Double Standards: The Implications of “Near” Certainty Drone Strikes in Pakistan

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Abstract

In 2013, U.S. President Barack Obama announced a policy to minimize civilian casualties following drone strikes in undeclared theaters of war. The policy calibrated Obama’s approval of strikes against the “near” certainty of no civilian casualties. Scholars do not empirically study the merits of Obama’s policy. Rather, they rely on descriptive trends for civilian casualties in Pakistan to justify competing claims for the policy’s impact. We provide a novel estimate for the impact of Obama’s policy for civilian casualties in Pakistan following U.S. drone strikes. We employ a regression discontinuity design to estimate the effect of Obama’s policy for civilian casualties, strike precision, and adverted civilian casualties. We find a discontinuity in civilian casualties approximately two years before Obama’s policy announcement, corroborating our primary research including interviews with senior officials responsible for implementing the near certainty standard. After confirming the sharp cutoff, we estimate the policy resulted in a reduction of 12 civilian deaths per month or 2 casualties per strike. The policy also enhanced the precision of U.S. drone strikes to the point that they only killed the intended target(s). Finally, we use a Monte Carlo simulation to estimate that the policy averted 320 civilian casualties. We then conduct a Value of Statistical Life calculation, the first-of-its-kind in drone warfare scholarship, to show that the adverted civilian casualties represent a gain of 80 to 260 million U.S. dollars. In addition to conditioning social and political outcomes, then, the near certainty standard also imposed economic implications that are much less studied.

Keywords certainty · civilian casualties · drones · Pakistan
1 Introduction

In a May 2013 speech at the National Defense University in Washington, D.C., U.S. President Barack Obama announced the implementation of a policy to exercise greater oversight of strikes conducted by Unmanned Aerial Vehicles (UAV), or drones, against suspected terrorists. The policy – formally termed Presidential Planning Guidance (PPG) – responded to increasingly vocal concerns and criticism from international and non-governmental organizations about civilian casualties that resulted from the United States’ counterterrorism drone strike program. The PPG intended to minimize collateral damage by imposing a near certainty standard for no civilian casualties during U.S. drone strikes in undeclared theaters of war. To what extent did the Obama administration’s policy cause a reduction in civilian casualties following U.S. drone strikes?

Where analysts have engaged this question, especially in terms of U.S. drone strikes in Pakistan, their explanations are inconclusive. Scholars rely on the same data compiled by one of several accountability organizations to substantiate two opposing claims. “By averaging the high and low casualty estimates of militant and non-militant deaths published in a wide range of reliable media outlets,” Bergen and Sims estimate “that the civilian death rate in U.S. drone strikes in Pakistan has declined dramatically” (Sheehan, Marquardt, and Collins 2021). The proximate cause for Lindsay (2020) is that “the Obama administration piled on many layers of oversight, and error rates decreased.” Turse (2021), a freelance journalist, uses a similar descriptive strategy to argue that “mountains of evidence demonstrate consistent failures.” One prominent international legal expert adds that the Obama administration’s policy “to impose stricter limitations on drone strikes seems to have had an effect only at the margins” (Jaffer 2016). These countervailing perspectives point to a broader gap in the literature for the evolution of U.S. drone warfare following the terrorist attacks of 9/11. Together, they suggest the need for an empirical study to determine the causal significance of the Obama administration’s reform to help minimize civilian deaths following U.S. drone strikes in undeclared theaters of operations.

The primary goal of this study is to determine the extent to which the Obama administration’s near certainty standard causally impacted the rate of civilian casualties in undeclared theaters of war. Providing a causal estimate for the implications of the Obama administration’s near certainty standard is important for a number of reasons. First, while descriptive inference is useful to identify unobserved trends, it is subject to endogeneity and cannot provide a causal estimate for the impact of the near certainty standard (King, Keohane, and Verba 1994). Evaluating the effects of policy on strike-level outcomes, then, becomes challenging using methods that primarily rely on descriptive analysis (Khan 2021; G. Martin and Steuter 2017; Sanger 2017; Shah 2018). Second, we cannot determine the degree to which mistakes – such as the Biden administration’s botched strike in August 2021 that killed ten Afghan citizens rather than a suspected terrorist – may be prevented by also applying the near certainty standard in declared theaters of war (Aikins et al. 2021). Therefore, our

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1“Remarks by the President at the National Defense University” (2013).
analysis contributes to ongoing policy debates about how the U.S. should conduct strikes against terrorists amid its withdrawal from Afghanistan and other conflict zones.

