial ties since the 1980s to Osama bin Laden,⁶ Khalid Sheikh Mohammad,⁷ and several other prominent Islamist militants.⁸

ASG began kidnapping hostages soon after its founding. It abducted an American missionary in Sulu in 1993,⁹ as well as five Americans and 11 Filipinos at Trankini Falls, a popular nature spot near Lake Sebu, in 1995.¹⁰ Even after police killed Janjalani in December 1998,¹¹ ASG remained heavily involved in kidnapping. Under the nominal leadership of Janjalani's brother Khadafi, who served as ASG's *emir* until his own death in a firefight in 2006,¹² ASG abducted nearly 60 teachers and school children in Sumisip in 2000; 21 tourists from a dive-resort on the Malaysian island of Sipadan later that year;¹³ and another 20 tourists, including three Americans, from the Dos Palmas Beach Resort on Palawan in 2001.¹⁴

Throughout its history, ASG has also conducted myriad lower-profile kidnappings for ransom. Primary victims were Filipino businessmen,¹⁵ news reporters,¹⁶ and Christian clergy members.¹⁷ Indeed, small-scale kidnappings became standard practice for ASG in the post-Janjalani era, during most of which the group lacked a titular *emir*.¹⁸

Beyond kidnapping, observers claim ASG conducted several high-profile plots and attacks. Circa 1995, the group assisted Ramzi Yousef, the lead operative in the first World Trade Center bombing, and his uncle, Khalid Sheikh Mohammad, in the failed Bojinka Project, which sought to use timed explosive devices to down a dozen American-flagged jetliners flying trans-Pacific routes.¹⁹ In 2000, ASG worked in concert with Jemaah Islamiyah (JI), the Southeast Asian terror group best remembered for bombing Bali in 2002, and the Moro Islamic Liberation Front (MILF), an Islamist insurgent group fighting for an independent Muslim state in the Southern Philippines,²⁰ to bomb several targets in Metro Manila on a national holiday commemorating the Philippines' struggle for independence from Spain.²¹ Two years later, ASG members killed 12 and wounded approximately 200 more by bombing shopping centers, department stores, and restaurants in Zamboanga City, on the island of Mindanao.²²

ASG's best-known bombing took place in 2004, when it and the Raja Solamain Movement (RSM), an extremist group comprised of Christian-born converts to Islam, attacked SuperFerry 14.²³ The vessel sank near Corregidor Island and killed 116 passengers, causing one Filipino academic to label the event as the deadliest incident of maritime terrorism on record.²⁴ RSM and ASG collaborated again the following year and killed six by bombing a passenger bus in Metro Manila on Valentine's Day.²⁵ And in 2009, ASG conducted an assassination-bombing that failed to kill its intended target, the governor of Sulu Province, but succeeded in wounding several security personnel and civilians.²⁶ Thus, a simple listing of prominent terror incidents attributed to ASG suggests that the organization has a long-standing agenda of violence against both the Philippine state and interests tied to Western capitalism.

However, definitional issues are among several factors that cast doubt on the organization's involvement in many attacks. The boundaries of VNSAs are poorly understood, even within the expert community. Consider Al Qaeda. As Kenney notes, scholars use this term to describe three distinct collections of violent Islamists: (1) the core group of followers surrounding prominent leaders like Osama bin Laden and Ayman al-Zawahiri; (2) the collection of organizations that claim ill-defined alliances with this core group; and (3) *all* adherents of violent Islamism, regardless of their organizational affiliation or degree of involvement with bin Laden and al-Zawahiri's immediate supporters. Simply put, "Al Qaeda" means very different things to different scholars.²⁷

Because there is no consensus regarding the boundaries of the world's most notorious terror group, it is unsurprising that ambiguities surround the definition of a regional VNSA like ASG. This uncertainty likely causes analysts to exaggerate ASG's interactions with JI, MILF, and RSM. Inter-organizational partnerships characterize some attacks, but analysts may commit organizational-attribution errors because the lack of clear conceptual definitions makes it impossible to know where ASG ends and another VNSA begins.

The Philippines-based Jillang Gang illustrates this challenge. When the gang kidnapped a Catholic priest in 1992, analysts typically labeled it a break-away faction or "lost command" of the Moro National Liberation Front (MNLF), the Mindanao-based insurgent group that spawned MILF. However, Ugarte argues that the Jillang Gang "did not seem 'lost' at all,"²⁸ and maintained close contact with MNLF's central leadership. Yet the gang also liaised closely with ASG. One former hostage recalled that ASG once supplied the gang with food and also maintained a camp in the same field that housed the gang's makeshift

detention facility. Ties between the “organizations” were so close that Ugarte concluded the gang “may have effectively merged with the Abu Sayyaf.”²⁹ Thus, the Jillang Gang existed in organizational limbo and moved fluidly between MNLF and ASG, demonstrating that VNSAs may sometimes receive credit for attacks that transient members conduct while operating independently or while taking direction from other organizations.

Language may also obfuscate ASG’s involvement in events. Ugarte and Turner’s description of the aftermath of the 2000 Sipidan kidnapping demonstrates that Abu Sayyaf was not a cohesive “group,” even during the Janjalani era. As ASG began receiving ransoms for the release of the Sipidan hostages, end-fighting crippled the organization. Competing constituencies squabbled because each felt entitled to a “fair” share of the payments. Disagreements were so profound that one disaffected ASG sub-group ambushed “Commander Robot,” the leader of the ASG faction that held the Sipidan hostages, in an attempt to rob him of ransom monies.³⁰

Ugarte and Turner document additional evidence of organizational dysfunction among ASG kidnappers. For example, different self-proclaimed ASG leaders have made mutually exclusive demands for the release of other hostages. Leaders must also typically conduct ransom negotiations without the knowledge of other ASG factions, for fear that a competing sub-group will use knowledge of the hostage-exchange in order to re-capture the detainees and extort a second ransom. When different portions of ASG’s loose membership interact with one another, they are as likely to compete as to cooperate. The term “Abu Sayyaf Group,” is likely a label of convenience, not an accurate descriptor of a well-formed organization.³¹

Given that much of the evidence questioning the extent of ASG’s involvement in events stems from kidnapping, efforts to extend this argument to bombings require a brief discussion of the environmental characteristics necessary to conduct bombings absent meaningful organizational support. In his 2000 analysis of Palestinian suicide attacks, Ehud Sprinzak concluded that terrorist bombings are impossible without a “long organizational chain,” which includes separate steps for target selection, surveillance, recruitment, spiritual training, explosives preparation, and execution.³² However, this model begins to break down when explosives are exceptionally plentiful. Logistical issues obviously become far easier, but target selection and surveillance also become less onerous, because explosives are no longer scarce resources that carry high opportunity costs if used sub-optimally. Similarly, when explosives are widely available, a larger share of the population is likely to come into regular contact with them and obtain the knowledge necessary to transform raw materials into a finished device, thereby making aspects of recruitment and bomb preparation easier. The question becomes: What sort of environment exists in the Philippines?

Unfortunately, the island nation presents near-ideal conditions for bombmaking. According to the Small Arms Survey’s 2010 assessment, the Southern Philippines are awash with weapons of all varieties,³³ and published reports claim that an estimated 10,000 incidents of dynamite fishing occur in the island nation each day.³⁴ Thus, explosives are widely available for purchase, which, according to one U.S. government analyst, has caused the Southern Philippines to amass “a lot of cultural knowledge about explosives.”³⁵ Aspiring Filipino bombers do not require the same level of organizational support as terrorists operating elsewhere; some bombings that have been attributed to ASG are likely the work of small, resource-poor organizations or independent actors.

