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Appendix to: The Wane of Command

Evidence on drone strikes and control within terrorist organizations

ANOUK S. RIGTERINK *Durham University*

This is a manuscript submitted for review.

A Data

Replication data can be found at: https://doi.org/10.7910/DVN/MNRIEP.

A.1 Terrorist groups included in dataset (as classified by BIJ)

TABLE A.1

Group	Subgroups[a]	Start month[b]
Al-Qaida	AQ in Iraq	
	AQ in the Arab Peninsula	
	AQ Indian Subcontinent	
	Abu Kasha's group	
	Islamic Army of Great Britain	
	Lashkar al Zil	
Al-Badr		
East Turkestan Islamic Movement		
Haqqani Network	Maulvi Ihsanullah's faction	
Harkat-ul-Jihad al-Islami		
Islamic Movement of Uzbekistan (IMU)		
Islamic Jihad Union		
Jund al Khilafah		September 2011
Lashkar-e-Islam		
Punjabi Taliban		
Taliban	Hezb-i-Islami	
	Maulvi Nazir's faction	
	SWAT Taliban	
Taliban (Pakistan)		
Tehrik-e-Taliban Pakistani (TTP)	Khan Said's faction	December 2007
	Hafiz Gul Bahadur's faction	
	Jamaat e Islami Azad Kashmir	
	Sajna faction	

[a] This table does not give a comprehensive overview of subgroups of these terrorist groups, merely of those subgroups that are named in the BIJ data.

[b] If after January 2014.

A.2 Codebook targeted leader killing

Coding Instructions

targettype

1=vehicle
2=building
3=both a vehicle and a building
9=unknown/other

Record the physical object hit by the strike, according to BIJ.

targetnamed

0=no
1=yes

Code 1 if AT LEAST ONE of the following is satisfied:

1. Report includes a NAMED individual classified by BIJ as "leader", "commander", "senior figure" or similar of a militant group, who, or a location associated with whom, is named by BIJ as "target" of a drone strike, potential or otherwise, or is mentioned as (falsely) claimed to have died in or as a result of the strike by any source.
2. BIJ identifies as a target of the strike, potential or otherwise, OR as having died in or as a result of the strike
   a. Individuals (allegedly) associated with a NAMED militant group, OR
   b. (alleged) militants (allegedly) associated with a NAMED individual, identified implicitly or explicitly as leader or similar of a militant group, OR
   c. a location associated with a NAMED militant group.

Code 0 otherwise.

IF 0: leave all remaining fields blank
IF 1: for EACH UNIQUE NAMED militant group under (2.) or associated with individual(s) under (1.) AND EACH UNIQUE NAMED individual NOT associated with a named militant group under (1.) or (2.) fill in the remaining fields.

NOTE: see page 2 for known named militant groups

group?HVTtarget

0=no
1=yes

FOR EACH UNIQUE named militant group or named individual not associated with a militant group
Code 1 if ALL of the following are satisfied

1. A named individual OR a gathering of more than two unnamed individuals,
2. Classified by BIJ as "leader(s)", "commander(s)", "senior figure(s) or similar of a militant group
3. Was either
   a. Named by BIJ as "target" of the drone strike, potential or otherwise
   b. Mentioned as (falsely) claimed to have died in or as a result of the strike by any source.

Code 0 otherwise

group?HVTdied

0=no
1=yes
9=unknown

Blank if group?HVTtarget=0

FOR EACH UNIQUE named militant group or named individual not associated with a militant group

Code 1 if ANY of the individuals recorded under group?HVTname have died in, or as a result of injuries incurred during, the drone strike.
Code 9 if BIJ mentions the death of ALL individuals recorded under group?HVTname is uncertain and/or if the BIJ cites conflicting reports on the death of ALL individuals recorded under group?HVTname.
Code 0 if otherwise.

group?HVTname

Text field (codes available)

Blank if group?HVTtarget=0 AND group?militant is EITHER 2, 3, OR 4 not involving a location associated with a named leader.

FOR EACH UNIQUE militant group or named individual not associated with a militant group

Record name(s) of HVT(s) under group?HVTtarget and group?militant IF group?militant=1 OR group?militant=4 and it involves a location associated with a named leader, separated by ; and including any aliases in brackets ( ).

Record 'gathering' if group?HVTtarget=1 because the report involved a gathering of more than two unnamed individuals.

group?militant

1=Militants associated with HVT
2=Named militants
3=Unnamed militants
4=Location associated with militants

Blank if group?HVTtarget=1

FOR EACH UNIQUE named militant group or named individual not associated with a militant group
record the LOWEST code applicable. Code:

1. If BIJ identifies as a target of the strike, potential or otherwise, OR as having died in or as a result of the strike, one or more individuals identified as (alleged) militant(s) AND associated with, or alleged to be associated with, a NAMED individual (or "Named individual's group") identified implicitly or explicitly as leader or similar of a militant group.
2. If BIJ identifies as a target of the strike, potential or otherwise, OR as having died in or as a result of the strike, one or more individual(s) BY NAME AND as militant(s) or alleged militant(s) associated with the named group.
3. If BIJ identifies as a target of the strike, potential or otherwise, OR as having died in or as a result of the strike, one or more UNNAMED individual(s) as (alleged) militant(s) associated with the named group.
4. If BIJ records that the location that was struck is (allegedly) associated with the named militant group or a named individual classified as "leader", "commander" "senior figure" or similar.

group?name

Text field, see spelling below

FOR EACH UNIQUE militant group, record name of:

1. the militant group the HVT is associated with if group?HVTtarget=1, OR group?militant=1 OR group?militant=4 and this involves a location associated with an HVT.
2. the militant group militants are associated with if group?militant=2 OR group?militant=3
3. the militant group the location struck is associated with if group?militant=4 AND this does NOT involve a location associated with a an HVT.

Record 'unknown' if group?HVTtarget=1 OR group?militant=1 AND the HVT is NOT associated with a militant group.

AQ: Al Qaeda
Haqqani: Haqqani network
LeI: Lashkar-e-Islam
IMU: Islamic Movement of Uzbekistan
Afghan Taliban: Afghan Taliban
TTP: Pakistani Taliban, Tehrik-e-Taliban Pakistani, Local Taliban
Taliban: Taliban, unspecified

Foreigner: including "Arab", "non-local" or individuals of a specific nationality not Pakistani, Afghani, Uzbek or Punjabi.
NOT TO BE CODED SIMULTANESOULY WITH AQ
Punjabi: Punjabi militants
Uzbeks: Uzbeks, Uzbek militants.
NOT TO BE CODED SIMULTANEOUSLY WITH IMU

A.3 Terrorist leaders included in dataset

TABLE A.2

Leader name	Group	Subgroup	# times targeted	hit
Abu Mus'ab al-Zarqawi	Al-Qaida	AQI	0	0
Abu Yahya al-Libi	Al-Qaida		2	1
Ahmad Farouq	Al-Qaida	AQIS	3	1
Amran Ali Siddiqi	Al-Qaida	AQIS	1	1
Atiyah adb al-Rahman	Al-Qaida		3	1
Ayman al-Zawahiri	Al-Qaida		2	0
Badruddin Haqqani	Haqqani network		2	1
Baitullah Mehsud	TTP		3	1
Hafiz Gul Bahadur	TTP		2	0
Hakimullah Mehsud	TTP		5	1
Jalaluddin Haqqani	Haqqani network		0	0
Maulana Faqir Muhammed	TTP		1	0
Maulvi Ahmad Jan	Haqqani network		1	1
Maulvi Nazir[a]	Taliban	Maulvi Nazir group	2	1
Muhammad Ilywas Kashmiri	Harkat-ul-Jihad		5	1
Mustafa Abu al-Yazid	AQ		1	1
Nasser al-Wuhayshi	AQ	AQAP	1	0
Qari Hussain	TTP		6	1
Qarri Imran	AQ	AQIS	1	1
Sangeen Sadran	Haqqani network		3	1
Sirajuddin Haqqani	Haqqani network		1	0
Wali ur Rehman Mehsud	TTP		1	1
TOTAL			46[b]	15

[a]Note that major attacks by the Maulvi Nazir faction as identified by the Stanford project are all coded as having been perpetrated by the 'Taliban' by the GTD. Hence, this faction is classified as Taliban, even though it was briefly merged with the TTP (Crenshaw 2012)

[b]Note that the unit of analysis for this Table is the leader, whereas the unit of analysis in Table 2 of the main text is the group. As one drone strike targeted (and missed) two leaders from the same group simultaneously, the number of individual leaders targeted equals 46, but the number of times a drone strike targeted a group's leader equals 45.

A.4 Splinter groups included in dataset

TABLE A.3

Affiliate name	Parent group name	Source
Abdullah Azzam Brigades	AQ	https://www.trackingterrorism.org/group/abdullah-azzam-brigades-aab
Abu Hafs Katibatul al-Ghurba al-Mujah	AQ	https://www.trackingterrorism.org/group/katibat-al-ghuraba-al-turkistan-kgt-al-qaeda-aqc
Ahle Sunnat Wal Jamaat	AQ	http://www.bbc.co.uk/news/world-asia-17322095
Al-Fatah	None	https://www.trackingterrorism.org/group/al-fatah
Al-Jihad (Pakistan)	Not found	
Al-Mansoorian	AQ	http://web.stanford.edu/group/mappingmilitants/cgi-bin/groups/view/79
Al-Qaida	AQ	
Al-Qaida in the Indian Subcontinent	AQIS	
Amr Bil Maroof Wa Nahi Anil Munkir	AQ	http://web.stanford.edu/group/mappingmilitants/cgi-bin/groups/view/445
Ansar Al-Mujahideen (Pakistan)	TTP	http://www.thefridaytimes.com/tft/ptis-peace-paradox/
Ansar Wa Mohajir (Pakistan)	TTP	https://speekout.wordpress.com/category/ansar-wa-mohajir/
Ansarul Islam (Pakistan)	None	https://www.rferl.org/a/pakistan-ansar-ul-islam-taliban-ttp/24886662.html
Baba Ladla Gang	None	https://www.dawn.com/news/1312260
Baloch Liberation Army (BLA)	None	http://web.stanford.edu/group/mappingmilitants/cgi-bin/groups/view/297
Baloch Liberation Front (BLF)	None	http://web.stanford.edu/group/mappingmilitants/cgi-bin/groups/view/297
Baloch Liberation Tigers (BLT)	None	http://web.stanford.edu/group/mappingmilitants/cgi-bin/groups/view/297
Baloch Militant Defense Army	Not found	
Baloch Mussalah Diffah Tanzim (BMDT)	TTP	https://www.trackingterrorism.org/group/balochistan-musalla-difa-tanzeem-bmdt-haq-na-tawar
Baloch National Liberation Front	None	
Baloch Nationalists	Not found	
Baloch Republican Army (BRA)	None	