We provide a causal estimate for the implications of the near certainty standard using data from the Bureau of Investigative Journalism (BIJ). The BIJ dataset captures the universe of U.S. drone strikes in Pakistan from 2002 to 2019 based on news reports, official statements, and government press releases. According to senior U.S. policy officials we interviewed for this paper, the BIJ is the most authoritative dataset and provides information on the death toll and injuries resulting from U.S. drone strikes for both adults and children.

We leverage the BIJ data in a regression discontinuity (RD) design and exploit variation at the Obama administration’s implementation of the near certainty standard to provide our estimate. Importantly, the implementation period or cutoff – informed by our multiple interviews with Obama-era officials responsible for exercising the policy – lies approximately two years before the Obama administration’s public announcement.

We find that the Obama administration’s shift to the near certainty standard 18 to 30 months prior to the official policy announcement dramatically reduced civilian casualties in Pakistan. Consequently, the policy markedly increased the precision of U.S. drone strikes, which scholars often impugn for arbitrarily imposing risk based on the “randomness” or “vagueness” of targets (Aaronson et al. 2014; G. Martin and Steuter 2017). Under the Obama administration, strikes increasingly removed only the intended target(s). This finding suggests that the promise of drone warfare – reducing risk to a country’s own forces concomitant to better protecting civilians – is possible but requires important political and military trade-offs that officials may be unwilling to make because they often impose greater risks on friendly forces. Leveraging the causal interpretation of our RD estimate and the “as-if” randomness of civilian casualties, we also simulate a projection of civilian casualties absent the policy. We estimate 320 averted civilian deaths attributable to the Obama administration’s near certainty standard. These represent a Value of Statistical Life (VSL) gain of 80 to 260 million U.S. dollars (USD). This result suggests that in addition to conditioning social and political outcomes, the certainty standard governing U.S. drone strikes also imposes key economic implications that are much less understood.

The remainder of this article unfolds in four parts. In Section 2, we position the Obama administration’s policy of near certainty within the broader debate for U.S. officials’ use of drone strikes since 9/11. In Section 3, we discuss our empirical approach and regression discontinuity in time (RDiT) specification. In Section 4, we discuss our results and several robustness checks conducted following guidance by Hausman and Rapson (2018). In Section 5, we discuss our findings and their limitations, and conclude.

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2 See the appendix for information on our elite interviews.
2 Background

2.1 Drones and U.S. Military Strategy

In 2002, U.S. President George W. Bush authorized the first-known use of an armed drone – a General Atomics MQ-1 Predator – to kill an al-Qaeda leader in Yemen (Kreps 2016). Following the Bush administration’s steady increase in drone strikes, the Obama administration institutionalized the weapon – a practice that Donald Trump continued. Obama himself viewed drones as a “cure-all for terrorism”[3]. On the heels of the United States’ withdrawal from Afghanistan, U.S. President Joseph Biden adopted an “over-the-horizon” counterterrorism strategy that suggests drone warfare will maintain its foothold in American military strategy (Kreps and Lushenko 2021). The United States has used armed drones in both active and non-active areas of conflict. Whereas the use of force in active conflicts such as Afghanistan, Iraq, and Libya was sanctioned by domestic or international organizations, the use of force in places such as Pakistan, Somalia, and Yemen are a different matter. These areas are characterized by operations that are neither sanctioned by international organizations nor explicitly endorsed by domestic authorization. To justify its use of drone strikes here, the U.S. has cited several documents. These include the United Nations (UN) Article 51 right to self-defense, Article II statutory powers of the President’s Commander in Chief authority, or the 2001 Authorization for the Use of Military Force that allowed American presidents to attack al-Qaeda and its affiliates (Swan 2019).