Because the existing evidence provides ample grounds to question the extent and nature of ASG’s involvement in several incidents typically attributed to the group, skepticism regarding the threat posed by the Filipino VNSA is also valid. However, demonstrating the limits of existing theories of ASG is not synonymous with providing the sort of systematic

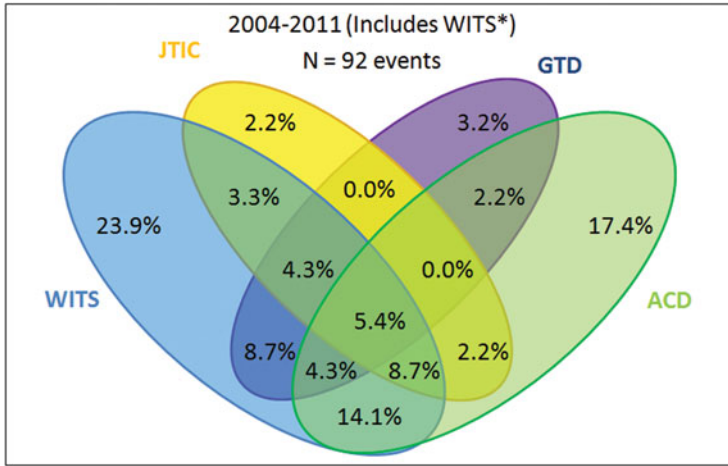


Figure 1. Venn diagram showing overlap among four prominent datasets' conception of ASG involvement in kidnappings, 2004–2011. (Color figure available online).

evaluation necessary to conclude that ASG operates as a loosely structured bandit group. Because any effort to provide such comprehensive coverage using qualitative tools would yield an organizational history running thousands of pages, efforts to study the whole of ASG, or any other VNSA, are best accomplished using quantitative methods. Unfortunately, as the following section discusses in detail, such research is impossible to conduct using currently available public datasets on extremism.

Data: From Organizational Characterizations to Agent-Based Models

The big four's characterization of ASG's involvement in the tactic most prominently attributed to the group, namely kidnapping, serves as a test-case to estimate the scale of data ambiguities among datasets commonly used to assess VNSAs at the organizational level. It would be unrealistic to expect these databases to align perfectly, since separate code-books underlie each collection effort, but even allowing for variance in procedure, the big four contain surprisingly little agreement. Each database clearly has a distinct operational definition of ASG.³⁶

Consider the period between 2004, when the NCTC first began compiling events for inclusion in WITS, and the end of 2011. Less than 6 percent of the kidnappings the big four collectively attributed to ASG were unanimously listed as "ASG events." Any three of the databases agreed regarding ASG's culpability for only an additional 17.4 percent of the abductions found during this seven year period. WITS and ACD shared the closest conception of ASG's role in kidnapping between 2004 and 2011, and agreed that ASG perpetrated 32.5 percent of the kidnappings collectively listed by the big four. As the Venn diagram in Figure 1 summarizes, discord among the datasets was the norm; nearly 47 percent of the events in the sample were attributed to ASG by only a single dataset.

The period preceding WITS's collection efforts provided similar results. Between ASG's founding in 1991 and 2003, the remaining three databases unanimously labeled only about 18 percent of the collective kidnappings as "ASG events." JTIC and GTD agreed that an additional 2.2 percent of events were attributable to the Filipino VNSA, but ACD displayed no other overlaps. According to the Venn diagram displayed in Figure 2, an

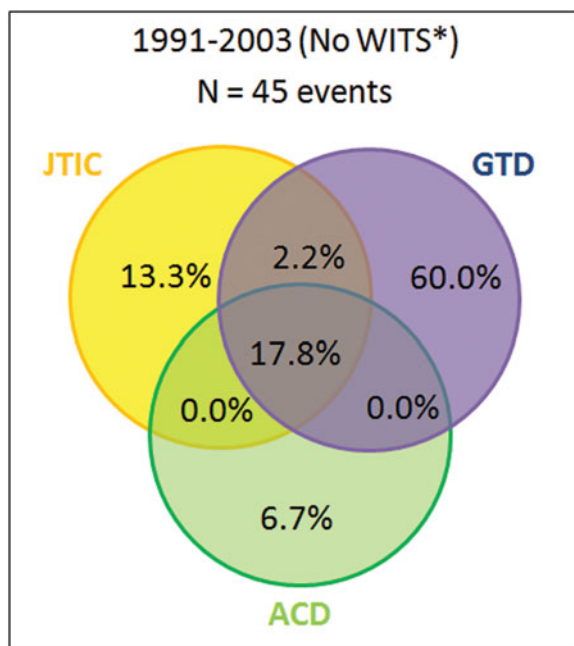


Figure 2. Venn diagram showing overlap among three prominent datasets' conception of ASG involvement in kidnappings, 1991–2003. (Color figure available online).

astounding 80 percent of the kidnappings these datasets attributed to ASG between 1991 and 2003 were designated as “ASG events” by any single dataset, with GTD making the largest contribution by far.

Although they each paint a unique picture of ASG, the big four share a common failing: they ignore VNSAs' internal dynamics. Because they provide little, if any, information on the individuals involved in events,³⁷ the big four cannot be used to assess members' history of participation in events, leadership changes within an organization, or any other structural adaptations within VNSAs. Therefore, efforts to study organizational dynamics require original data collection at the agent level.

This analysis includes one such collection effort. It extends the previous evaluation of ASG's involvement in kidnappings and covers the period from the organization's 1991 founding through 2011. This data offers an in-depth longitudinal characterization of ASG's most prominent tactic and, thereby, provides a first step toward the sort of comprehensive evaluations necessary to accurately determine VNSAs' membership, internal dynamics, and role in organized violence.

The characterizations offered by WITS, GTD, JTIC, and ACD served as the starting point to collect agent-level data. This study's efforts focused on the 137 abductions these datasets collectively attributed to ASG. The details of each attack—its location, its date of occurrence, the names of any known perpetrators—served as search terms in Academic Lexis-Nexis, yielding a reasonably comprehensive sample of journalistic coverage on each event. As outlined below, the research team hand-coded these search-returns to produce a longitudinal agent-level network depicting ASG's role in kidnappings.

The most important component of the original data was the agent x event matrix, which provides a tabular listing of the individuals who participated in each event, as well as the

location where each interaction occurred. Table 1 provides a brief excerpt characterizing some exploits of Commander Robot, a prolific ASG kidnapper. The full data contains similar listings for 246 individuals.

The research team paired this agent \times event data with information on individuals' membership in VNSA(s) at the time of each event. Inductive processing determined that individuals involved in the events under study primarily held membership in four named organizations: ASG, MNLF, MILF, and the Pentagon Gang (PG)—a profit-motivated organization that kidnaps hostages for ransom, but lacks an ideological agenda.³⁸ Each of these four organizations was treated as a non-exclusive binary variable, making it possible for individuals to hold membership in more than one organization at a given time. As the excerpt in Table 2 shows, an additional column was added to the data to characterize the small number of individuals who held membership in some other named organization, as well as an "unknown" column that characterized individuals whose organizational membership was impossible to determine from the available evidence.

Coding decisions were made independently each time an individual participated in an event, thereby allowing kidnappers to transition between organizations. Evidence that someone was a member of an organization at one time-point did not imply that someone was a member of the same organization at later time-points. Ultimately, these coding processes allowed individuals in the dataset to hold the sort of fluid (and possibly multiple) organizational memberships suggested by Ugarte's characterization of the Jillang Gang.

However, the research team's efforts to collect information at the individual level were not always successful. Agent-level data was unavailable for 50 of the 137 kidnappings the big four attributed to ASG. The data contained an additional 29 events linked only to individuals who lacked clear organizational affiliations, making it impossible to tie these events to any specific VNSA. Without evidence definitively linking members of ASG to these combined 79 events, it remains unclear what factors led the authors of the big four to determine that ASG perpetrated these abductions, rather than one of the Philippines' myriad other kidnapping organizations.