Baloch Republican Guards (BRG)	None	https://www.app.com.pk/14-activists-of-banned-outfit-in-balochistan-surrender/
Baloch Waja Liberation Army (BWLA)	None	
Baloch Young Tigers (BYT)	Not found	
Balochistan Liberation United Front	None	
Balochistan National Army	None	https://www.trackingterrorism.org/group/baluchistan-national-army
Bhittani tribe	Not found	
Free Balochistan Army (FBA)	Not found	
Gholam Yahya Akbar	Taliban	https://www.longwarjournal.org/archives/2009/02/coalition_strike_kil.php
Gunmen	Not found	
Hafiz Gul Bahadur Group	TTP	
Haji Fateh	None	http://www.xactrisk.com/international-security-update.html
Halqa-e-Mehsud	TTP	
Haqqani Network	Haqqani	
Harkatul Jihad-e-Islami	Harkat-Ul-Jihad	
Hizb al-Tahrir al-Islami (HT)	None	https://www.globalsecurity.org/military/world/para/hizb-ut-tahrir.htm
Hizb-I-Islami	Taliban; AQ	http://www.understandingwar.org/hizb-i-islami-gulbuddin-hig
Imam al-Bukhari Brigade	Taliban	https://www.longwarjournal.org/archives/2016/07/foreign-jihadists-advertise-role-in-latakia-fighting.php
Islambouli Brigades of al-Qaida	AQ	https://www.trackingterrorism.org/group/al-islambouli-brigades-al-qaeda
Islami Jamiat-e-Talaba (IJT)	AQ; TTP	http://web.stanford.edu/group/mappingmilitants/cgi-bin/groups/view/101?highlight=IJT
Islamic Movement of Uzbekistan (IMU)	IMU	
Jaish al-Muslimin	Taliban	https://reliefweb.int/report/afghanistan/baag-afghanistan-monthly-review-oct-2004
Jaish al-Umar (JaU)	Not found	
Jaish as-Saiyouf (Army of Swords)	Not found	
Jaish Usama	TTP	https://nation.com.pk/05-Mar-2014/not-bound-to-follow-ceasefire-jaish-e-usama
Jaish-e-Islam	None	https://jamestown.org/program/a-profile-of-militant-groups-in-bajaur-tribal-agency/

Jaish-e-Khorasan (JeK)	AQ	https://www.linkedin.com/pulse/rise-islamic-state-terror-its-climax-september-2014-hassan-ali/
Jaish-e-Mohammad	AQ; Taliban	http://web.stanford.edu/group/mappingmilitants/cgi-bin/groups/view/95
Jamaat Tauhid Wal Jihad (Pakistan)	AQ	https://ctc.usma.edu/militant-imagery-project/0068/
Jamaat-E-Islami (India/Pakistan)	None	
Jamaat-ul-Ahrar	TTP	Dawn
Jeay Sindh Qaumi Mahaz (JSQM)	None	https://tribune.com.pk/story/354308/pakistan-day-jsqm-leader-demands-freedom-for-sindh-and-balochistan/
Jundallah (Pakistan)	TTP	Dawn
Khatm-e-Nabuwat (KeN)	None	https://www.rabwah.net/ahrar-khatmenabuwat-terrorist-organizations/
Khorasan Chapter of the Islamic State	TTP; Taliban	https://thediplomat.com/2015/05/islamic-state-and-jihadi-realignments-in-khorasan/
Khorasan jihadi group	AQ	http://web.stanford.edu/group/mappingmilitants/cgi-bin/groups/view/21?highlight=khorasan
Lashkar-e-Balochistan	None	https://www.trackingterrorism.org/group/lashkar-e-balochistan
Lashkar-e-Islam (Pakistan)	Lashkar-e-Islam	
Lashkar-e-Jarrar	Not found	
Lashkar-e-Jhangvi	None	
Lashkar-e-Taiba (LeT)	AQ	http://web.stanford.edu/group/mappingmilitants/cgi-bin/groups/view/79
Mahaz Fedai Tahrik Islami Afghanistan	Taliban	Dawn
Mahsud Tribe	Not found	
Majlis-e-Askari	TTP	https://therearenosunglasses.wordpress.com/2017/05/25/us-drone-strike-in-khost-kills-3-ttpisis-taliban-while-pak-army-hangs-2-more-same-group/
Majlis-e-Lashkari	TTP	https://therearenosunglasses.wordpress.com/2017/05/25/us-drone-strike-in-khost-kills-3-ttpisis-taliban-while-pak-army-hangs-2-more-same-group/
Militants	Not found	
Mujahideen Ansar	TTP	http://www.thefridaytimes.com/tft/ptis-peace-paradox/
Mullah Dadullah Front	Taliban	https://www.trackingterrorism.org/group/dadullah-front
Muslim extremists	Not found	
Muslim Fundamentalists	Not found	
Mutahida Majlis-e-Amal	None	https://www.geo.tv/latest/166882-muttahida-majlis-e-amal-restored

Muttahida Qami Movement (MQM)	None	
New People's Army (NPA)	None	
Orakzai Freedom Movement	TTP	https://books.google.co.uk/books/about/Countering _New_est_Terrorism.html?id=8TZDDwAAQBAJ &redir _esc=y
Pakistani People's Party (PPP)	None	
People's Amn Committee	None	
Punjabi Taliban	Punjabi Taliban	
Qari Kamran Group	TTP	https://www.trackingterrorism.org/group/qari-kamran-group
Separatists	Not found	
Sindh Liberation Front	None	
Sindh Revolutionary Army	None	
Sindhu Desh Liberation Army (SDLA)	None	
Sindhudesh Revolutionary Army (SRA)	None	
Sipah-e-Sahaba/Pakistan (SSP)	None	http://web.stanford.edu/group/mappingmilitants/cgi-bin/groups/view/147
Sipah-I-Mohammed	None	http://www.satp.org/satporgtp/countries/pakistan /terroristoutfits/SMP.htm
Sirri Powz	Not found	
Sunni Muslim extremists	Not found	
Taliban	Taliban	
Taliban (Pakistan)	Local Taliban	
Tanzeem al-Islami al-Furqan	None	https://www.trackingterrorism.org/group/tanzeem-ul-islami-ul-furqan-tif
Tawheedul Islam	Not found	
Tehrik-e-Khilafat	TTP	http://www.dailymail.co.uk/news/article-2686009/Pakistani-terror-group-jihadi-group-defect-ISIS-outside-Middle-East-leader-al-Baghdadis-influence-grows.html
Tehrik-e-Nafaz-e-Shariat-e-Mohammadi	TTP	http://web.stanford.edu/group/mappingmilitants/cgi-bin/groups/view/411

Tehrik-e-Nifaz-e-Aman Balochistan	None	http://thebalochistanpoint.com/taliban-in-balochistan/
Tehrik-e-Taliban Islami (TTI)	TTP	https://in.reuters.com/article/idINIndia-58032520110701
Tehrik-e-Tuhafaz (Pakistan)	None	https://www.catholicforlife.com/tag/tehreek-e-tuhafaz/
Tehrik-i-Taliban Pakistan (TTP)	TTP	
Tela Mohammed	Not found	
Tribesmen	Not found	
United Baloch Army (UBA)	None	http://www.dopel.org/UBA.htm
Unknown	Not found	
Uzair Baloch Gang	None	https://www.dawn.com/news/1326325
Zehri Youth Force (ZYF)	Not found	

B Further results and robustness checks

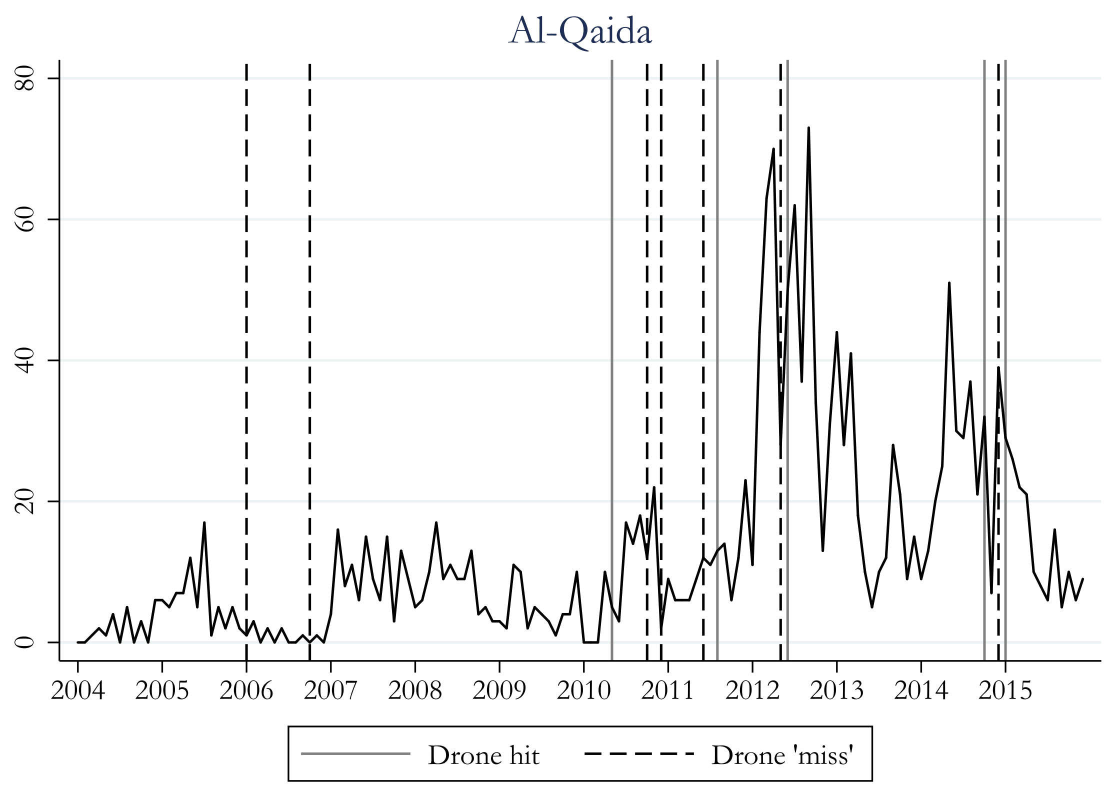
B.1 Graphs of terrorist attacks and drone hits and misses

Graphs B.1-B.5 depict raw data on (unlogged) terrorist attacks, and drone hits and misses on terrorist leaders, for those terrorist groups that experienced at least one hit and one miss. The number of terrorist attacks by group fluctuates strongly over time, in periods after drone hits or misses and in periods without drone attempts on a group's leader. From these graphs alone, it is difficult to discern any definitive pattern in the number of terrorist attacks after a drone hit, versus after a drone miss.

B.2 Bias due to misreporting and measurement error

Two kinds of biases could affect the main results. First, media may be more likely to report on terrorist attacks by a group in the six months after its leader was hit by a drone, compared to when he was missed. Second, there may a time trend in the likelihood that GTD attributes a terrorist attack to a particular group, which could correlate with the group-specific probability that a drone strike targeting its leader succeeds in killing him. Simulations show that either type of reporting bias would have to be substantial in size for it to fully account for the main results.

FIGURE B.1. Descriptive relationship: Al-Qaida



B.2.1 Differential probability of media reporting of terrorist attacks after a drone hit or miss

Media may be more likely to report terrorist attacks by a terrorist group after a drone strike hit its leader, compared to after a drone miss. This could arise if a drone hit on a group's leader puts a group at the center of the news cycle, whereas a drone miss does so to a lesser degree. This may be somewhat plausible, although a news item along the lines of "leader runs free and orders attacks" might be equally news-worthy as "group takes revenge after drone strike kills its leader". In addition, recall that the main analysis finds the strongest effect on terrorist attacks only in two to six months after a drone hit. This time-frame is much longer than we can expect any news cycle to be.

