

The Impact of U.S. Drone Strikes on Terrorism in Pakistan

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Abstract

Do drone strikes reduce or incite terrorist violence? This paper assesses the effectiveness of drone strikes as a counterterrorism instrument in northwestern Pakistan. Using open-source data on reported U.S. drone strikes and terrorist activity in Pakistan's Federally Administered Tribal Areas from March 2004 through June 2010, we find a negative correlation between drone strikes and militant violence after controlling for local effects and pre-existing trends in militant attacks. The analysis suggests that while violence in FATA remains high, drone strikes are associated with decreases in both the frequency and the lethality of militant attacks overall and in IED and suicide attacks specifically.

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Overview

One objective of US drone strikes in the Federally Administered Tribal Areas (FATA) of Pakistan is to reduce the capability of al Qaeda and other militant groups in the region to conduct campaigns of political violence aimed at seizing or maintaining control over sanctuary areas in the region.¹ This brief joins detailed data on drone strikes in Pakistan with incident-level data on terrorism in FATA to examine whether US drone strikes are advancing this objective.

To preview the main findings, there is evidence of a positive correlation between drone strikes and militant violence; however, we interpret this as evidence that the US has increasingly turned to drone warfare as the situation in FATA has grown more dire. Once we control for local and temporal factors, the correlation becomes negative, providing some suggestive evidence that drone strikes are associated with decreases in militant violence.

Background

The United States government (USG) is currently engaged in a covert air war in northwestern Pakistan, particularly in FATA.² FATA, with its rugged terrain, supportive Pashtun population, and shared border with Afghanistan, serves as a key sanctuary for elements from insurgent and terrorist organizations allegedly tied to al Qaeda.³ American airstrikes target senior al Qaeda and al Qaeda-affiliated leaders, as well as other high-value militants, who have taken refuge there in recent years.

Seeking to interdict militants' cross-border movement into Afghanistan and to deny sanctuary to terrorist leaders in FATA, the USG has experimented

¹To be sure, the US' overall objectives are broader than reducing militant violence; the US' specific aims are to deny sanctuary to militants by degrading the senior leadership cadre of militant groups and to disrupt militants' ability to plan, train for, and execute large-scale attacks in Pakistan, Afghanistan, and abroad.

²For a sample of scholarly work on the effectiveness of air power in war, see Pape (1996), Byman and Waxman (2000) Biddle (2006), Kocher, Pepinsky, and Kalyvas (2011). See also Lyall (2009).

³These groups include Tehrik-i-Taliban Pakistan, the Afghan Taliban, the Haqqani Network, the Islamic Movement of Uzbekistan, Islamic Jihad Group, Lashkar-e-Taiba, the Jaish-e-Muhammad, and the Harakat ul-Mujahadeen, the Libyan Islamic Fighters Group, and the Eastern Turkistan Islamic Movement.

with a variety of policy options to incentivize Pakistani counterterrorism cooperation. Pakistan has conducted military operations, notably in Bajaur and South Waziristan, making significant progress in certain areas, but has failed to extend these operations into other key areas—notably, North Waziristan, whose militant organizations are considered by Islamabad as non-threatening to Pakistan’s interests.

As FATA’s strategic importance as an al Qaeda and Taliban sanctuary has grown, militant violence in the region has increased significantly. Figure 1 shows that militant violence in FATA increased sharply in mid-2007 and continued to rise across most agencies until 2010. With conditions in FATA deteriorating and the USG renewing its commitment to the war in Afghanistan, the US escalated its air campaign against senior terrorist leaders and other perceived high-value militants in northwestern Pakistan. As Figure 1 illustrates, the US escalated the drone war in mid-2008, approximately a year after militant violence spiked across the region. Figure 2 illustrates these time trends graphically.

Drone strikes were used relatively sparingly during the campaign’s early years—only nine drone strikes were recorded between 2004 and 2007.⁴ The 34 airstrikes conducted by US drones in 2008 nearly quadrupled the total number of previous drone strikes during the entire history of the war. The US further escalated the drone war in 2009 and 2010 under President Barack Obama, conducting 53 drone strikes in 2009 and 118 in 2010. Figure 4 charts the agency-level variation in drone strikes for each year between 2004 and mid-2010. As the chart shows, North and South Waziristan have been the main fronts of the drone war: Of the 143 recorded drone strikes conducted through June 2010, only eight occurred outside of North or South Waziristan. North Waziristan, where Pakistani security forces have been less active, has been targeted the most: Through June 2010, the US had conducted 89 (62%) drone strikes in North Waziristan; by contrast, 46 (32%) strikes had been conducted in South Waziristan.⁵

⁴Table 1 contains data on annual counts of US drone strikes in FATA and Figure 3 shows the time trend graphically.

⁵This trend became even more striking following the time period under analysis—complete 2010 data from researchers at the New America Foundation show that, of the record-setting 118 drone strikes conducted in 2010, 104 (88%) targeted militants in North Waziristan.

Empirical Method

We use simple econometric tools to study the impact of all reported drone strikes from June 2004—June 2010 on a sample of 1238 terrorist incidents over the same time period aggregated to the agency-week level. We begin by examining the simple correlation between the incidence of drone strikes and various metrics of militant violence. Then we employ a standard econometric approach to panel data analysis, using fixed effects and first-differenced regression models to estimate the relative impact of drone strikes on FATA terrorism (Wooldridge 2002).⁶

Fixed effects account for all of the time-invariant differences between agencies, such as terrain and elevation, that could potentially confound analysis. The fixed effects approach enables us to estimate how drone strikes in particular areas of FATA correlate with changes in terrorist activity in those areas by analyzing deviations from mean levels in each FATA agency and during particular periods of time.⁷

Letting i denote the cross sectional index (i.e., the agency or tehsil) and t the time index that varies within an agency or tehsil (i.e., the week or month), we estimate the following model

$$y_{it} = \alpha_i + \beta X_{it} + h_t + \epsilon_{it} \quad (1)$$

where y measures the incidence of terrorism, x is the number of drone strikes, α_i are unobserved agency fixed effects, and h_t are time effects (half-year unless otherwise noted).

The intuition underlying the first-differencing approach is similar. The difference is that instead of examining deviations from means, changes from one time period to the next are examined.

The first-differences estimator can be expressed as

⁶Although the possibility of unobserved factors confounding causal inference can never be fully dismissed in any observational study, this estimation strategy can minimize the selection bias that has driven these trends and should provide the most analytical leverage in this context.