Similarly, there were several events which the big four attributed to ASG, but which the research team's subjective determinations suggested other organizations perpetrated. MILF appears to have conducted 31 of the events that the big four attributed to ASG, and MNLF appears to have conducted two additional such abductions. Thus, false positives greatly problematize existing datasets' characterizations of ASG's role in organized violence.

False negatives are also problematic. Because media articles on current events often discuss the perpetrators' participation in past events, the research team's review uncovered 15 kidnappings that ASG appears to have perpetrated, but which the big four omitted from their characterizations of the organization's involvement in kidnapping. Unfortunately, ambiguities inherent to open-source reporting make it impossible to determine whether or not ASG perpetrated any additional kidnappings beyond this handful of false negatives, so it is impossible to comment definitively on the number of events standard data collection efforts exclude.

With the caveats implied by such uncertainty, this study's agent-level collection strategy also facilitated the quantification of hitherto undocumented sources of data ambiguity with the potential to change organizational-level assessments of VNSAs. Figure 3 presents Venn diagrams summarizing the research team's findings regarding observed error rates in the big four's conceptions of ASG's role in kidnapping. The gray regions describe false negatives (events which the agent-level collection attributed to ASG, but which the big four excluded from consideration). The darkly colored regions of overlap describe consensus between the agent-level data and existing datasets, and the brightly colored regions describe

Table 1
Agent x event data on Commander Robot's participation in kidnappings

Agent_ID	Agent_Name	Event_ID	Event_Name	Location_ID	Location_Name	Event_Date
AG05002	CDR ROBOT	EVT02265	1993 KIDNAPPING OF NUNS JULIA FORESTER AND FATIMA URIBAREN	LOC00888	PATIKUL SULU PHILIPPINES	19930117
AG05002	CDR ROBOT	EVT02266	1994 KIDNAPPING OF FR. CLARENCE BERTELSMAN	LOC01149	JOLO ISLAND SULU PHILIPPINES	19940731
AG05002	CDR ROBOT	EVT01963	1994 KIDNAPPING OF LAND SURVEYORS IN THE PHILIPPINES	LOC00969	SUMISIP BASILAN PHILIPPINES	19941118
AG05002	CDR ROBOT	EVT03005	1995 ZAMBOANGA ZIZMORD COSMETIC FIRM, 4 SALES REPS KIDNAPPED	LOC00352	ZAMBOANGA PENINSULA PHILIPPINES	19950225
AG05002	CDR ROBOT	EVT03010	1998 THREE FOREIGNERS KIDNAPPED	LOC01106	SITANGKAI TAWI-TAWI PHILIPPINES	19980908
AG05002	CDR ROBOT	EVT00696	2000 SIDIPAN KIDNAPPING OF 20 ASIAN AND EUROPEAN HOSTAGES	LOC00957	SIPADAN ISLAND SABAH MALAYSIA	20000423
AG05002	CDR ROBOT	EVT01980	2000 KIDNAPPING OF WILDE ALMEDA AND FOLLOWERS (JESUS MIRACLE CRUSADE)	LOC01149	JOLO ISLAND SULU PHILIPPINES	20000701
AG05002	CDR ROBOT	EVT01981	2000 KIDNAPPING OF FRENCH TV CREW	LOC00345	JOLO CITY SULU PHILIPPINES	20000709
AG05002	CDR ROBOT	EVT03022	2000 SEPARATISTS ABDUCT THREE PEOPLE IN MALAYSIA	LOC00895	PANADAN ISLAND MALAYSIA	20000911

Table 2
Agent x organization data on a handful of Filipino kidnappers

Agent_ID	Agent_Name	Event_ID	Event_Name	Event_Date	ASG	MILF	MNLF	PG	OTHER	UNKNOWN
AG05004	JULHUNIR JILANG	EVT03142	1992 KIDNAPPING OF FR GERALD FRASZCZACK	19920815	1	0	0	0	0	0
AG05004	JULHUNIR JILANG	EVT03141	1992 DR BARANDINO AND FAMILY KIDNAPPED	19921129	0	0	1	0	0	0
AG05004	JULHUNIR JILANG	EVT03138	1993 KIDNAPPING OF FR. BERNARDO BLANCO	19930608	1	0	0	0	0	0
AG05004	JULHUNIR JILANG	EVT02267	1994 KIDNAPPING OF FR. CIRILO NACORDA AND FIFTEEN CHRISTIANS	19940608	1	0	0	0	0	0
AG05122	USMAN LIDJAL	EVT03012	1999 TWO BELGIANS KIDNAPPED	19990613	0	1	0	0	0	0
AG05122	USMAN LIDJAL	EVT03024	2001 FOUR GUNMEN KIDNAP 6 YEAR OLD APRIL GRANT	20010110	0	1	0	0	0	0

(Continued on next page)

Table 2
Agent x organization data on a handful of Filipino kidnappers (*Continued*)

Agent_ID	Agent_Name	Event_ID	Event_Name	Event_Date	ASG	MILF	MNLF	PG	OTHER	UNKNOWN
AG05122	USMAN LIDJAL	EVT03121	2007 ITALIAN PRIEST CARLO BOSSI (GIANCARLO BOSSI) KIDNAPPED	20070610	0	1	0	0	0	0
AG05122	USMAN LIDJAL	EVT03056	2008 FEMALE NURSE KIDNAPPED	20080707	0	0	0	0	1	0
AG05122	USMAN LIDJAL	EVT03061	2008 FIVE HUMANITARIAN WORKERS KIDNAPPED	20080915	0	0	0	0	1	0
AG05122	USMAN LIDJAL	EVT03070	2009 3 TEACHERS KIDNAPPED FROM A BOAT BY SUSPECTED ASG NEAR ZAMBOANGA	20090123	1	0	0	0	1	0
AG05122	USMAN LIDJAL	EVT03073	2009 NGO WORKER KIDNAPPED BY SUSPECTED ASG IN LAMITAN	20090213	1	1	0	0	0	0

AG05122	USMAN LIDJAL	EVT03074	2009 LENT KIDNAPPING OF EIGHT HOSTAGES IN ARCO VILLAGE	20090410	0	1	0	0	0	0	0
AG05122	USMAN LIDJAL	EVT03075	2009 FARM OWNER KIDNAPPED BY SUSPECTED ASG IN ZAMBOANGA	20090425	1	0	0	0	0	1	0
AG05243	ABUGAO BAYALI	EVT03076	2009 MICROFI- NANCIER LEAH LAPING-PATRIS KIDNAPPED	20090203	0	0	0	0	0	1	0
AG05243	ABUGAO BAYALI	EVT03073	2009 NGO WORKER KIDNAPPED BY SUSPECTED ASG IN LAMITAN	20090213	1	0	0	0	0	1	0