The trajectory of U.S. counterterrorism drone strikes suggests two dichotomous patterns of operations between declared and undeclared theaters of war. The differences in these patterns are necessary to properly account for the origins of the near certainty standard as well as adjudicate its effectiveness over time. Drone strikes outside the context of armed conflict have drawn the most criticism internationally because they are conducted largely unilaterally and raise questions about violations of sovereignty in ways that drone strikes within the context of authorized armed conflict do not. Drone strikes also, invariant of the theater of operations, threaten a “spectrum of impunity” where civilians are exposed to greater dangers while technologically superior combatants face far fewer battlefield risks (Riza 2013). For some philosophers, drone strikes have now made “combatant immunity” the guiding moral principle of war (Primoratz 2007). Differences in the use and constraint of U.S. drone strikes help explain why a “human rights community” consisting of intergovernmental organizations (e.g., Office of the UN High Commissioner for Human Rights), non-governmental organizations (e.g., Amnesty International), and academic institutions (e.g., Stanford University’s International Human Rights and Conflict Resolution Center) systematically tracked U.S. drone strikes in Pakistan, Somalia, and Yemen, while it was largely silent on Iraq and Afghanistan (Lushenko, Bose, and Maley 2022). The collection of these data by watchdog community organizations made apparent the large civilian toll which was resulting – in real time – from the U.S. drone program.

[3]“Remarks by the President at the National Defense University” (2013).
Between 2002 and 2020, data from the BIJ estimates 10,000 to 17,000 people were killed by U.S. drone strikes in Afghanistan, Pakistan, Somalia, and Yemen. Of these, between 800 and 1,750 were reported as civilian casualties. The highest percentage of these non-combatant deaths were in Pakistan. Roughly 14 to 17 percent of the deaths resulting from U.S. drone strikes in Pakistan – between 335 and 636 lives – were reported as civilian casualties. The data provided by the BIJ also shows 286 to 425 children killed by U.S. drone strikes in Pakistan, which constituted 21 to 33 percent of the overall civilian death toll.

The human toll of U.S. drone strikes is not limited to non-combatant fatalities. Drone strikes impose long-term psychological, environmental, and economic impacts on people living in targeted areas. These costs are usually hidden and therefore much less acknowledged and studied by researchers. U.S. drone strikes in communities near the Afghanistan-Pakistan border are reflected in “[...] populations experiencing immense stresses, reflecting fear of strikes, and disruption to already marginal subsistence livelihoods based on culture and limited trade [...]” (Page and Williams 2021). One interviewee also explained “we try to avoid going to each other’s homes.” The interviewee continued by stating “we try to avoid making relations with newcomers or strangers, because it’s hard to trust everyone. We cannot recognise the person whether he is a terrorist or a good person or if he is a target of drones or not” (Page and Williams 2021).

In the early years of U.S. counterterrorism policy based on drone strikes, the ease of remote warfare technology and lack of oversight made armed drones experimental (Lindsay 2020; Sanger 2017). For example, the U.S. was initially comfortable striking targets based on the appearance of terrorist activity. This activity, which could consist of younger men conducting jumping jacks at an apparent militant training camp, circumvented positive identification of a high-value target based on a confluence of intelligence (Sanger 2017). These so-called “signature strikes” were criticized for resulting in civilian casualties because they relied on little more than observing a target’s pattern-of-life (Renic 2020). Over time, the utilization of these strikes presented a moral hazard that incentivized the use of remote warfare technology given the anticipated reduction of U.S. soldiers’ exposure to harm on the battlefield. The perceived merit of drone strikes, however, came at a key cost: non-combatant immunity.

Indeed, this moral hazard encouraged the Obama administration to authorize drone strikes in undeclared theaters of operations at ten times the rate of the preceding Bush administration. This resulted in the Obama administration’s use of a drone strike every 5.4 days over the course of its tenure (Zenko 2017). Obama argued “the drones probably had less collateral damage, which is the antiseptic way of saying it killed people who were innocent and not just just targets.” This was troubling because the “machinery of it started becoming too easy” and “turns out I’m really good at killing people” (Zenko 2017). Politically, in this era, drone strikes were broadly recognized as the “least bad option” to contain terrorists enjoying sanctuary in fragile and failing states, including Pakistan, Somalia, and Yemen. These operations gave the appearance of tough action against terrorists but without the potential risks that accompany the deployment of U.S. soldiers abroad, especially their redeployment home in body bags.
2.2 “Near” Certainty of Risk Mitigation

In response to the growing evidence of civilian harm from the U.S. counterterrorism policy of drone strikes, a chorus of criticism emerged. In 2010, the UN’s Special Rapporteur on Extrajudicial, Summary, or Arbitrary Executions, Philip Alston, released a report pointing to the prolific use of drone strikes as the crux of counterterrorism efforts as well as the implications for civilians. Alston implored the U.S. to demonstrate more restraint when using armed drones, particularly in undeclared theaters of war – challenging the U.S. to clarify the legal basis for its strikes in non-active areas of conflict (Alston 2010). Other international and non-government organizations chimed in with similar criticisms (Abizaid and Brooks 2015).