⁷In the main analysis presented below, we include agency fixed effects and half-year fixed effects. Each fixed effect is treated as a parameter to be estimated in the regressions, enabling us to regress observed deviations from mean levels. In practice, the fixed effects are included to control for unobserved factors that might vary by agency, as well as biannual secular time trends in levels of conflict violence.

$$(y_{it} - y_{i(t-1)}) = \alpha_i + \beta(X_{it} - X_{i(t-1)}) + \epsilon_{it}. \quad (2)$$

where y again measures the incidence of terrorism, x is the number of drone strikes, and α_i are unobserved agency- or tehsil-specific effects.

Data and Variables

One striking feature of the war in northwestern Pakistan is the variation in levels of terrorist violence across FATA agencies. Figure 4 shows the heterogeneity in monthly terrorist incidents from March 2004 through June 2010.

To study patterns in the war in northwestern Pakistan, we combined detailed data on U.S. drone strikes collected by researchers at the New America Foundation (Bergen and Tiedemann January 2011) with incident-level data on terrorist activities in FATA compiled as part of the National Counterterrorism Center’s Worldwide Incidents Tracking System (National Counterterrorism Center October 2010). Incidents in both datasets were georeferenced according to the reported locations of the incidents as reported in the summaries used to track and cross-validate each drone strike and terrorism incident.

We created the data sets in the following manner: First, using geographic information system (GIS) tools, we mapped the incident-level data on drone strikes and militant violence to the administrative divisions—at both the agency and tehsil levels—where they occurred.⁸ We were then able to use the data produced through the GIS mapping procedure to create separate data sets containing aggregated weekly and monthly data on the variables of interest.⁹

Table 2 summarizes the variables and data sources used in our analysis. We focus primarily on drone strikes and four key indicators of terrorist activity. Our data sets measure the following variables at the agency-week, agency-month, tehsil-week, and tehsil-month levels:

⁸In FATA, the agency is the third-order administrative division; the tehsil is the second-order administrative division.

⁹Aggregating the incident-level data to the agency-week, agency-month, tehsil-week, and tehsil-month levels provides flexibility in answering a wider range of questions and to test whether observed trends hold across various levels of geographic and temporal aggregation.

- UAV: The number of drone strikes in a given location and time period.
- INCIDENTS: The number of militant incidents or attacks in a given location and time period.
- FATALITIES: The number of deaths inflicted in terrorist incidents or attacks in a given location and time period.
- IED: The number of IED attacks conducted in a given location and time period.
- SUICIDE: The number of suicide attacks conducted in a given location and time period.

The data sets also include information on a range of other indicators of militant activity.¹⁰

Descriptive Statistics

Summary statistics for the variables used in the analysis, measured at the agency-week level, are shown in Table 3. Summary statistics for North and South Waziristan—the key fronts of the drone war—are displayed separately in Tables 4 and 5.

As Table 3 shows, the average number of terrorist incidents per agency-week is about 0.15 per 100,000 population; these incidents result in an average of 0.20 deaths per 100,000. Table 3 also reveals that IED attacks are much more common than suicide attacks: the former has occurred at a rate of approximately 0.04 per agency-week per 100,000, while the latter has occurred at an average rate of 0.004 per agency-week per 100,000.

Drone strikes have occurred at a rate of about 0.025 per agency-week per 100,000 population. Unsurprisingly, this average is more than two times higher in South Waziristan (see Table 5) and more than four times higher in North Waziristan (Table 4).

¹⁰These indicators include, *inter alia*, variables on the number of people wounded in militant attacks and the total number of casualties inflicted in militant attacks; the number of incidents that resulted in casualties; the number of hostages taken during militant incidents; and the number of incidents that targeted either government or private property.

Findings

Have drone strikes reduced terrorism in FATA? At first glance, the answer appears to be no—as Figure 1 illustrates graphically and Table 6 shows quantitatively, the simple correlation between drone strikes and violence is positive and statistically significant for three of the four indicators examined.

It is possible, however, that reverse causality is driving these correlations; as Figures 1 and 2 show, US decision-makers were more likely to authorize drone strikes when levels of violence were high. The time trend in North Waziristan, which is shown in Figure 2, illustrates this pattern clearly. This type of “selection bias” is common when decision-makers act strategically. Militant-initiated incidents might reveal information, for example, that US decision-makers use for target identification. Moreover, decision-makers respond to increases in militant violence by using drone strikes to push back terrorist networks operating in particular areas.

After controlling for local conditions and secular time trends, a different picture emerges. The main results, as shown in Tables 7 and 8, suggest drone strikes are associated with reductions in (1) militant attacks (2) fatalities inflicted in militant attacks (3) IED attacks and (4) suicide attacks.¹¹

Measures of Terrorism

Incidents

Column 1 of Table 7 shows that drone strikes are associated with a decrease in terrorist incidents per 100,000 residents of approximately eight percentage points—a result that is statistically significant at the five-percent level. Estimating the regression in first-differences, as shown in Column 2 of Table 7, reveals a similar estimate that is significant at the one-percent level. Although an eight percentage point difference might seem small at first blush, it is actually quite large—roughly 47 percent—when considering the percentage change from average weekly levels.¹²

¹¹As noted in the table notes, these are results of ordinary least squares regression models. Models 1 and 3 include fixed effects to control for time-invariant agency-level differences, and half-year fixed effects to account for secular time trends in wartime violence. Using data from Pakistan’s most recent census, we also created measures of terrorist violence per capita, normalizing the raw measures of violence per 100,000 residents of each agency.

¹²These estimates are intended to provide context regarding the predicted impact of drone strikes on terrorist activity. They assume a constant and linear effect of drone strikes

Fatalities

We find some evidence that drone strikes are associated with decreases in militant lethality. Taken together with the previous results, the evidence suggests a reduction in both the quantity and the quality of militant attacks. Columns 3 and 4 of Table 7 show the statistical results. Column 3 suggests that drone strikes are associated with a decreased fatality rate of about four percentage points per 100,000 residents; the result is statistically significant at the 10 percent level. The estimate of a first-differenced regression, however, which is shown in Column 4, is not statistically significant. Both point estimates suggest a negative relationship between drone strikes and militant lethality, but the evidence suggesting that drone strikes reduce terrorist lethality is not as solid as the evidence suggesting that they slow the pace of militant attacks.