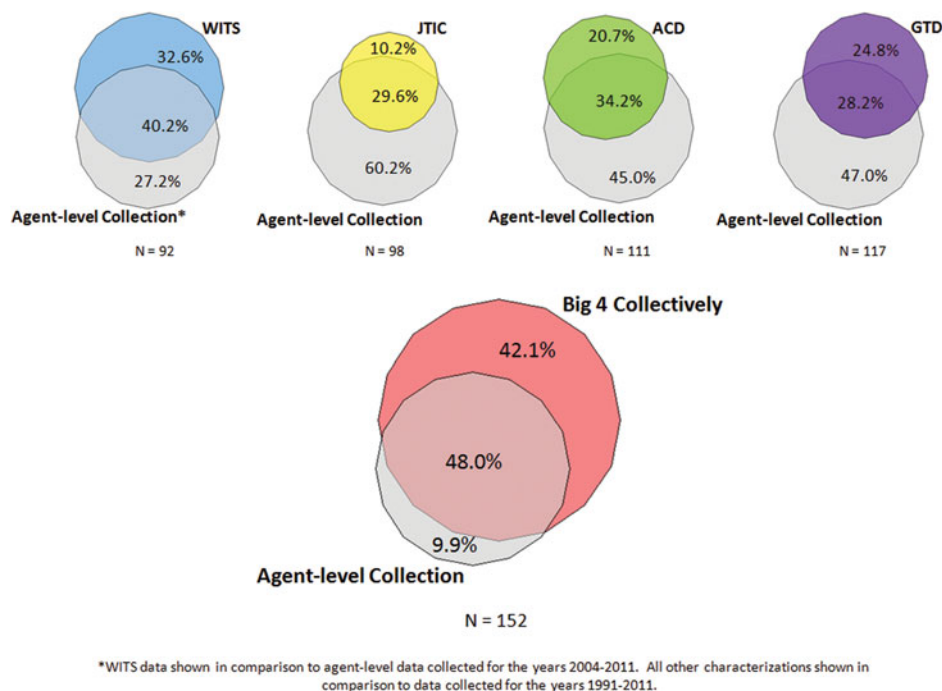


Figure 3. Contesting existing databases' characterization of ASG's involvement in kidnappings.³⁹ (Color figure available online).

false positives (events which the agent-level collection could not tie to ASG, but which the big four attributed to the Filipino VNSA). When viewed collectively, these diagrams demonstrate that there are ample grounds to question the construct validity of analyses that rely on event-data collected on VNSAs at the organizational level.

In addition to facilitating a more precise classification of organizations' involvement in events, this study's data collection strategy also yielded information on agents' attributes, which enabled the exploration of ASG's internal dynamics. The research team obtained this data by making a second pass through the same Lexis-Nexis returns used to build the agent \times event and agent \times organization data and recording information characterizing the agents and the events included in the analysis, rather than the links among agents, kidnappings, and VNSAs. In addition to standard attributes, such as agents' nationality and date of birth,⁴⁰ the research team also collected information on individuals' dates of capture and dates of death (as applicable), as well as data on the number and ultimate fate of the victims of each kidnapping.

The end result of the agent-level collection process was an attributed, three-mode dynamic network containing 246 agents, 3 organizations, and 102 kidnappings (the 137 events listed by the big four, less 50 events for which agent-level data was unavailable, plus 15 false negatives discovered during data collection). Although the attribute data allows the network to be viewed over time, Figure 4 offers a "flat" visualization of the data for the sake of expedience. This image consists of a single snap-shot depicting all the events for which agent-level data was available. Circles represent agents and diamonds represent events. Agent \times organization ties have been rendered by coloring nodes.

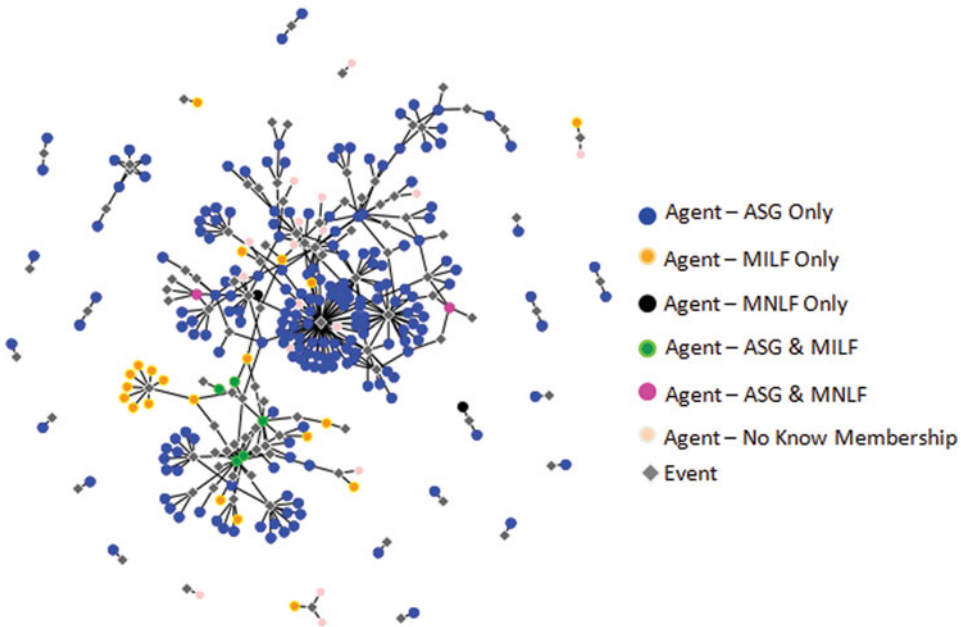


Figure 4. Multi-modal network depicting ASG involvement in kidnapping, 1991–2011.⁴¹ (Color figure available online).

This agent-based data represents a significant improvement over the vague, frequently conflicting accounts of ASG's organizational involvement in kidnapping offered by the big four. However, even the best data is useless if not used to test hypotheses. The next section, therefore, describes the theoretical context necessary to understand this study's efforts to draw inferences about ASG's strategic capacity from original network data.

Organizational Learning in VNSAs

Although a small number of individuals fashion new extremist beliefs in response to perceived social injustices,⁴² most violent radicals learn their creed via interactions with adherents of existing ideologies.⁴³ Nor are criminals, terrorists, and insurgents born with innate knowledge of the skills and tactics necessary to successfully conduct kidnappings and other forms of organized violence. Therefore, understanding how knowledge diffuses among VNSAs is fundamentally important, because even the most lethal weapons remain inert until someone has the training and motivation to use them.

Assuming that organizations operate rationally, VNSAs' knowledge-dissemination patterns also indicate organizations' sophistication and strategic outlook. VNSAs with strategic vision will seek to maximize their long-term capabilities by implementing learning-structures that effectively transmit skills and information from experienced personnel to new members. Conversely, organizations that operate absent clearly defined learning-structures lack a clear plan for the future, the sophistication necessary to implement knowledge-dissemination systems that advance their vision, or both. Smarter VNSAs are simply more dangerous.

But how do VNSAs become intelligent? Scholars have identified three broad pathways VNSAs use to acquire knowledge: learning by watching, learning by formal study, and learning by doing. The following sub-sections discuss the relative advantages of these pathways and demonstrate that although each mechanism merits monitoring, learning by doing requires the closest attention. It provides VNSAs with the hands-on experience necessary to successfully mount violent attacks, which suggest that VNSAs that learn-by-doing pose the greatest strategic threat.

Learning by Watching

Pundits worry that individuals aspiring to violence can self-train by accessing instructional videos and training manuals from the Internet.⁴⁴ Online resources purportedly allow would-be extremists to teach themselves everything from bomb-building, to evasion tactics, to marksmanship with surface-to-air missiles.⁴⁵ Some observers go so far as to claim that extremist web pages collectively comprise a “virtual training camp.”⁴⁶

Despite this anxiety, self-trained extremists have conducted few successful attacks. Nesser’s review of training patterns among *jihadists* in Western Europe is illustrative. He found only one possible case in which violent Islamists operating in this region trained entirely online, and concluded that it is “misleading, or at least premature, to refer to the Internet as a ‘virtual training camp.’”⁴⁷ Kenny offers a partial explanation for this state of affairs. He notes that the reliability of publically available training materials has not been assessed, thereby suggesting that technical inaccuracies in training materials are a likely reason that aspiring extremists find passive observation a difficult means to learn the skills necessary to conduct attacks.⁴⁸

This viewpoint also resonates with counterterrorism practitioners. One analyst working for the American government noted that small gaps in information often undermine tutorials that are otherwise accurate. For example, the authors of bombmaking videos often “assume that everyone watching is starting with the same set of knowledge they (the instructor) have, so they forget to mention ‘I’m using this size hex-wrench to assemble components’ or ‘I set my stove to this temperature when concentrating acid.’”⁴⁹ However, the analyst also allowed that a small handful of individuals may be able to construct explosive devices by following online tutorials, if these people had “a base-level aptitude for practical chemistry and engineering, a lot of patience to experiment, and enough luck to make sure that they don’t blow themselves up when they first get started.”⁵⁰ Thus, the small number of people who are able to successfully self-train must gain experience through experimentation and practice in order to realize their full destructive potential.