In interviews conducted at the end of his administration, Obama admitted that pressure from these criticisms encouraged him to implement measures for administrative officials to exercise more oversight on U.S. drone strikes. He referenced the critiques of two non-governmental organizations, the Human Rights Watch and Amnesty International, in particular. “So there’s an example of where I think, even if the criticism is not always perfectly informed and in some cases I would deem unfair, just the noise, attention, fuss probably keeps powerful officials or agencies on their toes. And they should be on their toes when it comes to the use of deadly force” (Friedersdorf 2016).

As civilian casualties and criticism mounted following U.S. drone strikes in undeclared theaters of war, Obama directed a review of U.S. counterterrorism policy during his first term in office. Obama “directed his administration to tighten procedures and standards” governing U.S. drone strikes abroad (Savage 2016). He reportedly “pushed his staff to come up with a complex set of rules and legal structures to make sure each strike comported to the rules of law” (Sanger 2017). Although the near certainty standard was not publicly disclosed until Obama’s speech at the National Defense University in late May 2013, this more restrictive guideline for civilian protection during U.S. drone strikes was the result of intensive policy deliberations starting as early as 2011 (Jaffer 2016; G. Martin and Steuter 2017). Moyn characterizes the deliberations as designed to achieve “little more than self-regulation” with the Obama administration “devising rules and enforcing them against themselves” (Moyn 2021). Jaffer (2016) adds “Obama administration officials insisted that drone strikes were lawful, but the ‘law’ they invoked was their own.” Even so, during the intervening period between 2011 and 2013, the Obama administration “ratcheted up” requirements for strike approval in undeclared theaters of war to ensure more discriminatory operations (Lindsay 2020).

Not only was the Obama administration’s near certainty standard important for instilling higher degrees of morality and legality into the drone strike approval process, it was also designed to enhance America’s approbation by attenuating images of the “quasi-secrective” use of armed drones (Banka and Quinn 2018). By 2012, for instance, a Pew Research Center poll showed that 94% of Pakistanis thought that U.S. drone strikes in Pakistan were killing “too many” civilians (Jaffer 2016). Public opinion tracked closely with the dominant narrative portrayed in Pakistani newspapers from 2009-2013, which suggested that U.S. drone
strikes killed more civilians than combatants (Fair and Hamza 2016). In demonstrating the United States’ rightful wartime conduct, in this case using force to kill terrorists while minimizing risks to innocent civilians, the near certainty standard was calibrated to enhance foreign audiences’ support for America’s use of strikes abroad (Aslam 2013; Clark 2005). Lastly, given the emerging arguments about blowback – that strikes with high civilian casualties might provide a recruitment tool for more terrorists (Cronin 2020; Tirman 2011) – the U.S. had important instrumental reasons to minimize collateral damage.

2.3 Operationalizing “Near” Certainty

The genesis of the Obama administration’s near certainty standard suggests that any reduction in civilian casualties during U.S. drone strikes in undeclared theaters of war is not a function of a figurative piece of paper, the PPG. Rather, we anticipate a reduction of civilian casualties based on the Obama administration’s deliberative process of carrying out a strike and the official policy change that publicly acknowledged heightened scrutiny. Testing this hypothesis requires that we first understand the mechanics of U.S. drone strikes to identify what changed given the Obama administration’s adoption of a more restrictive targeting policy. Casting U.S. strikes in terms of a production function suggests that the near certainty standard constituted the key mechanism that changed aspects of the targeting process to further protect civilians. This casts doubt on alternative explanations that suggest conditions unique to Pakistan or shifts in the intended targets may better account for the evolving accuracy of U.S. drone strikes (Plaw, Fricker, and Williams 2011).