IED Attacks

We also find evidence that drone strikes are correlated with reduced numbers of IED attacks; this is unsurprising given the negative association between drone strikes and the overall rate of militant-initiated incidents. The result in Column 1 of Table 8 is statistically significant at the five percent level and suggests that drone strikes are associated with a three percentage point weekly decrease in IED attacks per 100,000.¹³ The estimate of the first-differenced specification, which is shown in Column 2, is also significant, providing further evidence of a negative relationship between drone strikes and IED attacks.

Suicide Attacks

The results of our analysis of drone strikes and suicide attacks are similar. Like the IED findings, the result in Column 3 of Table 8 is statistically significant and predicts a three percentage point decrease in suicide attacks per 100,000 in weeks when drone strikes occur.¹⁴ The point estimate of the

on militant attacks.

¹³Alternatively, a regression of weekly IED attacks on drone strikes not normalized by population (not reported in Table 8) is also significant at the five percent level and predicts a 12 percentage point decrease in IED attacks. The predicted number of IED attacks declines from an estimated 0.15 in agency-weeks without a drone strike to 0.03 in agency-weeks when a drone strike occurs.

¹⁴It is unlikely that reverse causality is driving this correlation unless decision-makers are more likely to order drone strikes when violence is decreasing. As discussed above,

first-differenced regression in Column 4 is smaller but significant at the one-percent level. A caveat regarding these results is although there is evidence of a negative statistical relationship between drone strikes and suicide attacks, the predicted decline in the number of suicide attacks during agency-weeks in which one drone strike is conducted is insignificant.¹⁵

Location

Finally, we replicated the above analyses for the two main fronts of the drone war—North and South Waziristan. Upon examining each agency individually, we find evidence consistent with our previous results. Specific trends are described below.

North Waziristan

The results displayed in Table 9 suggest that the drone campaign in North Waziristan is associated with decreases in overall insurgent and terrorist attacks, fatalities caused by militant attacks, and levels of IED and suicide attacks. Only the decrease in militant attacks, however, is statistically significant. When estimated in first-differences, the estimate remains negative but is not statistically significant.¹⁶ Results from the other regressions are likewise negative but statistically insignificant.¹⁷

South Waziristan

The relationship between drone strikes and militant violence in South Waziristan also appears to be negative. The results are displayed in Table 10. As in North Waziristan, drone strikes correlate with reductions in the rate and the lethality of terrorist attacks, as well as IED and suicide attacks. Only one of these estimates—the relationship between airstrikes and IED attacks—is

to the extent that there is a relationship, we believe the opposite is true, which could be attenuating our results.

¹⁵The predicted number of drone strikes during agency-weeks with no drone strikes is 0.012 and the predicted number during agency-weeks with one drone strike is 0.0001.

¹⁶This result is not reported in Table 9.

¹⁷Reducing the amount of data in any analysis—in this case, reducing the number of agency-week observations from 2548 in the full FATA analysis to 364 in the North Waziristan-only analysis—necessarily reduces the chances of detecting a statistically significant relationship, even when a relationship exists.

statistically significant. Interpreting these results is particularly difficult, however, because intermittent but intense Pakistani military operations in South Waziristan could be confounding these results.¹⁸Pakistan’s reluctance to conduct large-scale military operations in North Waziristan makes it a superior test case in which to study the impact of drone strikes.

Implications

This research note has presented an analysis of the relationship between US drone strikes and militant violence in northwestern Pakistan. Initial analysis showed a positive correlation between drone strikes and militant violence. This correlation appears to be attributable to selection bias—as the war in northwestern Pakistan has intensified, the US has increasingly turned to direct action counterterrorism, primarily through drone strikes. After controlling for local factors and time trends, we found evidence of a negative correlation. But even though there is suggestive evidence that drones strikes have yielded counterterrorism dividends, caution should be exercised in inferring causality due to the selection bias inherent in the data.

Finally, it is important to reiterate that any reduction in terrorist activity associated with the drone campaign appears modest in scope. Although a decline in violence in FATA in 2010 coincided with the peak of the drone campaign, FATA militants remain active and violence remains high. To the extent drone strikes “work,” their effectiveness is more likely to lie in disrupting militant operations at the tactical level than as a silver bullet that will reverse the course of the war and singlehandedly defeat al Qaeda.¹⁹

¹⁸Pakistan military offensives in South Waziristan have varied in duration, and the half-year fixed effects might not be sensitive enough to fully absorb these trends. Similar results are found when month fixed effects are included instead of half-year effects.

¹⁹To be sure, additional research is needed if we are to fully understand the impact of drone strikes in FATA. Although the general trends reported above hold across different estimation strategies and units-of-analysis (see the below Appendices), significant questions remain outstanding. Further analysis is needed, for example, to assess the impact of removing high-value targets and of inflicting collateral damage, two key issues that threaten to work at cross-purposes with each other. Moreover, additional analysis is necessary to assess whether militant violence has spilled over into neighboring areas after drone strikes have made certain areas inhospitable to militant leaders. We are currently conducting analysis on these issues.