This characterization should not be interpreted as an outright dismissal of the dangers inherent to online training resources. These materials remain of concern precisely because they allow a few individuals with the right combination of skills and attributes to become effective attackers without any additional training or advice from established VNSAs. However, the dearth of large-scale attacks conducted by self-trained extremists and the difficulties inherent to learning new skills without active instruction demonstrate that learning by watching is not the most effective means to transmit the knowledge necessary to conduct violence.⁵¹ Ultimately, VNSAs’ attempts to disseminate operational knowledge via the Internet may not be nearly as dangerous as terror groups’ efforts to spread toxic ideologies online.⁵²

Learning by Formal Study

The preceding assessment suggests that VNSAs would do better to transmit operational knowledge by approximating a classroom setting. Indeed, VNSA's often conduct the practical equivalent of literature reviews, by attempting to learn lessons through the formal study of other groups' experiences. Forest turns to the Israeli–Palestine conflict for an example. He describes how Hamas, an organization which previously relied on mortar attacks and suicide-bombings, chose to launch rockets at Israeli targets after studying the example of Hizballah, which in 2006 became the first VNSA to deploy these weapons against the Jewish state.⁵³

Such examples demonstrate that vicarious experience can be transformational, but it remains to be seen how VNSAs learn the skills necessary to implement the tactics they seek to emulate. To revisit Forest's example, how did Hamas learn to assemble, transport, and fire rockets? A direct organization-to-organization transfer of knowledge is one possibility,⁵⁴ but since Hamas and Hizballah sit on opposite sides of the Sunni–Shi'a divide, their ideological differences would complicate, though not necessarily preclude, a cooperative relationship.⁵⁵

Until definitive evidence regarding the nature of the two groups' relationship becomes public, Forest's example will serve to highlight a broader point: VNSAs can rarely learn all of the skills and "trade secrets" necessary to implement unfamiliar modes of attack simply by studying other organizations. To clone unfamiliar tactics, VNSAs must either train under experienced outsiders or must experiment to gain practical knowledge via trial-and-error. Ultimately, there are inherent limitations to the amount of knowledge that VNSAs can acquire by studying peers.

However, VNSAs' efforts toward formal study often take another, more familiar form. For decades, VNSAs have run training camps in nearly every corner of the globe.⁵⁶ Broad generalizations regarding the nature and quality of instruction provided by these camps are inappropriate, because the content and duration of training varies widely by organization and over time. The training Al Qaeda provided to the "muscle hijackers" who perpetrated the 9/11 attacks offers an example from the high end of the spectrum. In 2000, these men received several months of instruction, including specialized classes on knife-fighting and close-quarters combat.⁵⁷ And on the low end of the spectrum, in 2004, several men with loose ties to the infamous Finsbury Park mosque attended rudimentary weekend training sessions in England's Lake District. Trainees marched with sticks and tree branches in lieu of rifles and learned none of the skills necessary to perpetrate organized violence.⁵⁸ Such discrepancies in the quality of instruction dictate that it may be more useful to discuss the merits of camp-based training within the broader context of geopolitical trends.

Given that the Global War on Terrorism (GWOT) has forced many VNSAs to adapt in order to survive,⁵⁹ this campaign is the most relevant geopolitical trend to analyze, and Tønnessen's work provides a superb starting point to discuss relevant theory. In order to demonstrate that VNSAs' training regimens are often constrained when states are committed to countering organized violence, he cites the example of the Provisional Irish Republican Army, which was often unable to conduct live-fire exercises in Northern Ireland for fear of discovery from proximate British forces.⁶⁰ Keating then extends Tønnessen's argument to include the GWOT, by noting that strategic concern over the ungoverned spaces where extremists typically train⁶¹ has triggered a concomitant change in Islamists groups' capacities for organizational learning. Large, permanent camps with firing ranges, artillery depots, and other amenities are now "largely a thing of the past," because VNSAs must "stay on the move to avoid detection by satellites or intelligence agencies."⁶² Consequently,

contemporary camps typically contain only one or two buildings and are almost always temporary.⁶³ Counterterrorism initiatives have at least partially mitigated the efficacy of training camps, suggesting that VNSAs are less able to disseminate practical knowledge via “classroom” settings than they were before 9/11.

Learning by Doing

However, it would be premature to conclude that VNSAs have experienced a collective decline in their ability to disseminate operational knowledge, because myriad contemporary conflicts allow VNSAs to conduct on-the-job training, which provides trainees with practical experience that cannot be gained via other means of instruction. For example, because trainees based in Iraq have been able to participate in live-fire attacks in lieu of classroom instruction, Tønnessen argues that Iraq’s climate of violence has provided the country’s insurgents with “an advantage compared with groups operating in less violent environments.”⁶⁴ Kenney seconds the importance of hands-on experience, concluding that violent Islamists operating in Western Europe have performed poorly on balance because the European Union’s post-9/11 counterterrorism initiatives have created an operating environment so hostile to terrorism that *jihadists* are killed or arrested before they can conduct the multiple attacks necessary to accumulate expertise through direct experience.⁶⁵ Finally, in his broad treatment of organizational learning among VNSAs, Jackson argues that marksmanship, bombmaking, and other skills vital to the organized conduct of violence can only be acquired through “face-to-face communication and hands-on contact” because “it is often too difficult (or even impossible) to codify tacit knowledge.”⁶⁶ Put simply, organizations’ capability for violence is directly proportional to the amount of on-the-job training their members receive.⁶⁷

Because tacit knowledge—the skills and practices that can only be learned through hands-on experience⁶⁸—is an important predictor of VNSAs’ capacity to wage violence, it is vital to measure these organizations’ capacity to disseminate such information. The following section, therefore, turns from theory to methodology and explains how to harness agent-based data to measure the dissemination of tacit knowledge.

Methodology

Building a variable that characterizes the observed dissemination of tacit knowledge is the first step in assessing ASG’s ability to transmit the tacit knowledge necessary to conduct kidnappings. This task begins by sorting the agent \times event data by person and then by date of event. This ordering makes it possible to determine each agent’s earliest known date of involvement in hostage-taking. Adding this start date as an agent-level attribute for all individuals in the data, before populating this information to the original agent \times event data, demonstrates which participant in each event held the longest record of experience in kidnapping. Simple arithmetic then yields the gap, measured in days, between the start-date of the most experienced participant in each event and the start-date of everyone else who played an operational role in the kidnapping. The mean of these individual values constitutes each event’s “mentorship gap.”

The relationship between mentorship gap values and the dissemination of tacit knowledge is demonstrated by considering the likely results of various organizational archetypes. If ASG deliberately structured kidnapping teams in order to disseminate tacit knowledge, the organization would routinely pair experienced personnel with green recruits, causing a consistent pattern of large mentorship gaps. If ASG routinely baptized green recruits by fire

and dispatched them to conduct kidnappings without active guidance from an experienced leader, then a consistent pattern of small, or even non-existent, membership gaps would result. A similar pattern of small, regular mentorship gaps would result if ASG's kidnapping teams were typically comprised of seasoned veterans who had built collective experience by working together repeatedly. If ASG blended these archetypes to create teams containing personnel with diverse experience levels, then middling mentorship gaps would routinely result. Real organizations change over time, so a longitudinal view of ASG's mentorship gap would likely reflect some evolution, and reasonable variation in values is always expected, but ASG could only produce a volatile pattern of wildly fluctuating mentorship gaps by ignoring the transmission of tacit knowledge in favor of some alternate criterion when selecting kidnapping teams from the organization's ranks. In short, any pattern of deliberate structuring to disseminate tacit knowledge would produce mentorship gap values that were stable in the short term, although periodicity might characterize knowledge-sharing patterns over ASG's entire lifetime.