A look at news sources cited by GTD[1] further undermines the idea that reporting of terrorist attacks is strongly influenced by the success or failure of US drone strikes. Out of the top 20 media sources cited, over half are non-Western media, mainly from Afghanistan and Pakistan, but also from China

[1]Analysis of the number of times a particular media source is cited is somewhat hampered because GTD naming of these sources is not always consistent across events

FIGURE B.2. Descriptive relationship: Harkatul Jihad-e-Islami

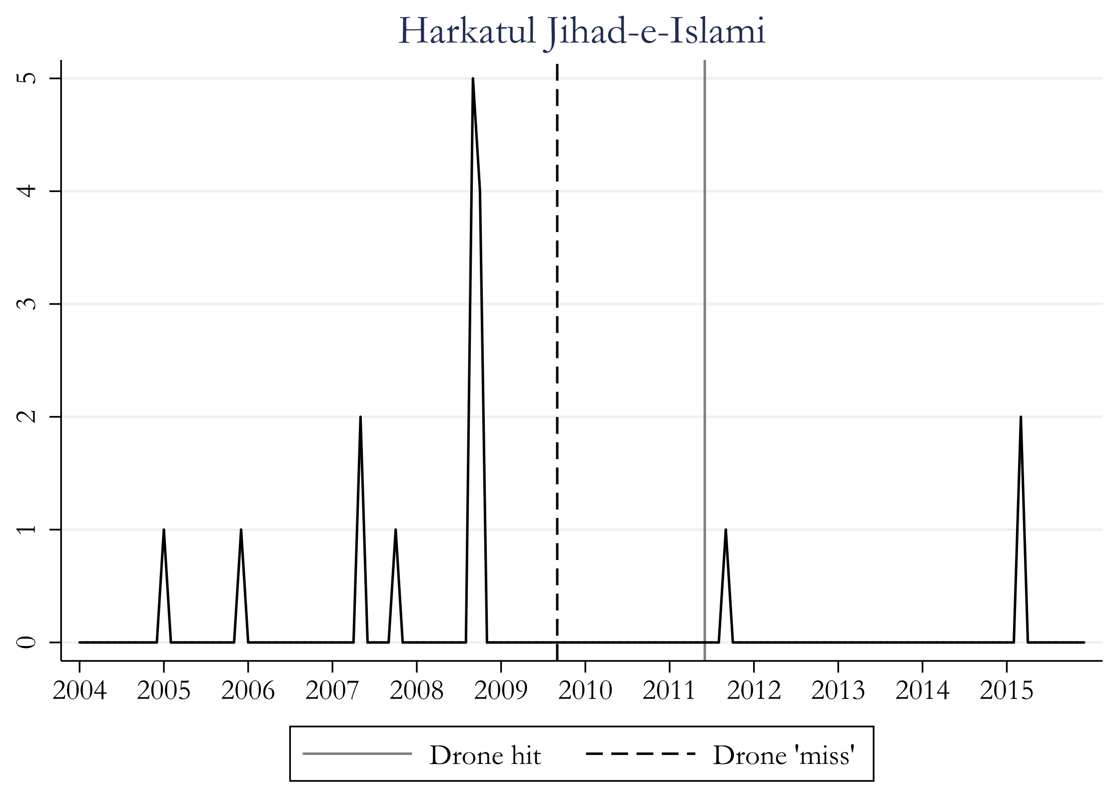


FIGURE B.3. Descriptive relationship: Haqqani Network

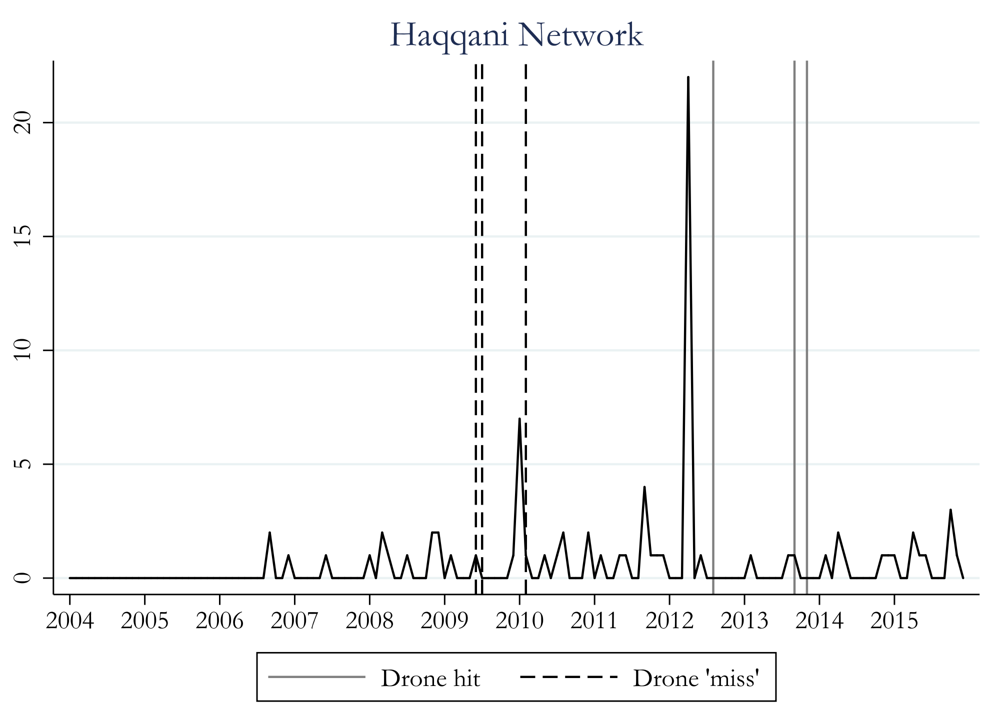


FIGURE B.4. Descriptive relationship: Taliban

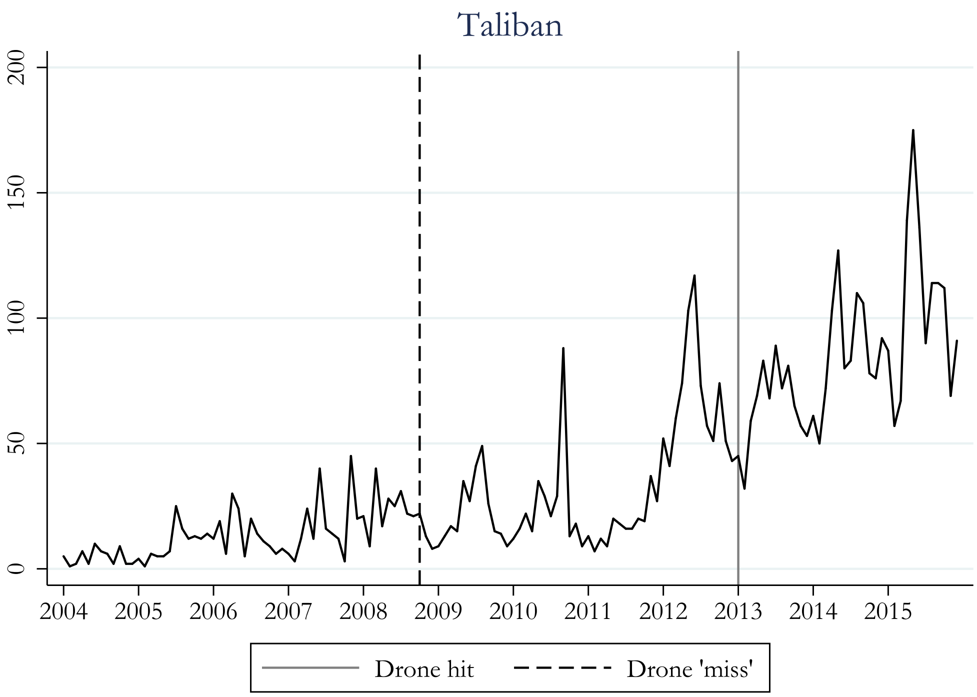
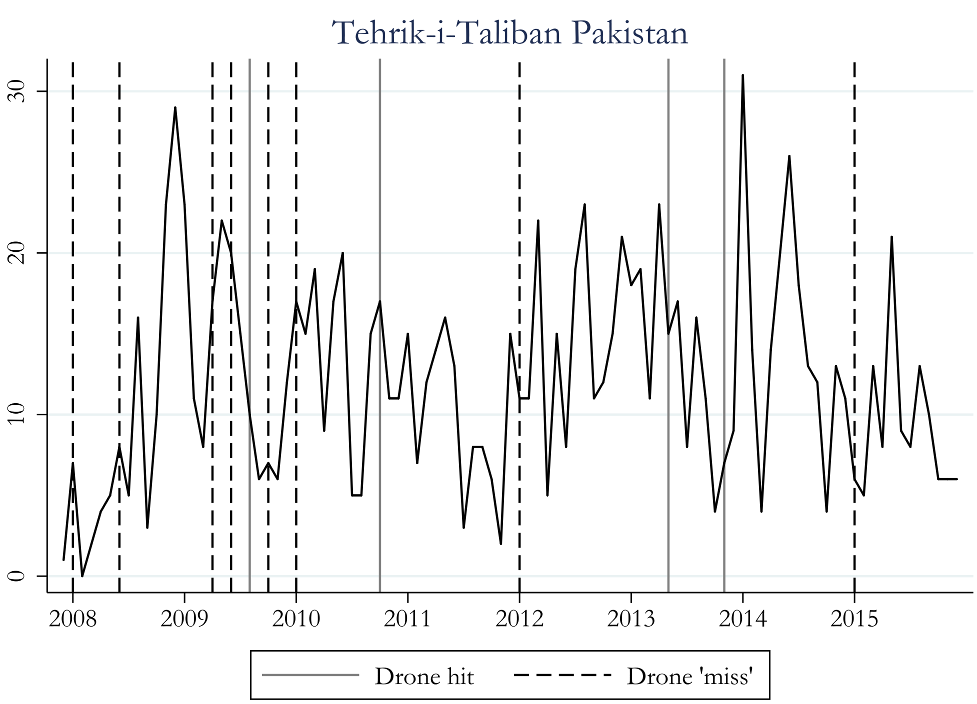


FIGURE B.5. Descriptive relationship: TTP



and the Philippines. Reporting on terrorist attacks by these sources is plausibly driven by national dynamics rather than US counterterrorism.

Nevertheless, I formally investigate the degree of reporting bias necessary to produce the main results. To do so, I start from the assumption that the number of terrorist attacks is completely unaffected by drone strikes: that the actual probability of a terrorist attack by some group is the same for the six months after a drone hit, the six months after a drone miss and in absence of prior drone strikes targeting its leader. However, the probability that the media will report the terrorist attack may differ across these periods. Specifically, I benchmark the likelihood of the media reporting a terrorist attack by a group in the six months after a drone hit on its leader at 1: $P(report|hit = 1)$. The probability of media reporting a terrorist attack by a group in the six months after a miss on its leader is $P(report|miss) < 1$, and the probability of the media reporting a terrorist attack by a group at any other time (including in periods after a drone strike not aimed at the group's leader) is $P(report|none) < 1$. I assume $P(report|miss) > P(report|none)$: a group is more newsworthy after a drone miss on its leader than after no drone strike targeting its leader at all.

To reflect this situation, I create 100 simulated datasets of terrorist attacks, in which the number of terrorist attacks by a group in a particular month is drawn randomly from a negative binomial distribution. The negative binomial distribution is chosen because it outperforms the Poisson distribution in a likelihood-ratio test for ten of the thirteen groups, and because there is no evidence that a zero-inflated negative binomial distribution outperforms the negative binomial distribution for any of the groups. For groups with at least one drone hit, parameters of the negative binomial distribution are estimated from the number of terrorist attacks reported in GTD for the six months after a drone hit on its leader. For groups with no drone hits, these parameters are estimated from all terrorist attacks by the group reported in GTD. Note that because parameters are estimated for each group individually, no group and period fixed effects are included, and negative binomial regression can be consistently estimated. As expected, the simulated datasets contain substantially more terrorist attacks than GTD.

Assume that media only report terrorist attacks with some probability. For each of the 100 simulated datasets of terrorist attacks, I simulate the number of *reported* terrorist attacks for each group in each month. The number of reported terrorist attacks is randomly drawn from a binomial distribution, where n equals the simulated number of terrorist attacks and p equals 1 for the six months after a drone hit, $P(report|miss) = [0.05, 0.1, 0.15...0.95, 1]$ for the six months after a miss, and $P(report|none) = [0.1, 0.2...0.9, 1]$ for all other group-months. For each of the 84 combinations of probabilities allowed by the assumption $P(report|miss) > P(report|none)$, I simulate the number of reported terrorist attacks 10 times, resulting in a total of 84.000 iterations.