References

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Figures

Figure 1: TIME TRENDS IN DRONE STRIKES AND TERRORISM INCIDENTS IN FATA

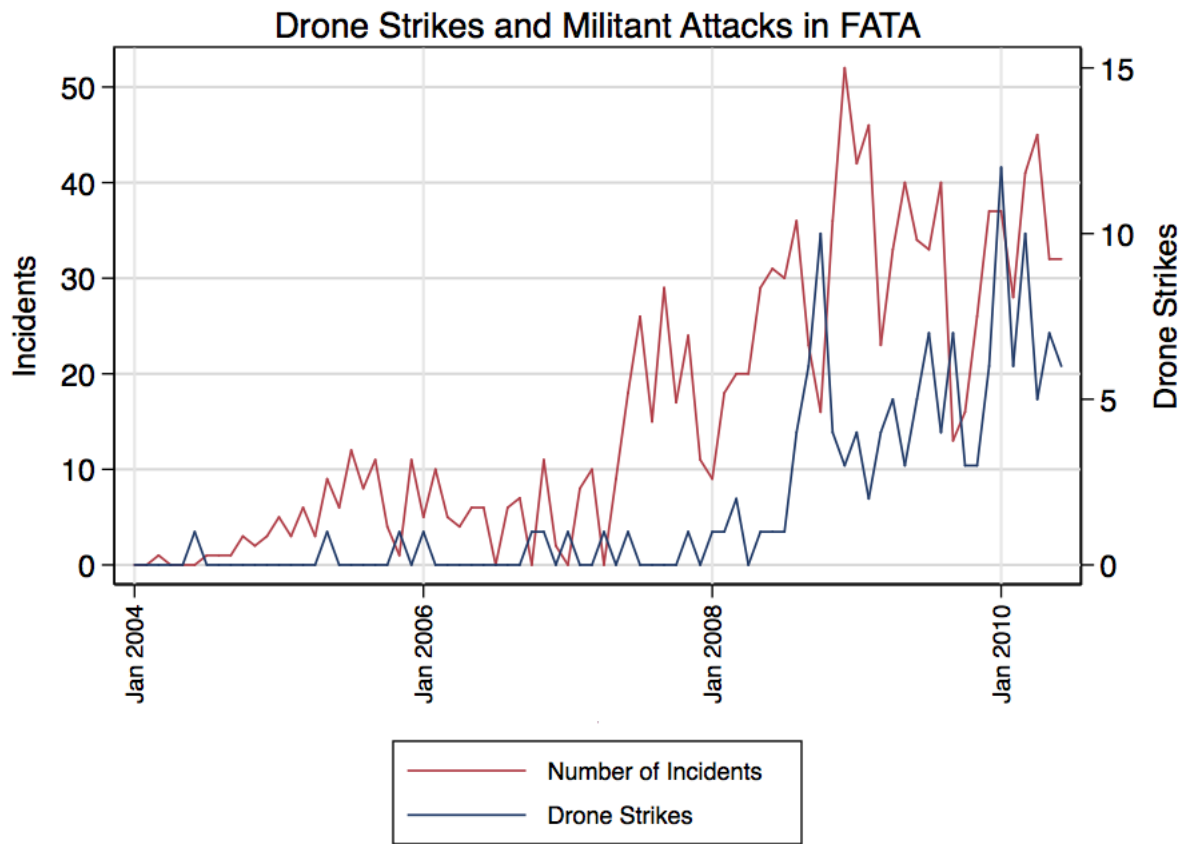


Figure 2: AGENCY-LEVEL TIME TRENDS IN DRONE STRIKES AND TERRORISM INCIDENTS