However, the ambiguities inherent to defining ASG complicate efforts to estimate mentorship gaps for ASG kidnappings, because as the big four demonstrate, there is broad disagreement regarding ASG's boundaries. In the interests of obtaining conceptually robust results, this study adopted an iterative research design and assessed ASG in six "takes." The research team independently analyzed ASG's role in kidnappings according to the characterizations offered by each of the big four. The study also included a meta-level assessment, which ostensibly summed the datasets' conceptions by including *all* kidnappings that *any* of the big four labeled as an ASG event. Finally, the research team's subjective, expert-informed model of ASG provided a sixth take. These multiple assessments allowed this study to do an end-run around the false surety that results from trusting any single dataset to correctly define VNSAs' boundaries and roles in violence.

Initial measurements of mentorship gap values suggested little consistency in ASG's approach to the dissemination of tacit knowledge. Observed values were volatile over time and fluctuated wildly across all six characterizations of ASG. Figure 5 shows observed results for each of the takes.⁶⁹

However, visual assessments of graphs offer insufficient evidence to conclude that ASG possesses a random pattern of tacit knowledge dissemination. This study adopted a simulation-based approach to probe the issue with additional rigor. For each of the six characterizations of ASG, the research team generated a semi-random version of the organization's kidnapping network and derived mentorship gap values from these networks, before using paired t-tests to compare these simulated values against the observed data.

As the following paragraph outlines, this study's approach to network simulation is best described as random re-wiring, with restrictions. When implemented in an agent \times event network, re-wiring works by holding the pattern of interactions constant and randomly re-assigning agents to events to produce a simulated network that shares all the same structural characteristics of the observed data. This process ensures that the observed and simulated event-teams always have the same number of participants, thereby making certain that the research team compared apples-to-apples when testing real mentorship gaps against simulated values.⁷⁰

Figure 6 provides a simple graphic representation of the re-wiring process as applied to 12 people's participating in two events (A and B). In the top panel, which represents observed data, four agents (1, 6, 9, and 12) perpetrated event A, and three agents (4, 8, and 11) perpetrated event B. When agents were randomly assigned to the events in the simulation depicted in the lower panel, the number of respective participants was held constant to generate new teams of the same size as those that perpetrated the actual event.

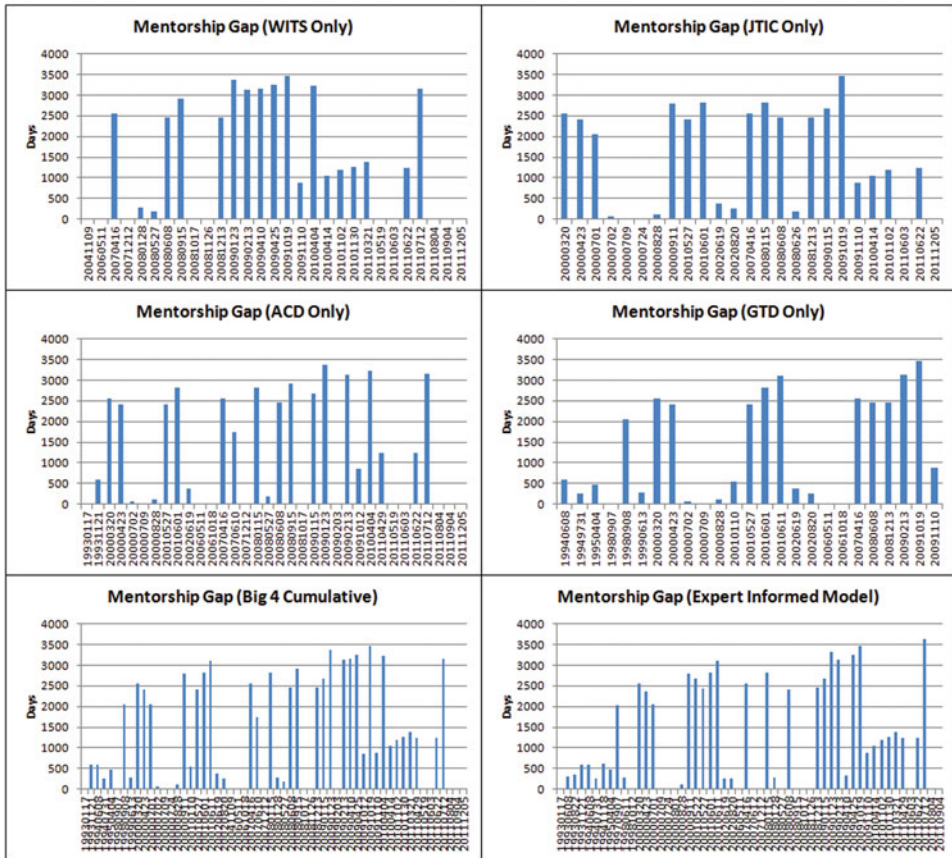


Figure 5. Observed mentorship gaps across six characterizations of ASG. (Color figure available online).

Specifically, agents 2, 5, 10, and 12 were randomly assigned to event A, and agents 3, 7, and 9 were randomly assigned to event B. As demonstrated by agent 12's tie to event A in both the observed and simulated data, actual participants are eligible for nomination via random selection. Thus, this process is conceptually equivalent to shuffling the seating chart at a wedding reception; each table still has the same number of guests, but instead of arranging them based on shared traits or interests, people are seated based solely on random chance.

Restrictions enter the model in order to enhance realism. It is, for example, vital to consider the aspect of time; a random model that assigned an individual who died in 1996 to an event that occurred in 2003 would produce suspect values, as would a model that assigned an individual who joined ASG in 2005 to an event that occurred in 2000. Therefore, attribute information served to restrict agents' eligibility for random assignment.

Specifically, individuals were required to meet three criteria before they were eligible for random assignment to a given event:

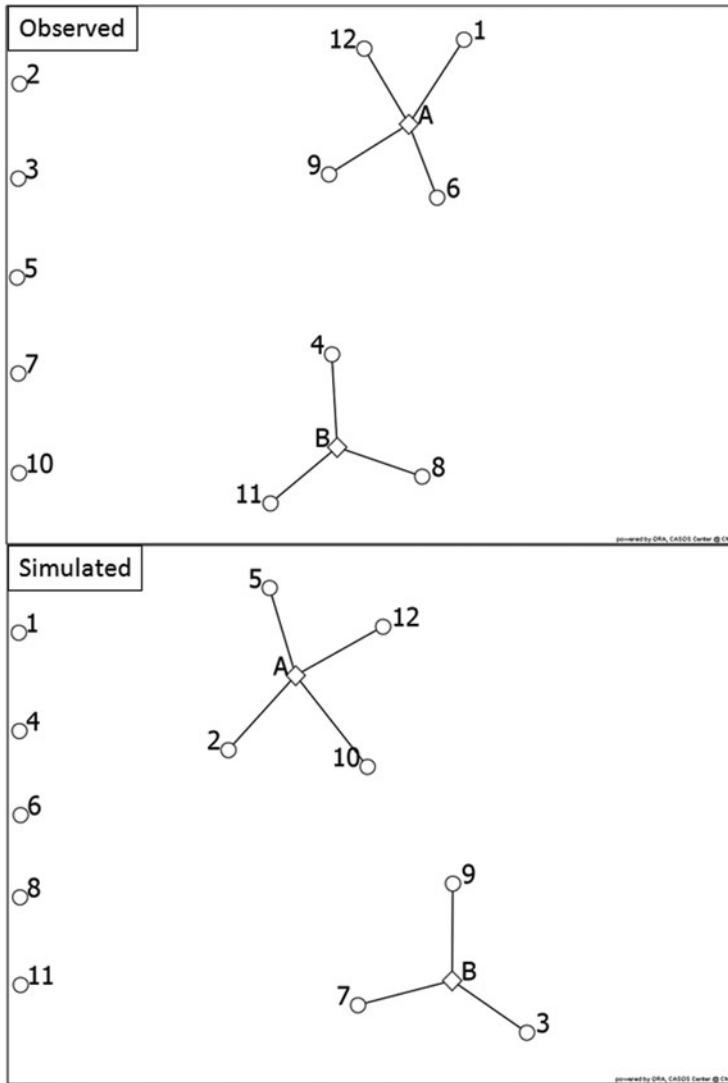


Figure 6. Re-wiring a simple two-mode network.