I run specification 1 in the main text for each iteration. The test statistic is the share of regressions that give a statistically significant coefficient estimate on at least one lag of hit. Recall that the analysis in the main paper gives three such significant coefficients.

Table B.1 reports the results from the simulation. It displays all combinations of $P(report|miss)$ and $P(report|none)$ for which $P(report|miss) > P(report|none)$, and the corresponding share of simulated regressions that result in a statistically significant coefficients on at least one of the six lags of hit. To obtain a single statistically significant coefficient with 95% certainty, media would have to report all terrorist attacks by a group after a drone strike hit its leader and only approximately 65% of terrorist attacks by the group after a drone strike missed its leader. The share of terrorist attacks reported by the media reported in the period not following either a hit or a miss does not strongly affect this conclusion. This seems a high level of reporting bias, especially over a six-month time frame and considering that the analysis in the main paper obtains three statistically significant coefficients.

B.2.2 Terrorist attacks with an unknown perpetrator

A second type of bias might arise because GTD records the perpetrator of a terrorist attack with error, and often cannot attribute terrorist attacks to a particular terrorist group. If there is a group-specific time trend in whether the media, and thus GTD, attribute terrorist attacks to a terrorist group, this could bias the analysis. For it to do so, this trend would have to be correlated with the probability that a drone strike targeting the group's leader succeeds in killing him.

Figure B.6 shows the number of terrorist attacks in GTD over time that are and are not attributed to a known perpetrator. The numbers of attributed and unattributed attacks track each other fairly closely for the nine years of the research period. However, they diverge for the last three years, after 2013, which could introduce bias if trends in the probability that GTD attributes a terrorist attack to a group

TABLE B.1. Simulation of reporting bias

P(report | none)	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
P(report | miss)									
0.95	.49	.496	.5	.489	.486	.471	.427	.386	.304
0.90	.58	.588	.585	.568	.554	.535	.503	.452	.374
0.85		.683	.682	.677	.658	.637	.59	.527	.439
0.80		.774	.78	.771	.77	.726	.703	.633	.545
0.75			.863	.863	.859	.851	.823	.765	.646
0.70			.91	.918	.905	.913	.888	.864	.782
0.65				.956	.954	.951	.944	.93	.888
0.60					.985	.989	.986	.963	.943
0.55					.999	.999	.998	.994	.975
0.50						1	1	1	.996
0.45						1	1	1	1
0.40							1	1	1
0.35							1	1	1
0.30								1	1
0.25								1	1
0.20									1
0.15									1

This table displays the share of simulated regressions with at least one coefficient statistically significant at the 5% level at the given probability that media report an attack by a terrorist group in the six months after a drone miss on its leader, and given no drone attempt on its leader respectively. Probability of media reporting an attack by a terrorist group in the six months after a drone hit on its leader is set to 1.

in the main dataset correlate to trends in the probability that a drone attempt on those groups' leaders' lives succeeds.

Figure B.7 investigates whether drone hits on the leaders of the thirteen terrorist groups in the main dataset correlate to the number of unattributed terrorist attacks worldwide. For this purpose, I aggregate the main dataset to the month level, for each month taking the maximum of the indicators *hit* and *targeted* and sum of the number of all drone strikes, regardless of whether they target a leader, which functions as a control variable. The dependent variable is the logged number of terrorist attacks with an unknown perpetrator in GTD. As is evident from Figure B.7, the number of unattributed terrorist attacks is unrelated to drone hits. Coefficients on all leads and lags of *hit* are individually and jointly insignificant.

I use a simulation to further investigate the sensitivity of the main results to bias resulting from

FIGURE B.6. Terrorist attacks attributed and unattributed to a terrorist group in GTD over time

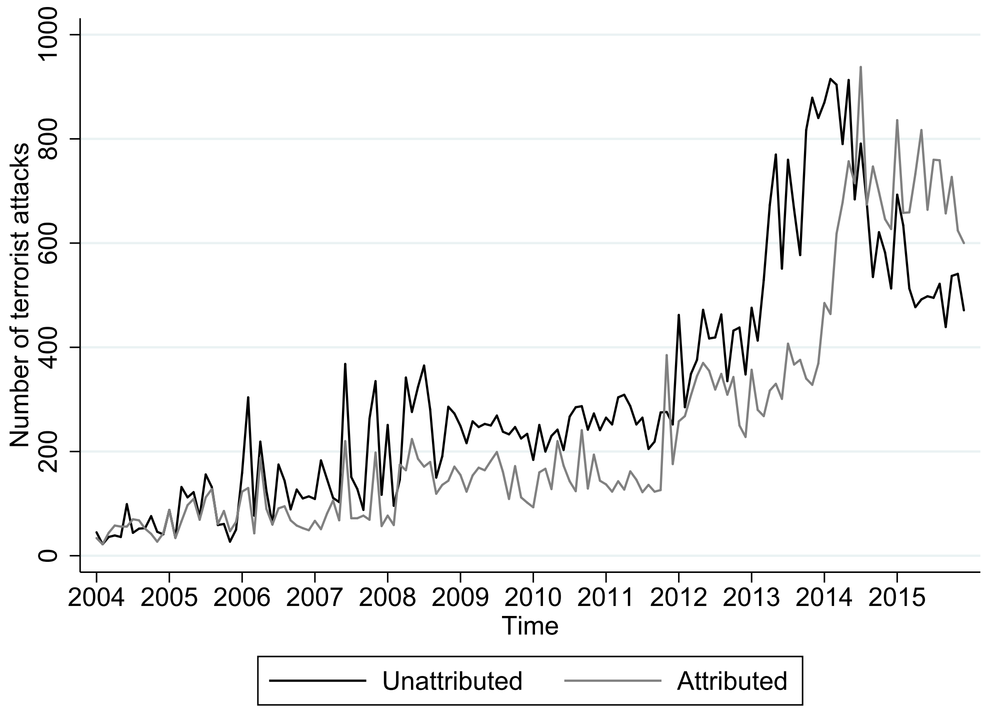


FIGURE B.7. Relationship between a drone hit and unattributed terrorist attacks

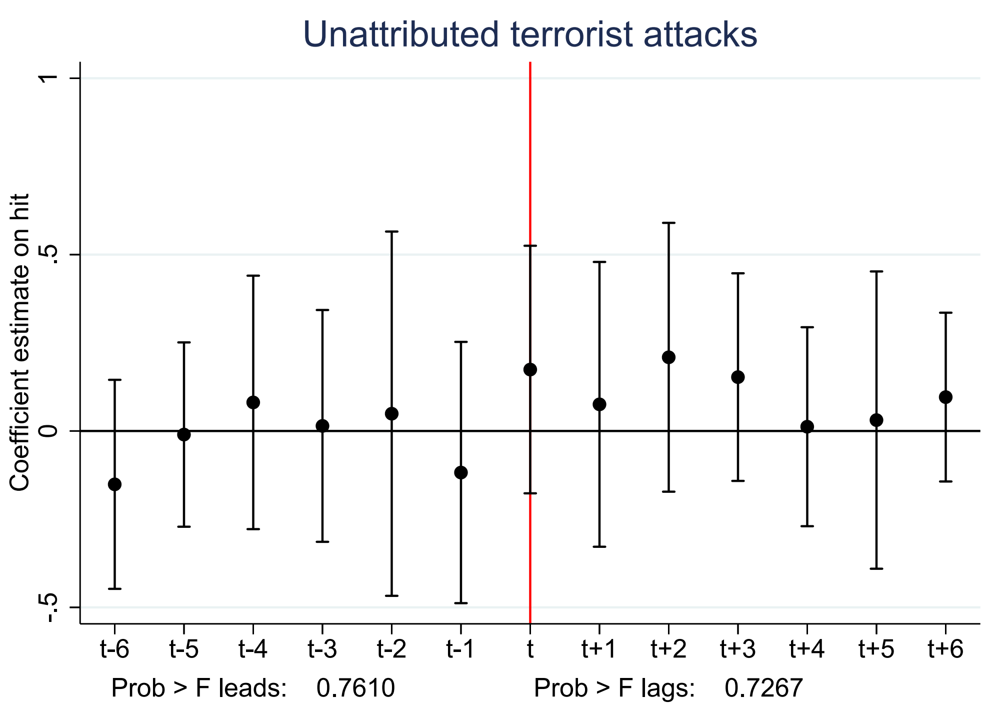


TABLE B.2. Simulation of bias in allocating attacks by unknown perpetrator

Lag of hit	Lower bound implied 96% CI	Upper bound implied 96% CI
t+1	.1366357	.4089971
t+2	.2682199	.5916294
t+3	.3482034	.5850728
t+4	.0417288	.382581
t+5	-.0357263	.2542275
t+6	.1377445	.4724822

This table displays 2th and 98th percentile of simulated coefficients obtained when allocating terrorist attacks with an unknown perpetrator to terrorist groups included in this study based on the 3-month rolling share of worldwide terrorist attacks with a known perpetrator that these groups committed

unattributed terrorist attacks. For this simulation, I attribute a share of terrorist attacks GTD classifies as committed by an "unknown" perpetrator to each of the thirteen groups in the main dataset. This is done using random draws from a binomial distribution, where n equals the total number of unattributed terrorist attacks worldwide and p equals the three-month rolling average of the share of worldwide terrorist attacks with a known perpetrator that GTD attributes to each group. This introduces a flexible, group-specific time trend in the probability that an unattributed terrorist attack should in reality have been attributed to one of the thirteen terrorist groups. Draws are repeated 1000 times. The number of attacks newly attributed to the terrorist group is added to the number of terrorist attacks by the group in GTD and this sum is logged. Specification 1 in the main text is run on each simulated dataset.

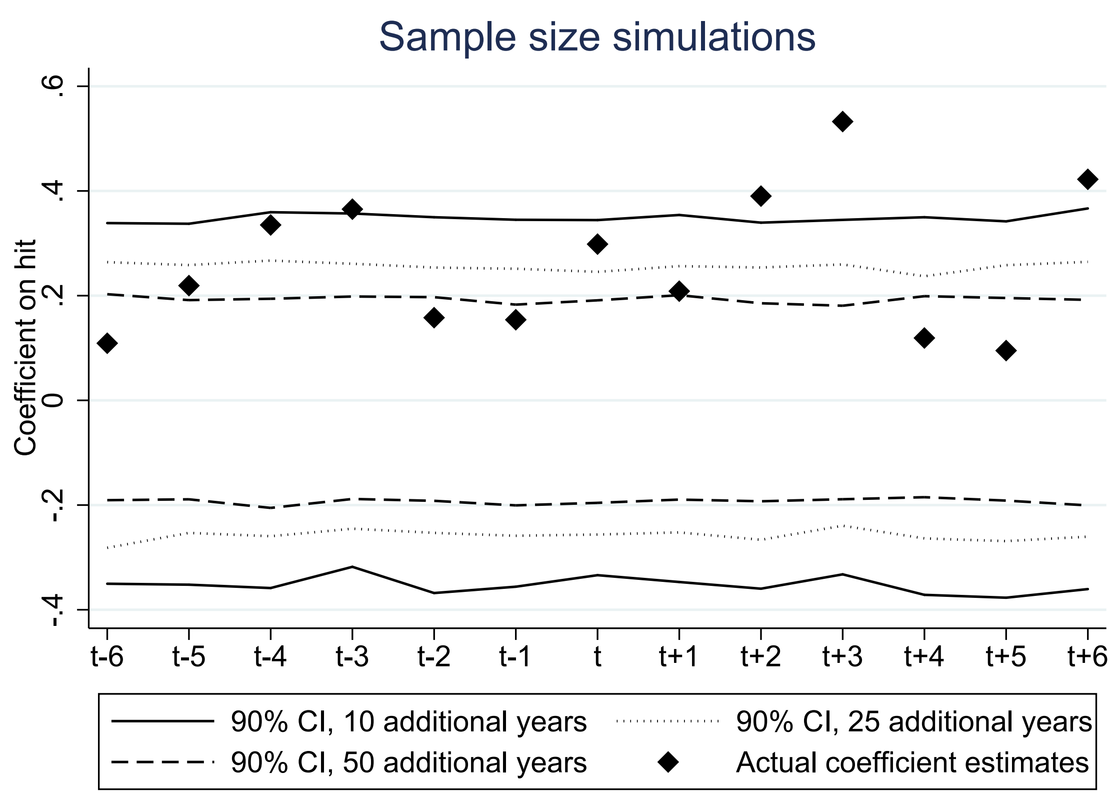
Table B.2 contains the results of this simulation. It displays the 2^{nd} and 98^{th} percentile of the distribution of coefficients for each of the six lags of *hit*, which constitutes the upper and lower bound of a simulated 96% confidence interval. Implied confidence intervals for 5 out of 6 coefficients are positive and exclude zero. In 88% of simulated regressions, the coefficient on at least one of the lags of *hit* is statistically significant.