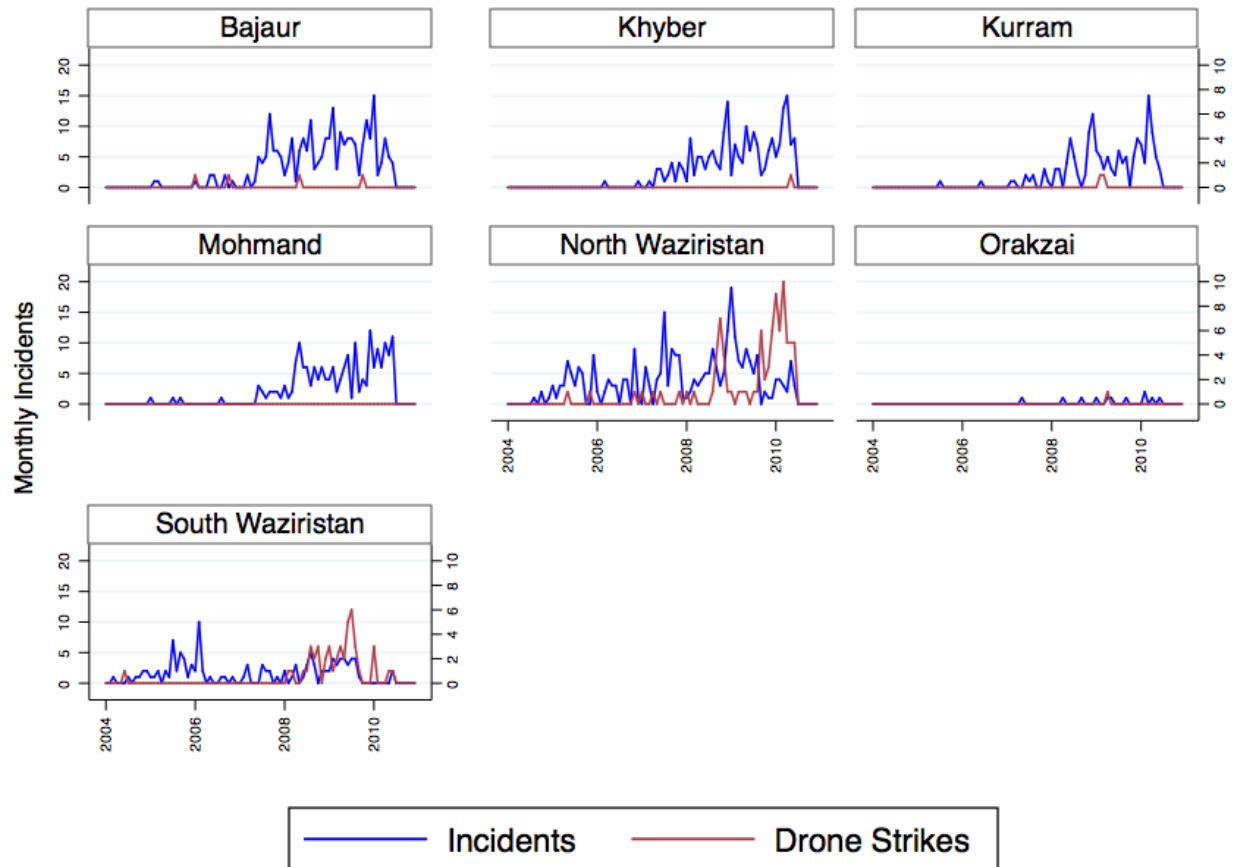


Figure 3: TIME TRENDS IN DRONE STRIKES

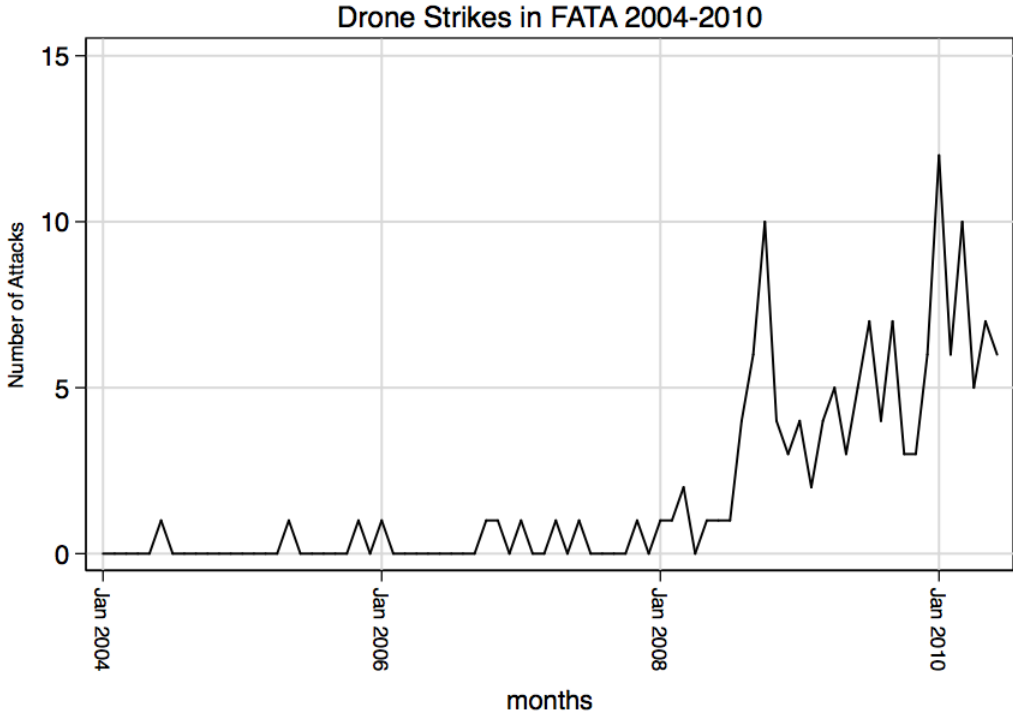


Figure 4: AGENCY-LEVEL VARIATION IN DRONE STRIKES

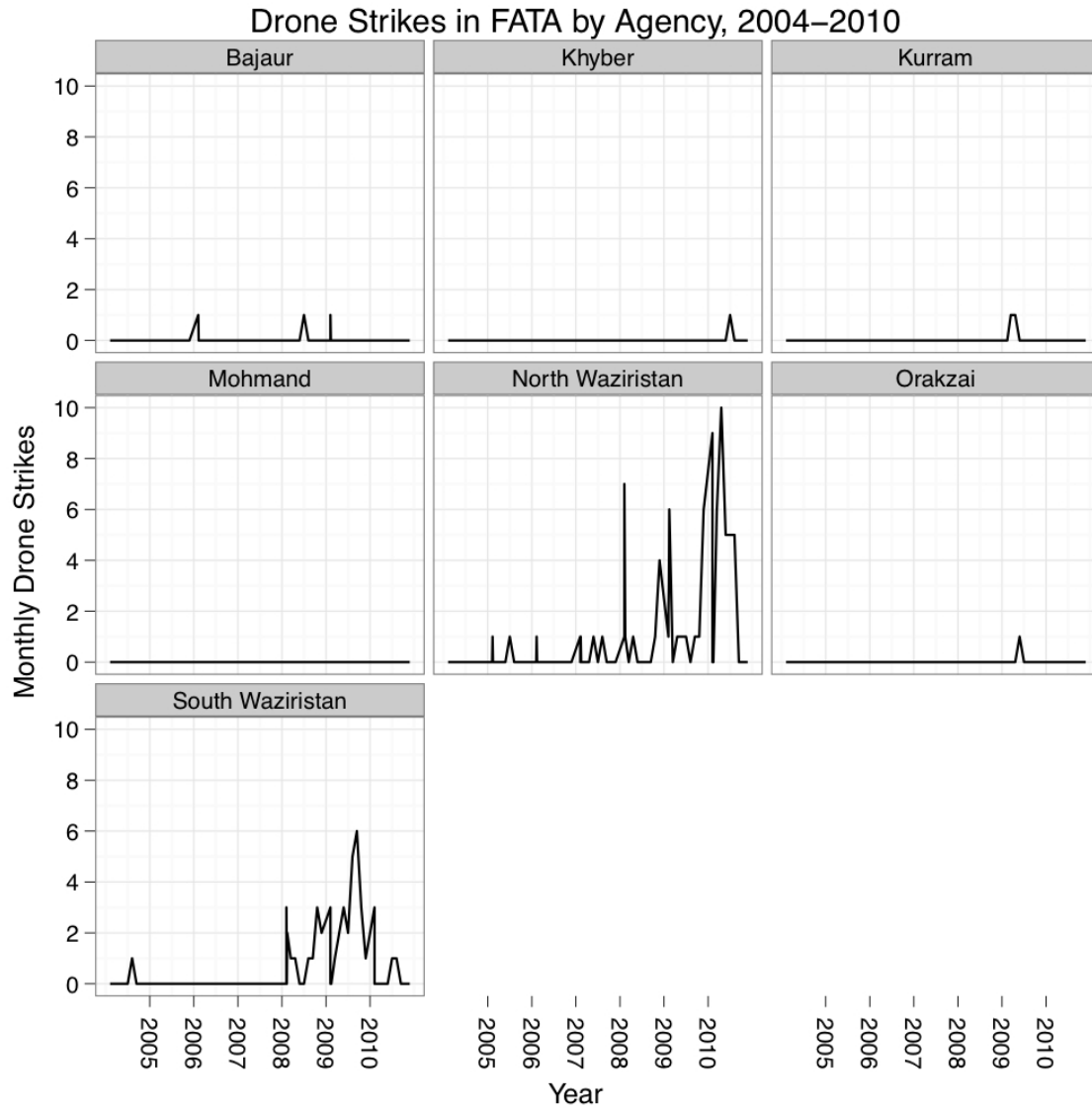
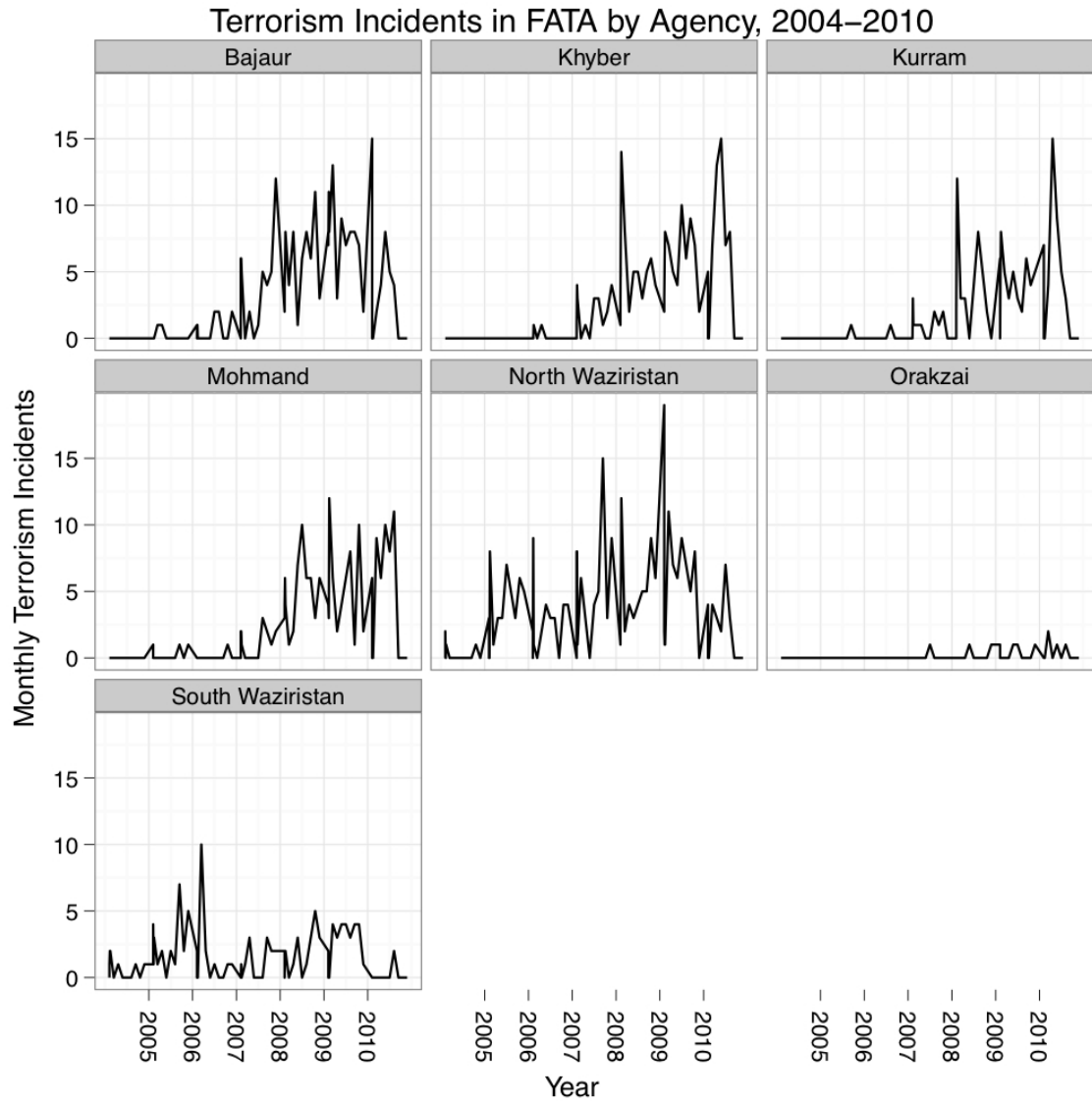