1. Agents' observed start date had to take place on or before the event under simulation. This requirement ensured that the simulated kidnapping teams did not include people who joined ASG years after the event took place.
2. Agents' observed date of removal from the network, through either death or capture, had to take place *after* the event under simulation. This requirement ensured that the simulated kidnapping teams included neither dead men nor prisoners.
3. Agents' involvement with ASG could not have decayed prior to the event under simulation. The research team calculated this decay function by measuring the length of time that transpired between individuals' first and last known dates of involvement in kidnappings. The research team then calculated the standard deviation of these time periods for individuals who were not removed from the

network due to death or capture. Three of these standard deviations, measured in days, were then added to each individual's observed start date, and people were then excluded from all events that transpired after this calculated date. Although this cut-point was somewhat arbitrary, it provided a liberal upward boundary for individuals' participation in ASG, while still allowing that individuals may have left the organization for reasons including ideological change, illness, and undocumented instances of death or arrest.

Once the simulations were complete, the research team populated the semi-randomized networks with real-world data on agents' start-date in kidnapping. Using these dates to create simulated mentorship gaps allowed the research team to produce measurements that would have existed if ASG had randomly assigned qualifying people to kidnapping teams.

However, several different simulated mentorship gap values were possible. Even with the restrictions in place, more people always qualified to participate in a simulated kidnapping than took part in the actual event. Therefore, the research team simulated each take 1,000 times, in order to generate a realistic range of possible mentorship gap values.

Once the simulations were complete, paired *t*-tests served to evaluate the extent of difference between the observed and simulated mentorship gaps.⁷¹ Observed values were treated analogously to data collected prior to an intervention, and simulated values were treated analogously to data collected after an intervention. Thus, this study's design is equivalent to more familiar examples from the physical sciences, such as studies that assess the manual dexterity of test subjects before and after consuming alcohol. Formally speaking, this design tested the null hypothesis that the mean difference between paired mentorship gaps was zero for the observed and simulated data.⁷²

Results

Very few of the paired *t*-tests displayed statistically significant results, suggesting that the observed data was similar to random. Remembering that *p*-values show the probability that the null hypothesis is correct,⁷³ and given that each simulation in each take is unaffected by any other test, it is fairly elementary to determine the number of significant tests necessary to conclude that meaningful differences exist between the observed and simulated data. At an alpha of 0.05, more than 50 tests out of 1,000 would need to be statistically significant in order for there to be sufficient evidence to conclude that observed mean mentorship values were meaningfully different from random.

The summary of results presented in Table 3 shows that none of the six takes met this threshold. In formal terms, there was insufficient evidence to reject the null hypothesis that the observed and simulated data displayed equal mean mentorship gap values. Because this finding is robust to variation in the definition of ASG's boundaries, it strongly suggests that ASG neglects to structure kidnapping teams to ensure that experienced members of the organization disseminate their tacit knowledge about abduction tradecraft to inexperienced members of the organization.

Conclusions and Recommendations

The results of this study have practical and theoretical implications. Because ASG appears to lack a meaningful system to disseminate tacit knowledge on kidnapping, the organization is less likely to maintain important skill sets over time. Although additional testing should evaluate ASG's ability to disseminate tacit knowledge on bombings and other violent

Table 3
Assessing the differences between observed and simulated mentor-
ship gap values across six takes of the Abu Sayyaf Group

Take	No. sig. tests
WITS	6
JTIC	2
GTD	1
ACD	18
Cumulative Big 4	7
Expert Informed Model	9
No. Simulations/Take = 1000	
$\alpha = 0.05$	

tactics—a task that will prove exceptionally difficult given the abundance of explosives and bombmaking expertise in the Philippines—this study’s findings generally support the view that ASG operates as a loose collection of bandits, not a well-structured terror group. Consequently, this “organization” should rank fairly low in terms of strategic risk. ASG still merits some official attention, in order to prevent the loose group from morphing into a more substantial concern, but in an era of scarce resources, ASG seems a second-level threat that can be managed primarily using law enforcement, rather than military intervention. Decapitation strategies which seek to remove individuals that analysts have identified as “key leaders” of ASG may also fail to meaningfully reduce the loose network’s capabilities, since there are substantial grounds to question the extent of formal structure within ASG. As Ugarte and Turner first hypothesized, the term “Abu Sayyaf Group” is likely a label of convenience that has been inappropriately used to describe a loosely coupled network, “in which no actor or group could make binding decision for the others.”⁷⁴

This study also highlights the need for additional inquiries into criteria that inform the construction of attack teams. While substantial evidence contradicts the theory that ASG constructs attack teams to perpetuate tacit knowledge, the current data does not allow the exploration of alternate explanations. Assessments of VNSAs operating in nearby Indonesia suggest that family ties and friendship bonds play a strong role in determining attack teams.⁷⁵ Perhaps ASG “members” operate similarly and ignore skills and qualifications in favor of affinity bonds? Unfortunately, rigorous testing of this hypothesis will prove difficult, as it requires the collection of reliable agent-level data on friendship choices and genealogy within a clandestine population.

However, one of this study’s contributions is to demonstrate the need for just this kind of detailed data collection. The big four’s attempts to gather organizational-level data on ASG’s involvement in kidnapping are undermined by the lack of common definitions of organizations’ boundaries and membership. If such discrepancies prove generalizable to organizations other than ASG and forms of organized violence beyond kidnapping—and there is every reason to suspect that they do—then many quantitative studies of VNSAs need to be re-evaluated with concerns of construct validity in mind. The inherent limitations of current data dictate that the academic and policy communities lack a clear understanding of which organization(s) perpetrated many violent events.

While detailed agent-level collection can help to resolve much of this ambiguity, a shift from organizational-level data to individual-level data will not, in and of itself, clarify the boundaries between VNSAs. Such a shift will merely move questions about culpability for events from “which organization(s) conducted this attack?” to “in which organization(s) did the perpetrators of this attack hold membership?” Therefore, collection of agent-level data must be paired with research on empirical means of determining VNSAs’ membership. Anthropological approaches that model consensus among subject-matter experts⁷⁶ and network science approaches that infer group membership from agent-level relationships⁷⁷ may hold particular promise.

Even if clear determinations of organizational membership are slow to come, the methods employed in this article may help to resolve ambiguities that result from the dearth of reliable quantitative data on VNSAs. The randomness inherent to the re-wiring process this study used to generate simulated networks provided a benchmark against which to test the significance of the observed patterns. This characteristic constitutes an advantage over approaches that skip-ahead to casual arguments, without first determining that observed patterns are in fact meaningful.