This simulation constitutes a fairly strict test of the impact of reporting bias resulting from unattributed terrorist attacks. Several of the thirteen terrorist groups in the main dataset are high-profile organizations, and we might expect that the share of terrorist attacks with a known perpetrator attributed to them by GTD exceeds the share of terrorist attacks with an unknown perpetrator mistakenly *not* attributed to them. Given simulated confidence intervals and statistical significance of simulated individual coefficients, we can conclude that results obtained in the main paper largely hold in this strict test.

B.3 Simulations of expanded sample size

By expanding the sample using simulated data, this section explores whether the lack of statistical significance of the coefficients on individual lags (or leads) of *hit* is due to a small sample size. The main results, in which three lags and none of the leads carry statistically significant coefficients, are based on 12 years of data, and 45 hits and misses on terrorist leaders.

FIGURE B.8. Sample size simulations



To expand the dataset, I add additional years to the end of the dataset, in five-year increments. Data on terrorist attacks, drone hits and misses on terrorist leaders, and number of drone strikes for all additional periods is drawn randomly based on the actual group-specific distribution of these variables. Data on terrorist attacks (drone strikes) is drawn from a negative binomial distribution, where parameters r and p differ by terrorist group and are estimated using the actual data. The negative binomial distribution is chosen because it outperforms the Poisson distribution in a likelihood-ratio test for ten (five in the case of drone strikes) of the thirteen groups, and because there is no evidence that a zero-inflated negative binomial distribution outperforms the negative binomial distribution for any of the groups. Note that because parameters are estimated for each group individually, no group and period fixed effects are included, and negative binomial regression can be consistently estimated. Data on drone hits and misses is drawn from a binomial distribution, where n equals one and p equals the actual group-specific probability of a drone hit or miss on a terrorist leader respectively.

Draws are repeated one thousand times for each sample size, and specification 1 in the main text is run on each simulated dataset. The 5th and 95th percentile of the resulting thousand coefficients demarcate the simulated 90% confidence interval for a given sample size. Figure 8 displays these 90% confidence intervals, together with the main results, the actual coefficient estimates obtained when running specification 1 in the main text on the original sample.

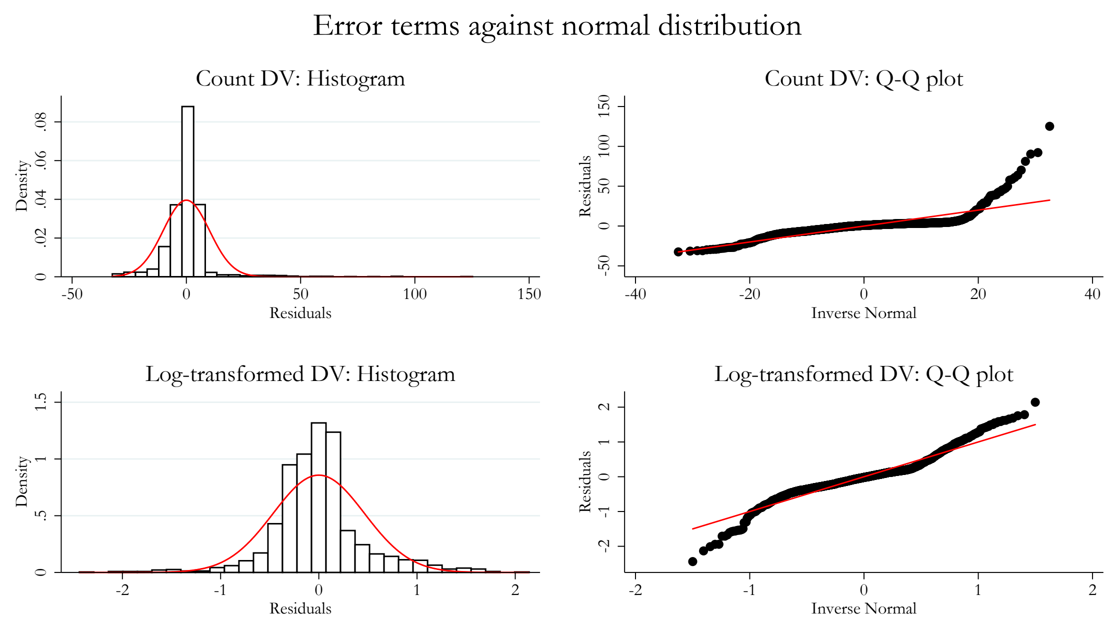
Simulations suggest that the sample size would have to be radically expanded to make a meaningful difference to the statistical significance of individual coefficients. Only after expanding the sample with fifty additional simulated years, more than quintupling the original dataset in size, do more coefficients on lags of *hit* gain statistical significance at the 10% level. This suggests that the first, fourth and fifth lag of *hit* are null. A similar observation holds for the leads of *hit*, although a single lead gains statistical significance after adding ten additional simulated years to the dataset, and one gains statistical significance after adding 25 additional years of data. Even when radically expanding the dataset, simulations never indicate an immediate (i.e. in the same month, or the month immediately following) effect of a drone hit on a terrorist leader compared to a drone miss. Nor do results of any of the simulations indicate a divergence in trends between a hit and a miss in the two months immediately preceding the drone strike.

B.4 Choice of econometric specifications

The preferred specification in the main paper is OLS, using a logged count of terrorist attacks as a dependent variable. For the particular specification presented in the main paper, using OLS has several advantages over using negative binomial regression, a commonly used alternative.

To estimate p-values for the statistical significance of individual coefficients, OLS relies on the assumption that residuals are normally distributed. Figure B.9 suggests that residuals of an OLS regression on a logged count of terrorist affects are indeed approximately normally distributed (bottom panel). This assuages concerns that standard errors from the OLS regressions in the main paper are biased downward due to non-normal distribution of residuals. The same cannot be said for the distribution of residuals from an OLS regression using the raw count of terrorist attacks as a dependent variable, which in places deviates from the normal distribution (top panel). This provides a clear argument for taking the log of terrorist attacks ($ln(attacks + 1)$) as a dependent variable.

FIGURE B.9. Distribution of error terms from OLS



The main argument against using negative binomial regression to analyze the raw count of terrorist attacks, is that unconditional fixed effects negative binomial regression has been shown to give inconsistent and biased results in the presence of many fixed effects (Hilbe 2011; Allison 2012). Specification 1 in the main text contains 145 fixed effects, well above the threshold of 20 that Hilbe (2011) gives as a rule of thumb for what constitutes 'many'. Simulations show that potential bias is small in size in particular cases (e.g. Allison and Waterman (2002)). However, these simulations investigate a case markedly different from the one presented in the main paper: simulations investigate cases with many cross-sectional and no time-fixed effects, whereas specification 1 in the main text has few cross-sectional and many time-fixed effects. As such, the extent of bias that using unconditional fixed effects negative binomial regression would introduce to the present analysis is not known. Alternatively, one might use conditional fixed effects negative binomial regression. Although this does give consistent results this has long been shown to not be a true fixed effects estimator and it has fallen into disuse (Allison and Waterman 2002). Hence, although results from both specifications are presented in section B.5, these should be treated with caution.

Other count models, notably Poisson regression, can be consistently estimated in the presence of fixed effects. However, Poisson regression and zero-inflated Poisson regression suffer from overdispersion. A likelihood ratio test rejects the hypothesis that the overdispersion parameter is zero ($p < 0.0000$), implying that Poisson-estimated standard errors are biased downward. Zero-inflated negative binomial regression is subject to the same problems as negative binomial regression.

Using OLS as the main specification is also advantageous because it allows the use of Newey-West standard errors robust to autocorrelation. As the present analysis involves a long time series, autocorrelation is a serious concern. Newey-West standard errors cannot be readily estimated for count models.

B.5 Alternative econometric specifications

Table B.3 investigates the robustness of the main results (reproduced in column 1) to the use of alternative econometric specifications.

To investigate whether the joint statistical significance of the coefficients on the lags *hit* is an artefact of the inclusion of the leads of *hit*, column 2 presents the main results excluding all lead variables. Main results are unaffected. Similarly, the lack of joint statistical significance of the coefficients on the leads of *hit* does not depend on the inclusion of the lags of *hit* (column 3). Column 4 restricts the analysis to periods within 6 months of a drone strike targeting a leader of some terrorist group. Again, results are unaffected. The model in column 5 includes linear group-time trends instead of period-fixed effects, giving results very similar to the main results. As column 6 shows, results are somewhat sensitive to using HAC instead of Newey-West standard errors: although the third lag of *hit* is still statistically significant at the 5% level, the coefficients on lags are no longer jointly statistically significant at conventional levels ($p = 0.1150$). Main results are robust to using Driscoll-Kraay standard errors (column 7).

Columns 8 and 9 estimate specification 1 in the main text using negative binomial regression instead of OLS, taking the raw count of terrorist attacks as a dependent variable. As highlighted in section B.4, these results should be taken with caution: unconditional negative binomial regression has been shown to give inconsistent results in the presence of many fixed effects, and conditional negative binomial regression is not a true fixed effects estimator. Keeping these caveats in mind, results are weakened when using either estimator. None of the resulting individual coefficients on lags of *hit* are statistically significant in column 8, and only one coefficient is statistically significant at the 10% level in column 9. However, in both regressions, coefficients on *hit* are jointly statistically significant at the 5% level. For both regressions, the p-value for joint significance is obtained using a likelihood ratio test, not an Wald test as is the case for linear models.

Table B.4 presents a final set of robustness checks. Drone misses are measured with error: a leader may have been targeted by a particular drone strike, but this may be unobserved by the media or the BIJ. Hence one may be concerned that the main results are an artefact of this measurement error. Therefore, columns 2 and 3 investigate alternative counterfactuals for a drone hit that may be more easily observed. In column 2 any drone strike not killing a terrorist leader is taken as a counterfactual. In column 3, any drone strike in which a leader is named, but not necessarily targeted is considered a counterfactual. These include drone strikes targeting militants closely associated with the leader, locations associated with the terrorist leader – commonly a known residence – or family members of the terrorist leader. Coefficient estimates on *hit* are similar to those obtained in the baseline model (column 1), and they are strongly jointly statistically significant (1% level). These are not the preferred specifications however, as it becomes more difficult to substantiate the parallel trends assumption. In column 3 leads of *hit* are jointly statistically significant, albeit only at the 10% level. Perhaps unsurprisingly, groups that have their militants but not their leaders (or individuals or locations associated with their leaders rather than their leaders themselves) targeted may already commit an increasing number of terrorist attacks prior to a drone strike.