Drone strikes result from a two-stage process of intelligence and approval that are linked by the certainty standard. Intelligence is the process of analyzing raw data and information given some military or political objective (Odom 2008). Approval is the prosecution of a strike based on authorization from a political official. Intelligence drives drone strikes and is a function of three actors. First, analysts assess the body of reporting on a proposed target to justify its value – the target’s placement, access, and contribution to a terrorist group. Second, an intelligence officer communicates this assessment to a commander while further validating the target’s location, estimating the impact of the target’s loss, and framing the target against a commander’s priorities that reflect broader strategic and policy goals (Lushenko 2018). Third, drone operators have the ability to shape judgment for the degree to which strikes meet a certainty standard given their prolonged observation of a target. Only in the case that targeted killing is manifestly illegal, meaning it purposefully contradicts the *jus in bello* (justice in war) principle of distinction, will operators protest a strike (M. Martin and Sasser 2010). Even then, protests are usually *post hoc* considering strikes are ultimately underwritten by commanders.

Intelligence is decisive to the approval process that follows. With this initial risk assessment, the approval process also includes two additional assessments that further frame the certainty standard. A collateral damage estimate (CDE) results from “computerized algorithms to predict, estimate, and minimize collateral damage” based on the munitions, terrain, urbanization, and human traffic pattern throughout an area that is
marked for a drone strike (Crawford 2013). The CDE process further considers the potential for secondary explosions following a drone strike that can – and often do – harm civilians (Khan 2021). A lawyer then assesses the merits of targeted killing based on the rules of engagement that link lethal action to a combatant’s hostile act or intent, as well as a politically-informed “noncombatant casualty cutoff value” that shifts up or down based on the certainty standard (Crawford 2013; Khan 2021; Liddick 2021).

Under the Bush administration, the United States’ strategic use of drone warfare was based on the lenient standard of reasonable certainty. This standard allowed for civilian casualties in both declared and undeclared theaters of war during U.S. drone strikes. In response to the concern over the loss of civilian life, the Obama administration conditioned the approval of drone strikes on four requirements. A strike would be approved after demonstrating (1) a target constituted a “continuing imminent threat to U.S. persons”; (2) infeasibility of capturing the target; (3) near certainty of target identification; and, (4) near certainty of no civilian casualties.\(^4\)

Movement from reasonable to near certainty modified the intelligence and approval processes in part by shifting the burden of proof from the signature of terrorist behavior to positive identification of a target as the threshold for a drone strike. Commanders also placed more emphasis on the CDE assessment. This was crucial to ensure the Obama administration’s use of drone strikes for targeting killing aligned with publicly acknowledged criteria and international law (B. DeRosa and Regan 2021). Indeed, the near certainty standard resulted in a series of military, legal, and policy checks. These required commanders to more thoroughly inform “decisions about whether a potential target satisfies the policy criteria to be designated for a lethal use of force; development of an operational plan, including assessment of whether it is possible to satisfy operational requirements; legal review; final policy-level approval, and some external oversight” (B. DeRosa and Regan 2021).

2.4 Theoretical Mechanism

We are interested in studying a change from the reasonable to near certainty standard that came to govern the Obama administration’s risk assessment of using drone strikes in undeclared theaters of war, including Pakistan. As described above, the production function for a drone strike is split into two stages with separate actors. In studying the change in certainty standard, we observe increased scrutiny for risk assessment in several of these actors. The two stage process for a drone strike’s approval takes the following functional form:

\[
\text{StrikeApproval}_s = f(\text{Intelligence}_s; \ CDEAssessment_s; \ LegalCounsel_s)
\]

where  \( \text{Intelligence}_s = f(w_1 \ast \text{AnalystReporting}; \ w_2 \ast \text{IntelOfficer}; \ w_3 \ast \text{Operator}) \)

\(^4\)“Remarks by the President at the National Defense University” (2013).
We describe the function and role for each of these actors in our conceptual framework above. We attach weights \(- w_n \) to each of the three actors in the intelligence gathering process and observe in this setting that \( w_2 > w_1 > w_3 \). The more stringent level of certainty levied by the Obama administration’s policy adjusted the risk assessment guidelines to gain approval for a strike. Following the Obama administration’s implementation of the near certainty standard, increased scrutiny was placed on three components of this process: the intelligence officer’s assessment, the CDE assessment, and legal counsel.