Figure 5: AGENCY-LEVEL VARIATION IN TERRORIST INCIDENTS



Tables

Table 1: U.S. DRONE STRIKES IN FATA, BY YEAR

Year	Drone Strikes
2004	1
2005	2
2006	2
2007	4
2008	34
2009	53
2010	118
Total	214

Table 2: VARIABLES AND DATA

Variable	Description	Source(s)
UAV	Num. drone strikes.	<i>NAF</i>
Incidents	Num. terrorist attacks.	<i>WITS</i>
Fatalities	Num. deaths in terrorist attacks.	<i>WITS</i>
Suicide	Num. suicide attacks.	<i>WITS</i>
IED	Num. IED attacks.	<i>WITS</i>
Population	1998 population, by agency.	<i>1998 Pak. Census</i>
Incidents/100k	Num. terrorist attacks/100,000 pop.	<i>WITS; Pak. Census</i>
Fatalities/100k	Num. deaths in attacks/100,000 pop.	<i>WITS; Pak. Census</i>
Suicide/100k	Num. suicide attacks/100,000 pop.	<i>WITS; Pak. Census</i>
IED/100k	Num. IED attacks/100,000 pop.	<i>WITS; Pak. Census</i>

Note: Variables are aggregated to the agency(tehsil)-week(month) level. See the tables in the text.

Table 3: SUMMARY STATISTICS

Variable	Mean	Std. Dev.	Min.	Max.	N
UAV	0.024	0.139	0	2.127	2548
Incidents	0.149	0.322	0	2.99	2548
Fatalities	0.195	0.909	0	25.415	2548
Suicide Attacks	0.004	0.038	0	0.887	2548
IED Attacks	0.039	0.132	0	1.331	2548

Note: Statistics are calculated at the weekly level per 100,000.

Table 4: SUMMARY STATISTICS: NORTH WAZIRISTAN

Variable	Mean	Std. Dev.	Min.	Max.	N
UAV	0.108	0.51	0	2.661	364
Incidents	0.484	1.047	0	7.984	364
Fatalities	1.091	2.361	0	18	364
Suicide Attacks	0.01	0.073	0	0.887	364
IED Attacks	0.057	0.176	0	1.331	364

Note: Statistics are calculated at the weekly level per 100,000.

Table 5: SUMMARY STATISTICS: SOUTH WAZIRISTAN

Variable	Mean	Std. Dev.	Min.	Max.	N
UAV	0.054	0.197	0	2.127	364
Incidents	0.14	0.305	0	2.552	364
Fatalities	0.264	1.131	0	17.015	364
Suicide Attacks	0.004	0.039	0	0.425	364
IED Attacks	0.03	0.118	0	0.851	364

Note: Statistics are calculated at the weekly level per 100,000.