TABLE B.3. Alternative econometric specifications

VARIABLES	(1) Baseline Terr.att.	(2) Only lags Terr.att.	(3) Only leads Terr.att.	(4) <7 mnths from targeted Terr.att.	(5) Baseline Terr.att.	(6) Baseline Terr.att.	(7) Baseline Terr.att.	(8) Uncond. Neg. bin. Terr.att.	(9) Cond. Neg. bin. Terr.att.
t	0.298	0.233		0.289	0.147	0.298	0.298	0.0127	-0.0991
	(0.191)	(0.186)		(0.185)	(0.152)	(0.227)	(0.256)	(0.222)	(0.255)
t+1	0.209	0.120		0.187	-0.00636	0.209	0.209	0.0368	0.0671
	(0.193)	(0.192)		(0.187)	(0.152)	(0.230)	(0.198)	(0.347)	(0.263)
t+2	0.390**	0.374*		0.363*	0.195	0.390	0.390	0.0853	0.0994
	(0.191)	(0.194)		(0.185)	(0.152)	(0.266)	(0.255)	(0.225)	(0.248)
t+3	0.533***	0.537***		0.517***	0.291*	0.533***	0.533***	0.534	0.453*
	(0.191)	(0.190)		(0.185)	(0.151)	(0.198)	(0.185)	(0.478)	(0.257)
t+4	0.119	0.130		0.104	-0.0455	0.119	0.119	-0.126	-0.238
	(0.194)	(0.194)		(0.188)	(0.152)	(0.260)	(0.269)	(0.111)	(0.262)
t+5	0.0951	0.0363		0.0785	-0.0517	0.0951	0.0951	-0.170	-0.105
	(0.189)	(0.191)		(0.183)	(0.149)	(0.191)	(0.142)	(0.171)	(0.271)
t+6	0.422**	0.300		0.394**	0.198	0.422	0.422**	0.400	0.364
	(0.192)	(0.184)		(0.186)	(0.152)	(0.275)	(0.210)	(0.341)	(0.269)
Observations	1,577	1,655	1,655	1,368	1,577	1,577	1,577	1,577	1,577
R-squared	0.850	0.847	0.836	0.869	0.891	0.850	0.850		
Includes 6 leads	YES	NO	YES	YES	YES	YES	YES	YES	YES
Group FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Month FE	YES	YES	YES	YES	NO	YES	YES	YES	YES
Group-Month trend	NO	NO	NO	NO	YES	NO	NO	NO	NO
Standard errors	N. West	N. West	N. West	N. West	N. West	HAC	Drisc.-Kr.	Clustered	IOM
p-val lags hit	0.0236	0.0292		0.0273	0.1760	0.1150	0.0228	0.0431	0.0179
p-val leads hit	0.6137		0.3193	0.6125	0.7345	0.9258	0.9609	0.3023	0.1920
p-val lags targeted	0.8760	0.7974		0.8983	0.6576	0.9707	0.9493	0.1194	0.1140
p-val leads targeted	0.2688		0.4640	0.2853	0.0937	0.6053	0.0489	0.2745	0.0622
Control mean	1.9450	1.9450	1.9450	1.9450	1.9450	1.9450	1.9450	11.0792	11.0792

Standard errors in parentheses

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

TABLE B.4. Alternative counterfactuals and further robustness

VARIABLES	(1) Baseline Terr.att.	(2) Cntrfac: drone strike Terr.att.	(3) Cntrfac: leader named Terr.att.	(4) Only < Sept. 2015 Terr.att.	(5) Drop 2 small gr. Terr.att.	(6) Region-Gr.-mnth Terr.att.	(7) Region-Gr.-mnth Terr.att.	(8) Region-Gr.-mnth Terr.att.	(9) Exp. sample Terr.att.
t	0.298	0.209	0.385**	0.298	0.459*	0.124	0.124***	0.124	0.396*
	(0.191)	(0.141)	(0.156)	(0.191)	(0.235)	(0.101)	(0.0469)	(0.103)	(0.222)
t+1	0.209	0.120	0.204	0.209	0.381	0.0308	0.0308	0.0308	0.255
	(0.193)	(0.143)	(0.158)	(0.193)	(0.239)	(0.102)	(0.0471)	(0.104)	(0.219)
t+2	0.390**	0.299**	0.448***	0.390**	0.760***	0.109	0.109**	0.109	0.472*
	(0.191)	(0.142)	(0.158)	(0.191)	(0.236)	(0.0980)	(0.0463)	(0.100)	(0.280)
t+3	0.533***	0.480***	0.530***	0.533***	0.778***	0.135	0.135***	0.135	0.585***
	(0.191)	(0.142)	(0.158)	(0.191)	(0.237)	(0.100)	(0.0472)	(0.103)	(0.185)
t+4	0.119	0.214	0.174	0.119	0.433*	0.0688	0.0688	0.0688	0.233
	(0.194)	(0.144)	(0.159)	(0.194)	(0.242)	(0.107)	(0.0486)	(0.110)	(0.276)
t+5	0.0951	0.130	0.0885	0.0951	0.297	0.0162	0.0162	0.0162	0.202
	(0.189)	(0.146)	(0.161)	(0.189)	(0.230)	(0.106)	(0.0481)	(0.109)	(0.172)
t+6	0.422**	0.512***	0.456***	0.422**	0.980***	0.0871	0.0871*	0.0871	0.454*
	(0.192)	(0.147)	(0.162)	(0.192)	(0.229)	(0.111)	(0.0525)	(0.113)	(0.264)
Observations	1,577	1,577	1,577	1,577	1,313	6,308	6,308	6,308	10,421
R-squared	0.850	0.849	0.852	0.850	0.869	0.276	0.842	0.290	0.753
Group FE	YES	YES	YES	YES	YES	YES	NO	YES	YES
Period FE	YES	YES	YES	YES	YES	YES	YES	NO	YES
Region FE	NO	NO	NO	NO	NO	YES	NO	NO	NO
Region-group FE	NO	NO	NO	NO	NO	NO	YES	NO	NO
Region-period FE	NO	NO	NO	NO	NO	NO	NO	YES	NO
Prob > F lags hit	0.0236	0.0009	0.0020	0.0236	0.0000	0.438	0.0294	0.460	0.0365
Prob > F leads hit	0.6137	0.1203	0.0571	0.614	0.0701	0.523	0.0201	0.544	0.8714
Prob > F lags targeted	0.8760			0.876	0.7061	0.953	0.823	0.956	0.9542
Prob > F leads targeted	0.2688			0.269	0.8737	0.704	0.335	0.717	0.5762
Control mean	1.9450	1.9450	1.9450	1.945	1.9450	0.574	0.574	0.574	1.9450

Newey-West standard errors in parentheses, column (9) displays HAC standard errors
* p<0.1 ** p<0.05 *** p<0.01

Results are unaffected when excluding periods after September 2015, the month in which the Pakistani military acquired its own weaponized drones (Column 4).

Some may be concerned that the probability of a hit on a terrorist leader conditional on a leader being targeted is different for the leaders of large compared to small terrorist groups and that these small groups would somehow drive the main results. However, main results are robust to excluding two groups which commit substantially fewer attacks, the Haqqani network and Harkat-ul-Jihad-al-Islami (column 5).

Up to this point, the dependent variable in all regressions is an aggregation of all terrorist attacks committed by a group globally. One might worry about the existence of region-time specific factors (for instance holidays or other occasions which may be a target of terrorist groups) that could be correlated to level of effort to hit leaders of groups active in these regions. One might have similar worries about group-region specific factors, such as differential ability of groups to commit terrorist attacks in different regions. Therefore, the final three columns of Table B.4 re-estimates the baseline model at the group-region-month level, distinguishing four regions (Western Europe, the US and Australia, Asia, Middle East and North Africa). Models include region-fixed effects (column 6), region-time fixed effects (column 7) and region-group fixed effects (column 8) respectively. Estimates for these three models are extremely similar, as there is limited variation across regions between groups (many groups commit terrorist attacks only in a single region) and limited variation over time across regions (two regions do not experience any terrorist attacks in most time periods). In all three models, the size of the coefficients decreases, as these now represent the impact of a drone hit per month, group and region, and they are not individually statistically significant in columns 6 and 8. This loss in statistical significance follows exclusively from an increase in the size of the standard errors, not from a decrease in coefficient size. As such, the loss of significance in those columns is likely a result of introducing substantial noise into the dataset, rather than the fixed effects capturing some omitted variable. Coefficients on lags of *hit* are individually and jointly statistically significant in column 7.

Column 9 displays the results obtained when running specification 1 in the main text on an expanded sample, adding all terrorist organizations that committed more than one terrorist attack in Afghanistan or Pakistan over the research period. This specification employs HAC standard errors, as adding these observations introduces strong heteroskedasticity. Results are very similar to those presented in the main text.

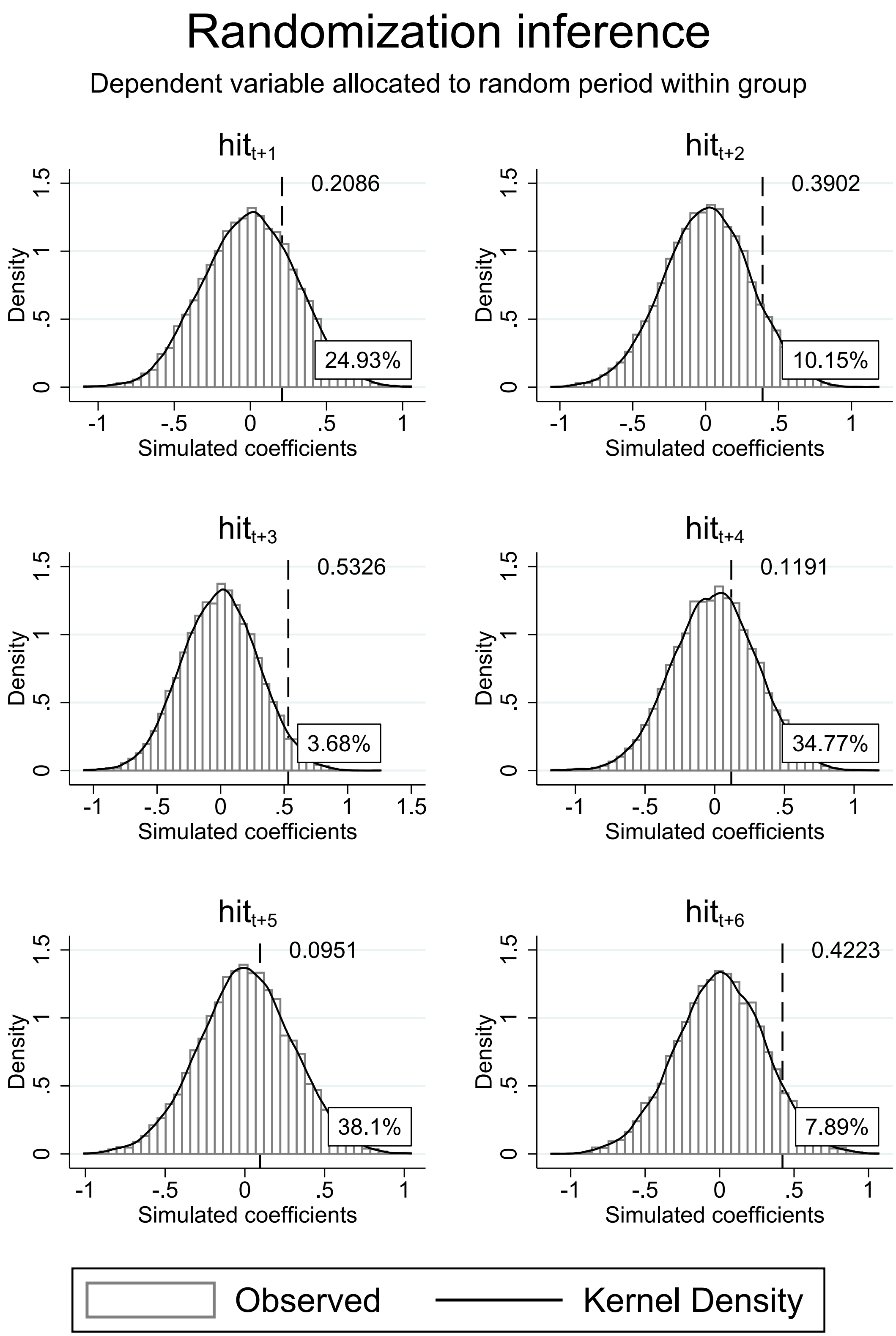
B.6 Randomization inference

The empirical strategy in the main paper can be considered a quasi-experiment with a small number of clusters (i.e. terrorist groups) and several treatment coefficients (i.e. lags of *hit*). Under these circumstances, we may worry that either outliers or multiple testing can lead to false conclusions regarding the statistical significance of the main results (Young 2017). Furthermore, even though the distribution of residuals from an OLS regression on the logged number of terrorist attacks resembles the normal distribution (see Figure B.9), there may be lingering concerns about the OLS assumption that residuals are normally distributed.