Although several interesting aspects of VNSAs’ behavior lie beyond the limitations of this study’s network-based approach to simulation, the broad strokes of this study’s iterative research design should prove useful to researchers favoring an assortment of approaches. Analysts should control for fact that no one knows exactly where the boundaries of VNSAs lie by testing hypotheses across multiple datasets. Only those findings that prove valid across multiple, competing operational definitions of organizational boundaries have the conceptual robustness necessary to gain wide acceptance. This study’s conclusions about the lack of knowledge-dissemination structures among ASG’s kidnapping teams offer one such robust finding.

Notes

1. Brainy Quote. Available at <http://www.brainyquote.com/quotes/quotes/b/benjaminfr383997.html> (accessed 23 January 2014).

2. This article uses the term “violent non-state actor” in broad accordance with the characterization offered by Williams, who describes VNSAs as *organizations* that use violence or its threat to challenge state sovereignty. Examples of VNSAs include *jihadi* terror groups, sophisticated narco-traffickers, militias, and well-organized youth gangs. Phil Williams, “Violent Non-State Actors and National and International Security,” *International Relations and Security Network, ETH Zurich*, 2008.

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11. "Former Muslim Extremist Leader Killed in Southern Philippines," *Associated Press Worldstream*, 15 January 1999.

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15. See, for example, the 1993 kidnapping of shipping magnate Ricardo Tong, the 2002 kidnapping of sales representatives in Sulu, the 2008 kidnapping of businesswoman Rosalie Lao, and the 2011 kidnapping of businessman Nelson Lim. "Moslem Kidnappers Free Ethnic Chinese Shipyard Owner," *AFP*, 18 January 1994; "Former Top Moslem Rebel Acquitted on Kidnapping Charges in Philippines," *AFP*, 19 May 1997; "One of Four Kidnap Victims Escape from Moslem Extremists," *AFP*, 16 March 1995; "Muslim Extremists Take Four Hostage in Southern Philippines," *AP*, 27 February 1995; Felipe F. Falsosa II and Rey Luis Banagudos, "Six Sales Agents Abducted by Abu Sayyaf," *Businessworld*, 22 August 2002; Al Jacinto, "Police Rescue Trader Held Captive by Abu Sayyaf for P2 Million Ransom in Sulu," *Manila Times*, 12 April 2008; Darwin T. Wee, "Business Airls Concern Over Rising Criminality," *Businessworld*, 4 February 2008; "Gunmen Kidnap Chinese-Filipino Businessman in S. Philippines," *Xinhua General News Service*, 29 April 2011.

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37. It is possible to glean small amounts of information on individuals’ participation in events by studying the narrative incident reports that accompany entries. However, none of the databases attempt to provide comprehensive lists of the participants involved in events.
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44. Forest provides an overview of several prominent manuals in an appendix to *The Making of a Terrorist: Recruitment, Training, and Root Causes, Volume II: Training* (Westport, CT: Praeger, 2006), pp. 310–333.

45. Eben Kaplan, "Terrorists and the Internet," *Council on Foreign Relations*, 8 January 2009.

46. Gabriel Weimann, "Virtual Training Camps: Terrorists' Use of the Internet," in James J. F. Forest, ed., *Teaching Terrors: Strategic and Tactical Learning in the Terrorist World*, (Oxford, UK: Rowman & Littlefield, 2007), pp. 110–132; Gabriel Weimann, *Terror on the Internet* (Washington, DC: U.S. Institute of Peace, 2006). See also, Bruce Hoffman, *Inside Terrorism* (New York: Columbia University Press, 1998), p. 203. Anne Stenersen offers an important criticism of the "virtual training camp" argument by noting that terror groups do not manage online resources from the top down; instead sympathizers post content of their own volition. "The Internet: A Virtual Training Camp?" *Terrorism and Political Violence* 20(2) (2008), pp. 215–233.

47. Petter Nesser, "How Did Europe's Global Jihadists Obtain Training for their Militant Causes?" *Terrorism and Political Violence* 20(2) (2008), pp. 234–256.

48. Kenney, *From Pablo to Osama*, p. 46.

49. Interview.

50. Interview.

51. Kenney, *From Pablo to Osama*; Forest, *The Making of a Terrorist*.

52. Weimann, "Virtual Training Camps," 2006. Evan F. Kohlmann, "The Real Online Terrorist Threat," *Foreign Affairs* 85(5) (September/October 2006), pp. 115–124; Bruce Hoffman, "Rethinking Terrorism and Counterterrorism Since 9/11," *Studies in Conflict and Terrorism* 25 (2002), p. 307.

53. James J. F. Forest, "Knowledge Transfer and Shared Learning among Armed Groups," in Jeffrey H. Norwitz, ed., *Armed Groups: Studies in National Security, Counterterrorism, and Counterinsurgency* (Newport, RI: U.S. Naval War College, 2008), pp. 269–289; Horacio R. Trujillo and Brain A. Jackson, "Organizational Learning and Terrorist Groups," in James J. F. Forrest, ed., *Teaching Terror: Strategic and Tactical Learning in the Terrorist World* (Oxford, UK: Rowman & Littlefield, 2007), pp. 52–68.

54. Forest describes organization-to-organization transfers of knowledge in his discussion of FARC's decision to hire PIRA bombmakers as instructors. Forest, "Knowledge Transfer and Shared Learning among Armed Groups," p. 272.

55. Hizballah has occasionally been willing to work with Sunni organizations in the past and even trained a handful of Al Qaeda operatives in bombmaking in the early 1990s. See: USA v. Usama bin Laden, et al (Defendants), Day 2 of Trial Testimony, U.S. District Court Southern District of New York (S(7) 98 Cr. 1023), 2001; and National Commission on Terrorist Attacks Upon the United States (9/11 Commission), *Final Report of the National Commission on Terrorist Attacks Upon the United States* (New York: W.W. Norton and Company, 2004), p. 61. (Hereafter "9/11 Commission Report").

56. Forest, *The Making of a Terrorist*, 2007. James J. F. Forest, "Terrorist Training Centers Around the World: A Brief Review," in James J. F. Forest, ed., *The Making of a Terrorists: Recruitment, Training, and Root Causes, Volume II: Training* (Westport, CT: Praeger, 2006), pp. 296–310.

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66. Brian A. Jackson, “Organizational Learning and Terrorist Groups,” *RAND Working Paper*, February 2004, p. 10.

67. Evidence from the related field of proliferation studies also supports this assessment. Sonia Ben Ouagrham-Gormley, “Barriers to Bioweapons: Intangible Obstacles to Proliferation,” *International Security* 36(4) (2012), pp. 80–114; Dennis M. Gormley, *Missile Contagion: Cruise Missile Proliferation and the Threat to International Security* (Annapolis, MD: Naval Institute Press, 2008), pp. 85–89; Donald MacKenzie and Graham Spinardi, “Tacit Knowledge, Weapons Design, and the Uninvention of Nuclear Weapons,” *American Journal of Sociology* 101(1) (July 1995), pp. 44–99.

68. Michael Polanyi, *The Tacit Dimension* (New York: Doubleday, 1966), p. 5.

69. Because events with only one known participant will always produce a membership gap of zero, such events were excluded from consideration in order to avoid biasing the data. Each of the graphs describes only those events with two or more known participants.

70. This study’s approach to re-wiring two-mode networks was based on Krackhardt’s approach to permuting one-mode networks to test correlations between networks that share a common node-set. David Krackhardt, “QAP Partialling as a Test of Spuriousness,” *Social Networks* 9 (1988), pp. 171–186; D. D. Dekker, D. Krackhardt, and T. A. B. Snijder, “Sensitivity of MRQAP Tests to Colinearity and Autocorrelation Conditions,” *Psychometrika* 72 (2007), pp. 563–581.

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72. J. H. McDonald, *Handbook of Biological Statistics*, 2nd Edition (Baltimore, MD: Sparky House Publishing, 2009).

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74. Ugarte and Turner, “What is the ‘Abu Sayyaf’?”

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