Table 6: CORRELATIONS BETWEEN DRONE STRIKES AND TERRORIST VI-
OLENCE

	(1) Incidents	(2) Fatalities	(3) IED	(4) Suicide
UAV	0.0795** (0.0269)	0.1206** (0.0391)	0.0099** (0.0034)	-0.0003 (0.0007)
Constant	0.1441*** (0.0382)	0.1879** (0.0579)	0.0388*** (0.0071)	0.0036** (0.0011)
Observations	2,548	2,548	2,548	2,548

Note: Results are from OLS regressions with robust standard errors adjusted for clustering at the agency level. The unit of analysis is the agency-week. LHS variables are normalized by 100,000 residents. *** p<0.01, ** p<0.05, * p<0.1

Table 7: THE IMPACT OF DRONE STRIKES ON TERRORIST ATTACKS AND
LETHALITY

	(1) Incidents	(2) Incidents	(3) Fatalities	(4) Fatalities
UAV	-0.0781** (0.0227)	-0.0757*** (0.0171)	-0.0434* (0.0248)	-0.0793 (0.0732)
Constant	-0.0232 (0.0437)	0.0020 (0.0022)	-0.0625 (0.0636)	-0.0014 (0.0051)
First-Differences	No	Yes	No	Yes
Observations	2,548	2,541	2,548	2,541

Note: Results are from OLS regressions with robust standard errors adjusted for clustering at the agency level. The unit of analysis is the agency-week. All regressions include agency and half-year fixed effects. LHS variables are normalized by 100,000 residents. Specifications with first-differencing are indicated in the table. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: THE IMPACT OF DRONE STRIKES ON IED AND SUICIDE ATTACKS

	(1)	(2)	(3)	(4)
	IED	IED	Suicide	Suicide
UAV	-0.0295** (0.0097)	-0.0041*** (0.0003)	-0.0290* (0.0160)	-0.0039*** (0.0015)
Constant	0.0126 (0.0086)	0.0015* (0.0008)	-0.0007 (0.0013)	-0.0002 (0.0002)
First-Differences	No	Yes	No	Yes
Observations	2,548	2,541	2,548	2,541

Note: Results are from OLS regressions with robust standard errors adjusted for clustering at the agency level. The unit of analysis is the agency-week. All regressions include agency and half-year fixed effects. LHS variables are normalized by 100,000 residents. Specifications with first-differencing are indicated in the table. *** p<0.01, ** p<0.05, * p<0.1.

Table 9: DRONE STRIKES AND TERRORISM IN NORTH WAZIRISTAN

	(1)	(2)	(3)	(4)
	Incidents	Fatalities	IED	Suicide
UAV	-0.0907* (0.0468)	-0.1452 (0.1094)	-0.0123 (0.0160)	-0.0037 (0.0064)
Constant	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)
Observations	364	364	364	364

Note: Results are from OLS regressions with robust standard errors. The unit of analysis is the week, from January 2004–June2010. All regressions include half-year fixed effects. LHS variables are normalized by 100,000 residents. Specifications with first-differencing are indicated in the table. *** p<0.01, ** p<0.05, * p<0.1.

Table 10: DRONE STRIKES AND TERRORISM IN SOUTH WAZIRISTAN

	(1)	(2)	(3)	(4)
	Incidents	Fatalities	IED	Suicide
UAV	-0.0420 (0.0310)	-0.1053 (0.1029)	-0.0277* (0.0152)	-0.0081 (0.0063)
Constant	0.0180 (0.0165)	0.0041 (0.0056)	0.0174 (0.0164)	0.0003 (0.0004)
Observations	364	364	364	364

Note: Results are from OLS regressions with robust standard errors. The unit of analysis is the week, from January 2004–June 2010. All regressions include half-year fixed effects. LHS variables are normalized by 100,000 residents. Specifications with first-differencing are indicated in the table. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendices

Appendix 1: Time Trends

Table 11: DRONE STRIKES AND PATTERNS OF TERRORISM SINCE 2007

	(1) Incidents	(2) Incidents	(3) Fatalities	(4) Fatalities
UAV	-0.0904* (0.0396)	-0.1165*** (0.0280)	-0.0506** (0.0258)	-0.0909 (0.0681)
Constant	0.1517*** (0.0156)	-0.0000 (0.0000)	0.2050*** (0.0267)	0.0000 (0.0000)
First-Differences	No	Yes	No	Yes
Observations	1,456	1,456	1,456	1,456

Note: Results are from OLS regressions with robust standard errors adjusted for clustering at the agency level. The unit of analysis is the agency-week. All regressions include agency and half-year fixed effects. LHS variables are normalized by 100,000 residents. Specifications with first-differencing are indicated in the table. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 12: DRONE STRIKES AND PATTERNS OF SUICIDE AND IED ATTACKS SINCE 2007

	(1)	(2)	(3)	(4)
	IED	IED	Suicide	Suicide
UAV	-0.0254** (0.0097)	-0.0063*** (0.0008)	-0.0287 (0.0214)	-0.0039*** (0.0014)
Constant	0.0545*** (0.0097)	0.0000** (0.0000)	0.0065*** (0.0014)	0.0000 (0.0000)
First-Differences	No	Yes	No	Yes
Observations	1,456	1,456	1,456	1,456

Note: Results are from OLS regressions with robust standard errors adjusted for clustering at the agency level. The unit of analysis is the agency-week. All regressions include agency and half-year fixed effects. LHS variables are normalized by 100,000 residents. Specifications with first-differencing are indicated in the table. *** p<0.01, ** p<0.05, * p<0.1.

Appendix 2: Placebo Tests

Table 13: PREDICTING TERRORISM AS FUNCTION OF FUTURE DRONE STRIKES

	(1) Incidents	(2) Fatalities	(3) IED	(4) Suicide
UAV <i>(lead)</i>	-0.0395 (0.0215)	-0.0354 (0.0600)	0.0067 (0.0247)	-0.0001 (0.0039)
Constant	0.0000 (0.0000)	-0.0000 (0.0000)	0.0000** (0.0000)	0.0000 (0.0000)
Observations	2,534	2,534	2,534	2,534

Note: Results are from OLS regressions with robust standard errors adjusted for clustering at the agency level. The unit of analysis is the agency-week, from January 2004–June2010. All regressions include half-year fixed effects. LHS variables are normalized by 100,000 residents. All regressions display first-differences estimates. *** p<0.01, ** p<0.05, * p<0.1.

Table 14: PREDICTING DRONE STRIKES AS A FUNCTION OF FUTURE TERRORISM

DV: D.UAV	(1)	(2)	(3)	(4)
D.Incidents (<i>lead</i>)	0.0667 (0.0642)			
D.Fatalities (<i>lead</i>)		0.0092 (0.0117)		
D.IED (<i>lead</i>)			0.1958 (0.1208)	
D.Suicide (<i>lead</i>)				-0.0662 (0.0426)
Constant	-0.0000 (0.0000)	0.0000 (0.0000)	-0.0000 (0.0000)	0.0000 (0.0000)
Observations	2,534	2,534	2,534	2,534

Note: Results are from OLS regressions with robust standard errors adjusted for clustering at the agency level. The unit of analysis is the agency-week, from January 2004–June2010. All regressions include half-year fixed effects. RHS variables are normalized by 100,000 residents. All regressions display first-differences estimates. *** p<0.01, ** p<0.05, * p<0.1.