3 Empirical Approach

3.1 Drone Strikes Data and Outcomes

We use data from the BIJ that captures the universe of U.S. drone strikes in Pakistan from 2002-2019. Specifically, these data capture 351 U.S. drone strikes. From these data, we retrieve strike-specific information about location and estimates for civilian casualties, child casualties, and total casualties. We opt to use data from the BIJ for a number of reasons. First, the BIJ provides multiple references for each strike cataloged in the dataset. The casualty values in the dataset are validated by multiple sources that are made separately available and when cross-referencing a subsample of the BIJ citations, we also identified no reporting errors. Second, the U.S. government’s estimates for civilian casualties are often questioned by scholars and practitioners. The author of the policy we study states this plainly: “the U.S. figures undercount civilian casualties”\(^5\). Finally, the other two organizations that similarly collect data on U.S. drone warfare – New America Foundation and The Long War Journal – are often criticized for consistency issues (Kreps 2016). For our main analysis, we aggregate our sample to the country-month level and observe strikes in 61 months prior to the policy’s implementation and 43 months afterwards.

We take the midpoint of the minimum and maximum estimates for casualties to use as our outcome variables, following prior literature (Sheehan, Marquardt, and Collins 2021). We construct these midpoint values for civilian, child, and total casualties. We create a measure of strike precision from these values as the proportion of total deaths from a strike that are reported as combatant deaths. This measure of precision ranges from 0 to 1 and takes the value of 1 when only combatants are killed and 0 when only civilians are killed and can be interpreted as the percent of total deaths from a strike that were combatants. We aggregate these measures to the monthly-level for analysis.

3.2 Regression Discontinuity in Time

Our baseline model is a regression discontinuity in time (RDiT) that follows work by Davis (2008), Auffhammer and Kellogg (2011), Chen and Whalley (2012), and Anderson (2014). This method mimics a randomized controlled trial by observing the period before a policy goes into effect as the counterfactual (control) to

\(^{5}\)See the appendix for information on our elite interviews.
the treated observations. An RDitT design is an extension of the canonical RD design to time series data that treats calendar time as the running – or forcing – variable. The discontinuity is estimated at a cutoff $c$ that aligns with the implementation of our policy. We opt for this design over our ideal approach – a difference-in-differences (DiD) model – due to data limitations in our only potentially valid counterfactual setting: Afghanistan. We follow the guidance of Hausman and Rapson (2018) who outline a set of assumptions and robustness checks that researchers should satisfy when adopting this method.

3.2.1 RD Specification

Our primary regression discontinuity model takes the following form:

$$ y_m = \alpha + \beta \text{Cutoff}_m + f(\text{date}_m) + \varepsilon_m $$

In this equation $y_m$ is our monthly outcome variable in Pakistan for month $m$, $\text{Cutoff}_m$ is a binary variable equal to unity when the near certainty standard is implemented and zero otherwise, and $\text{date}_m$ is the unit measured in months from policy implementation. An RD model is driven by the assumption that the potentially endogenous relationship between our running variable $\text{date}_m$ and the error term $\varepsilon_m$ is eliminated by the flexible function $f(\cdot)$. An assumption underlying this design is that the relationship between the error term and our running variable does not change discontinuously near our cutoff $c$. In particular, the relationship between $\varepsilon_m$ and the date must not change discontinuously on or near the date on which the strike begins. Our RD specification is a sharp RD in that the running variable $\text{date}_m$ completely determines $PPG_m$.

To estimate this model we follow Imbens and Lemieux (2008), using a parametric approach with two bandwidths: the MSERD optimal and a manual bandwidth of 48 months. We estimate local linear regressions of the form:

$$ y_m = \alpha_0 + g(\text{date}_m)\beta + \alpha_1 \text{Cutoff}_m + f(\text{date}_m) \ast \text{Cutoff}_m \omega + \varepsilon_m $$

We estimate these regressions for outcomes $y_m$ and create two functional forms on either side of the discontinuity: $f$ and $g$. We are interested in the coefficient $\alpha_1$ which represents the discontinuity in the trends between functions $f$ and $g$. Though we capture strike-level outcomes in our aggregate measures, our primary analysis is at the month-level. In contrast to studies of the military effectiveness of individual strikes in Pakistan (P. Johnston and Sarbahi 2016) that encourage analysis at the day or week level, we opt for monthly aggregation. This allows us to capture the broader impact for U.S. counterterrorism strategy following a change in the certainty standard – particularly because strike frequency did not see an analogous discontinuity in a parametric setting. Indeed, the Obama administration intended the near certainty standard to radically
alter decision-making at the strike-level, thus reflecting a broader strategic adjustment. Obama’s articulation of the policy makes clear that the intended effect was a net reduction in civilian casualties, invariant of strike frequency.