To mitigate these concerns, I estimate standard errors by randomization inference. Within each terrorist group, I re-allocate the logged number of terrorist attacks randomly to some other time period and run specification 1 in the main text on the resulting dataset. Doing this repeatedly gives an indication of how exceptional the coefficients making up the main results are in a universe of 10,000 possible random assignments of the outcome variable. Note that this determination can be made on the basis of simulated coefficients alone, and does not require any assumption regarding the distribution of standard errors.

Figure B.10 gives the distribution of simulated coefficients for each lag of *hit*, and the actual coefficients from the main paper. The percentages in the white boxes reflect the percentage of simulated coefficients that are larger than the actual coefficient, providing a simulated p-value. The third and sixth lag of *hit* are statistically significant by this metric, albeit at a lower level of significance for the sixth lag. The second lag of *hit* is narrowly no longer statistically significant at conventional levels. Overall, results from estimating standard errors using randomization inference are qualitatively similar to the main results.

FIGURE B.10. Results from randomization inference



B.7 Alternative numbers of leads and lags

Table B.5 illustrates that main results are not an artefact of choosing six as the particular number of leads and lags of the variables of interest to include. The table gives the p-value for each lag of *hit* in specification 1 in the main text, varying the number of leads and lags of all variables included between four and fifteen. Coefficient estimates on most lags of *hit* are similar across the nine models. The second and third lag of *hit* is statistically significant at the 5% level in each of the twelve cases. The significance of the sixth lag of *hit* is somewhat sensitive to the number of leads and lags included, but still statistically significant in six out of ten regressions in which it is included. No coefficient on any lag of *hit* beyond the seventh is ever statistically significant.

TABLE B.5. p-values on lags of hit when varying number of leads and lags (L&L) included

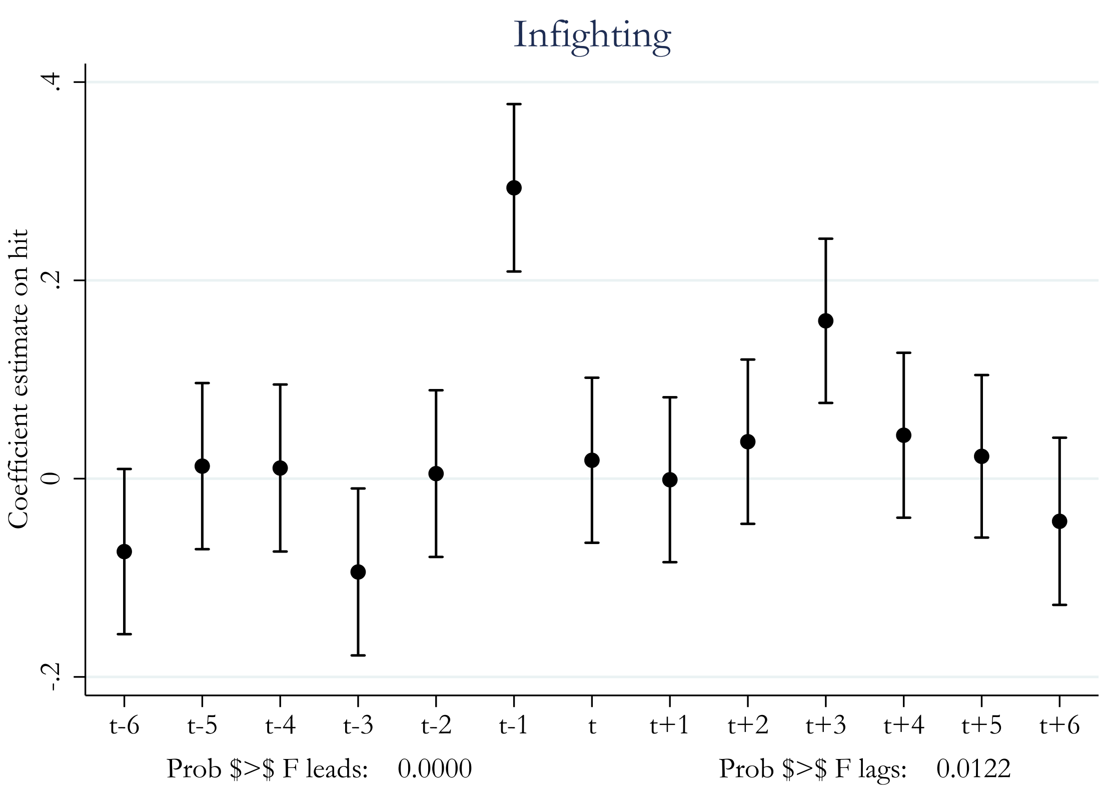
# L&L	t+1	t+2	t+3	t+4	t+5	t+6	t+7	t+8	t+9	t+10	t+11	t+12	t+13	t+14	t+15
4	.576	.048	.001	.353											
5	.552	.032	.003	.415	.626										
6	.277	.041	.005	.537	.614	.029									
7	.299	.028	.006	.495	.449	.066	.32								
8	.327	.023	.004	.272	.533	.125	.341	.253							
9	.285	.017	.003	.24	.378	.137	.237	.335	.926						
10	.242	.016	.004	.16	.418	.161	.215	.529	.957	.185					
11	.541	.005	.005	.599	.343	.128	.195	.577	.911	.249	.282				
12	.406	.008	.023	.543	.211	.09	.188	.577	.966	.271	.256	.434			
13	.402	.019	.036	.657	.14	.045	.112	.582	.921	.335	.37	.424	.483		
14	.576	.011	.023	.786	.138	.019	.031	.593	.973	.313	.346	.263	.378	.75	
15	.756	.013	.017	.709	.153	.008	.03	.667	.796	.3	.67	.306	.381	.878	.567

This table displays the p-value for each lag of hit when varying the number of leads and lags of hit, target and control variables between 4 and 15

B.8 Graph of results on infighting

Figure B.11 shows graphically the results on infighting presented in section 6.1 of the main text. It shows that the leads of *hit* are strongly jointly statistically significant, but that this is driven by the first lead of *hit*. Closer examination reveals that this is not an artefact of a single outlier. Therefore, results on infighting should be treated with some caution. However, there is no evidence that trends in infighting differ between a hit and a miss prior to a drone strike for any other time period.

FIGURE B.11. Infighting



C Affiliate groups

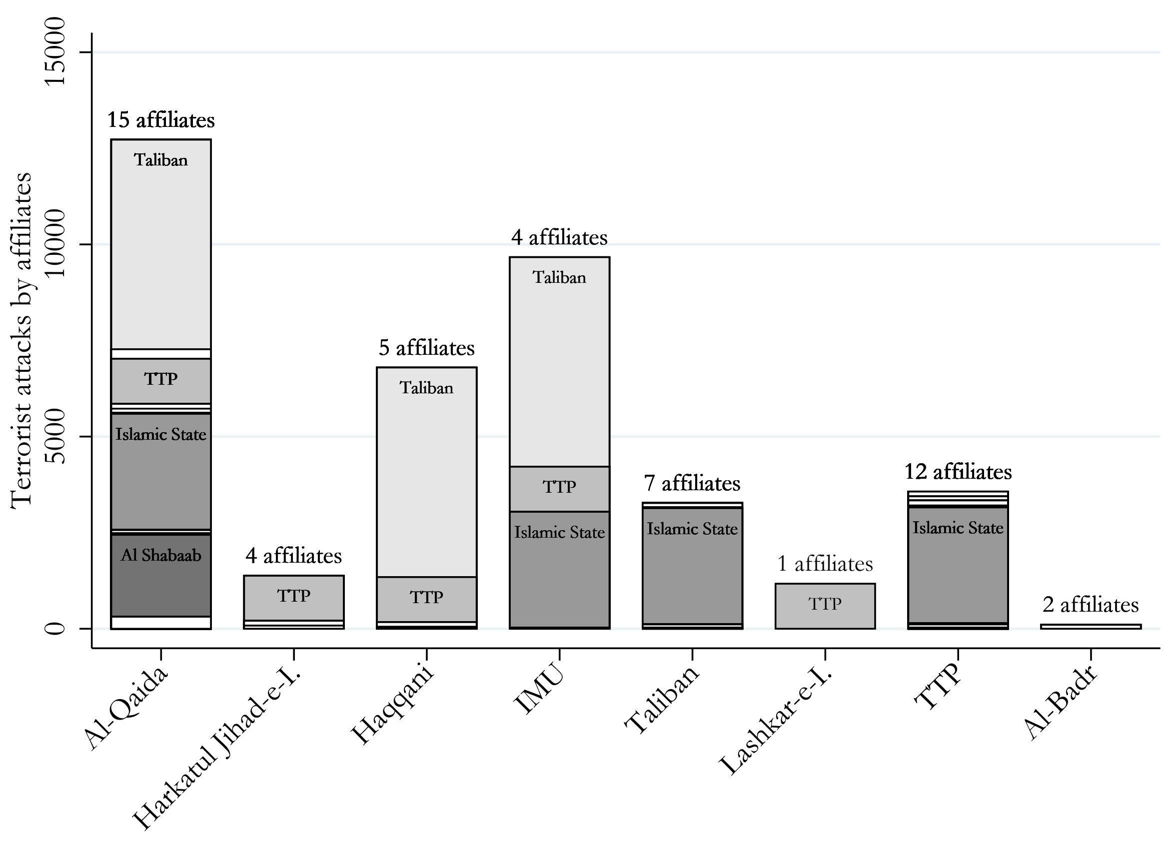
The effect of a drone strike killing the leader of a terrorist group may extend beyond the group itself, to its affiliates[2]. With a few notable exceptions (i.e. Enders and Jindapon (2010) and Siqueira and Sandler (2006)), few theoretical models cover the effect of counterterrorism against a group on the group's affiliates. Both existing models suggest that the effect on affiliates is ambiguous. As such, this paper hopes to contribute to future theory development by providing empirical results for the case of drone strikes.

[2]An affiliate is defined as a terrorist organization that has either (a) pledged fealty to the parent group and relies on it for support or guidance; or (b) shares a similar ideology or goals and coordinates operations with the parent group; (c) once operated under the same banner as the parent group and consolidated resources with the parent (Crenshaw 2012).

C.1 Drone hits on parent groups and affiliate attacks

To investigate the impact of the death of a group's leader on affiliated terrorist groups, I record all affiliations, alliances and mergers involving the thirteen terrorist groups identified by Crenshaw (2012), and locate the terrorist groups involved in the GTD. For the purpose of this paper, any terrorist group that was ever affiliated, allied or merged with one of the thirteen groups is considered an affiliate. Figure C.12 shows the distribution of affiliates for those terrorist organizations coded as having any. Al-Qaida has the most affiliations, both in terms of the number of affiliates and the number of attacks they commit, although most other terrorist organizations included in the dataset have substantial affiliations as well.