Appendix 3: Agency-Month Replication

Table 15: AGENCY-MONTH SUMMARY STATISTICS

Variable	Mean	Std. Dev.	Min.	Max.	N
UAV	0.262	1.037	0	10	546
Incidents	2.267	3.238	0	19	546
Fatalities	2.789	6.779	0	93	546
Suicide Attacks	0.053	0.262	0	3	546
IED Attacks	0.67	1.379	0	11	546
Victims	1.753	2.601	0	19	546
Property Attacks	1.201	1.998	0	12	546

Note: Statistics are calculated at the monthly level.

Table 16: THE IMPACT OF DRONE STRIKES ON TERRORIST ATTACKS AND LETHALITY

	(1) Incidents	(2) Incidents	(3) Fatalities	(4) Fatalities
UAV	-0.1372* (0.0619)	-0.0703 (0.0600)	-0.1446*** (0.0490)	-0.2886*** (0.0455)
Constant	-0.1202 (0.2194)	0.0165 (0.0213)	-0.2908 (0.3041)	0.0485 (0.0589)
First-Differences	No	Yes	No	Yes
Observations	546	539	546	539

Note: Results are from OLS regressions with robust standard errors adjusted for clustering at the agency level. The unit of analysis is the agency-month. All regressions include agency and half-year fixed effects. LHS variables are normalized by 100,000 residents. Specifications with first-differencing are indicated in the table. *** p<0.01, ** p<0.05, * p<0.1.

Table 17: THE IMPACT OF DRONE STRIKES ON IED AND SUICIDE ATTACKS

	(1)	(2)	(3)	(4)
	IED	IED	Suicide	Suicide
UAV	-0.0414 (0.0364)	-0.0041 (0.0023)	-0.0125* (0.0065)	-0.0240*** (0.0012)
Constant	0.0556 (0.0454)	0.0192*** (0.0063)	-0.0033 (0.0062)	-0.0043 (0.0031)
First-Differences	No	Yes	No	Yes
Observations	546	539	546	539

Note: Results are from OLS regressions with robust standard errors adjusted for clustering at the agency level. The unit of analysis is the agency-month. All regressions include agency and half-year fixed effects. LHS variables are normalized by 100,000 residents. Specifications with first-differencing are indicated in the table. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix 4: Tehsil-Week Replication

Table 18: SUMMARY STATISTICS

Variable	Mean	Std. Dev.	Min.	Max.	N
UAV	0.006	0.087	0	2	14976
Incidents	0.068	0.349	0	9	14976
Lethality	0.092	1.109	0	85	14976
Suicide Attacks	0.002	0.043	0	2	14976
IED Attacks	0.017	0.148	0	3	14976

Note: Statistics are calculated at the weekly level.

Table 19: THE IMPACT OF DRONE STRIKES ON TERRORIST ATTACKS AND LETHALITY

	(1) Incidents	(2) Incidents	(3) Fatalities	(4) Fatalities
UAV	-0.0555* (0.0296)	-0.1970** (0.0794)	-0.0777 (0.0631)	-0.1019 (0.0769)
Constant	-0.0000 (0.0000)	0.0015*** (0.0000)	-0.0000 (0.0000)	0.0022*** (0.0000)
First-Differences	No	Yes	No	Yes
Observations	14,976	14,928	14,976	14,928

Note: Results are from OLS regressions with robust standard errors adjusted for clustering at the agency level. The unit of analysis is the tehsil-week. All regressions include tehsil and month fixed effects. Specifications with first-differencing are indicated in the table. *** p<0.01, ** p<0.05, * p<0.1.

Table 20: THE IMPACT OF DRONE STRIKES ON IED AND SUICIDE ATTACKS

	(1)	(2)	(3)	(4)
	IED	IED	Suicide	Suicide
UAV	-0.0404** (0.0188)	-0.0069 (0.0042)	-0.0583 (0.0361)	-0.0049 (0.0039)
Constant	-0.0000 (0.0000)	0.0005*** (0.0000)	-0.0000 (0.0000)	0.0000 (0.0000)
First-Differences	No	Yes	No	Yes
Observations	14,976	14,928	14,976	14,928

Note: Results are from OLS regressions with robust standard errors adjusted for clustering at the agency level. The unit of analysis is the tehsil-week. All regressions include tehsil and month fixed effects. Specifications with first-differencing are indicated in the table. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix 5: Tehsil-Month Replication

Table 21: TEHSIL-MONTH SUMMARY STATISTICS

Variable	Mean	Std. Dev.	Min.	Max.	N
UAV	0.006	0.087	0	2	14976
Incidents	0.068	0.349	0	9	14976
Lethality	0.092	1.109	0	85	14976
Suicide Attacks	0.002	0.043	0	2	14976
IED Attacks	0.017	0.148	0	3	14976

Note: Statistics are calculated at the monthly level.

Table 22: THE IMPACT OF DRONE STRIKES ON TERRORIST ATTACKS AND LETHALITY

	(1) Incidents	(2) Incidents	(3) Fatalities	(4) Fatalities
UAV	-0.1492*** (0.0539)	-0.3876** (0.1626)	-0.1744* (0.0995)	-0.5733 (0.3432)
Constant	-0.0000 (0.0000)	0.0089*** (0.0002)	-0.0000 (0.0000)	0.0042*** (0.0006)
First-Differences	No	Yes	No	Yes
Observations	3,744	3,696	3,744	3,696

Note: Results are from OLS regressions with robust standard errors adjusted for clustering at the agency level. The unit of analysis is the tehsil-month. All regressions include tehsil and month fixed effects. Specifications with first-differencing are indicated in the table. *** p<0.01, ** p<0.05, * p<0.1.

Table 23: THE IMPACT OF DRONE STRIKES ON IED AND SUICIDE ATTACKS

	(1)	(2)	(3)	(4)
	IED	IED	Suicide	Suicide
UAV	-0.0914** (0.0353)	-0.0197* (0.0105)	-0.1124** (0.0538)	-0.0290 (0.0232)
Constant	-0.0000 (0.0000)	0.0034*** (0.0001)	-0.0000 (0.0000)	0.0000 (0.0000)
First-Differences	No	Yes	No	Yes
Observations	3,744	3,696	3,744	3,696

Note: Results are from OLS regressions with robust standard errors adjusted for clustering at the agency level. The unit of analysis is the tehsil-month. All regressions include tehsil and month fixed effects. Specifications with first-differencing are indicated in the table. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.