FIGURE C.12. Distribution of affiliates by terrorist organization



To estimate the effect of killing a group's leader on attacks by affiliated terrorist groups, I employ the following specification:

$$Y_{jit} = \sum_{k=-6}^{6} \beta_{i,t-k} hit_{i,t-k} + \sum_{k=-6}^{6} \delta_{i,t-k} targeted_{i,t-k} + \sum_{k=-6}^{6} \rho_{j,t-k} hit_{j,t-k} + \sum_{k=-6}^{6} \phi_{j,t-k} targeted_{j,t-k} \quad (1)$$
$$\gamma_{i,t-k} X_{i,t-k} + \psi_{j,t-k} X_{j,t-k} + \mu_j + \theta_t + \epsilon_{jit}$$

where Y_{jit} represents the logged number of terrorist attacks perpetrated by group j affiliated to parent group i. The coefficients of interest are the coefficients on the lags of hit_i, which represent the effect of a drone hit (compared to a miss) on the parent group on violence perpetrated by the affiliate. As some groups are both parent group and affiliate, this specification controls for drone misses and hits on the leaders of the affiliate groups. Similarly, six leads and lags of the number of drone strikes targeted at both parent and affiliate (regardless of whether these targeted a leader) are included as control variables. Inclusion of affiliate-group fixed effects (μ_j), makes including parent-group fixed effects redundant.

Affiliates of a terrorist group commit an increasing number of terrorist attacks after a drone strike that hit, compared to missed, the parent group's leader. Table C.1 investigates the impact of a drone hit on a terrorist group leader on terrorist attacks committed by other terrorist groups affiliated with the group struck. I present results at the group-month level (specification 1 in the main text), and at the affiliate-month level, following specification 1 in this Appendix.

Column 1 and 3 show that a drone hit on a parent group is associated with an increase in terrorist attacks by affiliates of that group. For the regression at the group-month level (column 1), three coefficients on the lags of hit are individually statistically significant, although coefficients are not jointly statistically significant. This effect is substantial in size: estimates in column 1 suggest an increase in terrorist attacks by affiliates of between 59.2% and 83.7% for the months in which it is significant. For reference, the mean number of terrorist attacks by affiliates per month in the six months after a drone miss on the parent's leader is approximately 23. There is no evidence that drone strikes targeting but missing the parent group's leader affect affiliates: coefficients on leads and lags of $targeted$ are jointly statistically insignificant.

These results at the group-month level are strongly influenced, but not exclusively driven, by Al-Qaida, the terrorist group with the most affiliates. Column 2 of Table C.1 presents results excluding

TABLE C.1. Effect of drone strikes on attacks by affiliates

VARIABLES	(1) Affil. att.	(2) Affil. att. excl. AQ	(3) Affil. att.	(4) Affil. att. excl. ISIS
t	0.487*	0.283	0.151	0.0978
	(0.272)	(0.340)	(0.103)	(0.0913)
t+1	0.106	-0.194	0.0338	-0.0155
	(0.279)	(0.354)	(0.104)	(0.0920)
t+2	0.498*	0.370	0.0186	-0.0423
	(0.274)	(0.346)	(0.104)	(0.0921)
t+3	0.327	0.0105	0.213**	0.139
	(0.273)	(0.340)	(0.106)	(0.0937)
t+4	0.465*	0.250	0.189*	0.120
	(0.280)	(0.342)	(0.108)	(0.0956)
t+5	0.342	0.280	0.0138	-0.0548
	(0.272)	(0.336)	(0.106)	(0.0942)
t+6	0.608**	0.661*	0.163	0.0707
	(0.273)	(0.353)	(0.102)	(0.0906)
Observations	1,577	1,445	3,312	3,168
R-squared	0.857	0.830	0.657	0.706
Model	Gr.-mnth	Gr.-mnth	Affil.-mnth	Affil.-mnth
Group FE	YES	YES	NO	NO
Period FE	YES	YES	YES	YES
Affiliate FE	NO	NO	YES	YES
Prob > F lags hit	0.1798	0.1980		
Prob > F leads hit	0.4739	0.6705		
Prob > F lags targeted	0.6953	0.3656		
Prob > F leads targeted	0.3860	0.4844		
Control mean	3.1340	3.1340	0.5760	0.5497
Prob > F lags parent hit			0.0450	0.0903
Prob > F leads parent hit			0.7786	0.4320
Prob > F lags parent targeted			0.8416	0.9638
Prob > F leads parent targeted			0.9658	0.7308
Prob > F lags affil. hit			0.1297	0.0823
Prob > F leads affil. hit			0.2087	0.1173

Newey-West standard errors in parentheses
* p<0.1 ** p<0.05 *** p<0.01

Al-Qaida. Coefficients on *hit* are no longer jointly statistically significant and only the coefficient on the sixth lag retains statistical significance, and that only at the 10% level.

Evidence at the affiliate-month level are somewhat stronger compared to those at the group-month level. Estimates suggest that a drone hit on the parent group is associated with an increase in terrorist attacks by affiliate groups in month three and four after the drone strike, and these coefficients are jointly statistically significant (column 3). Results at the affiliate-month level are markedly weakened by excluding Islamic State (ISIS) from the analysis (column 4), although coefficients retain joint statistical significance at the 10% level.

C.2 Analysis by attack type

I proceed to analyze which type(s) of terrorist attacks drive the increase in affiliate group violence after a drone hit on their parent group. The increase in terrorist attacks by affiliates, following a drone strike killing the leader of their parent group, is driven by an increase in attack types across the board.

Table C.2, showing results at the group-month level, and Table C.3, showing results at the affiliate-month level, suggest that a drone hit is associate with an increase in terrorist attacks on military, private, and civilian targets, and terrorist attacks with a US citizen killed our wounded.

I find some limited evidence that a drone hit on the parent group's leader negatively affects affiliate capacity. Measuring capacity as the mean number of victims per terrorist attack, results at the group-month level appear to suggest that affiliate capacity decreases in the fifth and sixth month after a drone hit on the parent group's leader (Table C.2, column 2). Coefficients are not jointly statistically significant however, and the result is not reproduced at the affiliate-month level (Table C.3, column 1). At the affiliate-month level, the percentage of 'successful' terrorist attacks by affiliates appears to decrease following a drone hit on the parent group's leader (Table C.3, column 1). This result is not reproduced at the group-month level, although coefficients are consistently negative (Table C.2, column 1).

TABLE C.2. Type of affiliate attack (group-month level)

VARIABLES	(1) % success Affil.att.	(2) mean # vics. Affil.att.	(3) Civilian Affil.att.	(4) Private Affil.att.	(5) Military Affil.att.	(6) US vic. Affil.att.
t	-0.0418	0.470**	0.484*	0.361	0.700***	0.116
	(0.0923)	(0.206)	(0.273)	(0.255)	(0.261)	(0.0956)
t+1	-0.00269	-0.184	0.104	0.440*	0.333	0.365***
	(0.0934)	(0.207)	(0.280)	(0.261)	(0.267)	(0.0963)
t+2	-0.0566	-0.0144	0.480*	0.450*	0.546**	0.0972
	(0.0924)	(0.206)	(0.275)	(0.257)	(0.263)	(0.0956)
t+3	-0.0645	-0.198	0.324	0.111	0.755***	0.258***
	(0.0924)	(0.206)	(0.274)	(0.256)	(0.262)	(0.0956)
t+4	0.00376	-0.260	0.550*	0.560**	0.919***	0.0507
	(0.0933)	(0.207)	(0.281)	(0.262)	(0.268)	(0.0963)
t+5	-0.0335	-0.502**	0.360	0.375	0.478*	0.281***
	(0.0914)	(0.203)	(0.273)	(0.255)	(0.261)	(0.0945)
t+6	-0.0695	-0.411**	0.571**	0.587**	0.678***	0.0210
	(0.0932)	(0.208)	(0.273)	(0.256)	(0.262)	(0.0968)
Observations	1,577	1,577	1,577	1,577	1,577	1,577
R-squared	0.770	0.682	0.853	0.788	0.788	0.510
Model	Gr.-mnth	Gr.-mnth	Gr.-mnth	Gr.-mnth	Gr.-mnth	Gr.-mnth
Group FE	YES	YES	YES	YES	YES	YES
Period FE	YES	YES	YES	YES	YES	YES
Prob > F lags hit	0.9589	0.1963	0.1961	0.0844	0.0184	0.0008
Prob > F leads hit	0.9534	0.7826	0.4140	0.7475	0.1441	0.0828
Prob > F lags targeted	0.9766	0.5147	0.8548	0.2920	0.3859	0.0406
Prob > F leads targeted	0.7522	0.8471	0.3792	0.5927	0.4531	0.1711
Control mean	0.8767	1.6992	3.0501	2.2180	1.8051	0.2608

Newey-West standard errors in parentheses
* p<0.1 ** p<0.05 *** p<0.01

TABLE C.3. Type of affiliate attack (affiliate-month level)

VARIABLES	(1) % success Affil.att.	(2) mean # vics. Affil.att.	(3) Civilian Affil.att.	(4) Private Affil.att.	(5) Military Affil.att.	(6) US vic. Affil.att.
t	0.0410	0.920	0.151	0.144*	0.203**	0.0230
	(0.0523)	(0.858)	(0.103)	(0.0819)	(0.0865)	(0.0197)
t+1	0.0365	0.473	0.0324	0.107	0.0711	0.0576***
	(0.0524)	(0.857)	(0.104)	(0.0826)	(0.0873)	(0.0197)
t+2	-0.0956*	0.0176	0.0190	0.0693	0.101	0.0285
	(0.0523)	(0.854)	(0.104)	(0.0828)	(0.0876)	(0.0197)
t+3	0.0754	0.455	0.209**	0.0871	0.235***	0.0498**
	(0.0528)	(0.856)	(0.106)	(0.0842)	(0.0893)	(0.0198)
t+4	0.0291	0.668	0.191*	0.178**	0.249***	0.0172
	(0.0532)	(0.855)	(0.108)	(0.0860)	(0.0915)	(0.0199)
t+5	-0.0616	-1.185	0.0139	-0.0318	0.114	0.0392**
	(0.0527)	(0.852)	(0.106)	(0.0844)	(0.0896)	(0.0198)
t+6	0.0119	-1.011	0.163	0.0943	0.183**	-0.00361
	(0.0515)	(0.842)	(0.102)	(0.0811)	(0.0859)	(0.0195)
Observations	3,312	3,312	3,312	3,312	3,312	3,312
R-squared	0.467	0.139	0.657	0.577	0.577	0.319
Model	Affil.-mnth	Affil.-mnth	Affil.-mnth	Affil.-mnth	Affil.-mnth	Affil.-mnth
Group FE	NO	NO	NO	NO	NO	NO
Period FE	YES	YES	YES	YES	YES	YES
Affiliate FE	YES	YES	YES	YES	YES	YES
Prob > F lags parent hit	0.0413	0.5644	0.0481	0.0538	0.0460	0.0208
Prob > F leads parent hit	0.6253	0.2528	0.7850	0.6395	0.2475	0.5667
Prob > F lags parent targeted	0.5585	0.8313	0.8492	0.9861	0.8496	0.2144
Prob > F leads parent targeted	0.5551	0.1737	0.9660	0.6657	0.9356	0.9555
Prob > F lags affil. hit	0.9465	0.5066	0.1303	0.3564	0.0074	0.0010
Prob > F leads affil. hit	0.4157	0.9228	0.2097	0.1745	0.1357	0.0084
Control mean	0.2890	1.8059	0.5755	0.3452	0.3066	0.0219

Newey-West standard errors in parentheses

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

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