We set our primary cutoff value $c$—based on a series of analyses and feedback from Obama-era officials responsible for implementing the policy—at July 2011. We perform an analogous specification for the Obama administration’s official announcement of the policy on May 23, 2013—though, we opted to not use this date for three key reasons. First, we know that the certainty standard accompanying the Obama administration’s policy was being rolled out well before the official policy announcement (Lindsay 2020). Indeed, the cutoff coincides with several official statements and documents released by the Obama administration relating to U.S. drone strikes, including a Justice Department memorandum on the targeting of U.S. citizens abroad (Jaffer 2016). Second, setting the cutoff at the announcement date includes the implementation period of the policy as untreated observations and excludes several strikes with high civilian casualties—notably in July 2012. Third, we conduct a structural break analysis to corroborate feedback from Obama-era officials indicating that July 2011 aligns with the “true” policy implementation period.

### 3.2.2 Structural Break Analysis

Our specification functions well when a discrete, sharp cutoff $c$ exists. Given this requirement, the roll-out period for the Obama administration’s policy of near certainty in the 18 to 30 months prior to the official announcement could present an issue. To confirm July 2011 aligns with the “true” policy implementation date, as suggested by our primary research, we conduct a structural break analysis. Structural break analysis relies on Chow’s F-test to estimate points in time series data where there exists a pronounced break in the trend underlying the outcomes. We use the [xtbreak] function in Stata to estimate potential breaks in the BIJ data (Ditzen, Karavias, and Westerlund 2021). Empirically, our structural break analysis takes the following form:

$$\hat{T}_s = \arg\min_{T_s \in T_s, c} SSR(T_s)$$

The resulting estimate $\hat{T}_s$ provides the points along our running variable of calendar time where the outcomes break with the linear trend. We perform this estimation without hypothesized breakpoints and instead specify three potential breaks. The estimate is then evaluated on statistical power following Bai and Perron (1998). In performing this operation, we find structural changes in our time series that align across outcomes and aggregation level, though our monthly breakpoints are better identified.

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6“Remarks by the President at the National Defense University” (2013).
4 Results

4.1 Summary Statistics and Trends

4.1.1 Monthly Summary Statistics for Strike Outcomes

Table 1: Summary Statistics for Casualty Outcomes

|                     | Pre Jul11 | Post Jul11 | Pre May13 | Post May13 |
|---------------------|-----------|------------|-----------|------------|
| Civilian Casualties |           |            |           |            |
| Count               | 607       | 90         | 690       | 7          |
| Mean                | 11.902    | 1.689      | 9.318     | 0.233      |
| Mean MinEst         | 7.667     | 0.623      | 5.689     | 0.1        |
| Mean MaxEst         | 16.137    | 2.755      | 12.946    | 0.367      |
| Child Casualties    |           |            |           |            |
| Count               | 182       | 7          | 188       | 1          |
| Mean                | 3.578     | 0.132      | 2.547     | 0.033      |
| Mean MinEst         | 3.294     | 0.075      | 2.324     | 0          |
| Mean MaxEst         | 3.863     | 0.189      | 2.77      | 0.067      |
| Total Casualties    |           |            |           |            |
| Count               | 2256      | 1014       | 2936      | 334        |
| Mean                | 44.235    | 19.142     | 39.676    | 11.15      |
| Strike Precision    |           |            |           |            |
| Mean                | 0.686     | 0.95       | 0.761     | 0.97       |
| Strike Frequency    |           |            |           |            |
| Count               | 263       | 167        | 369       | 61         |
| Mean                | 5.157     | 3.151      | 4.986     | 2.033      |

Table of means of primary outcome variables indexed by two cutoffs. July 2011 – our policy cutoff – and May 2013, when the Obama administration announced the policy. Mean values of the minimum and maximum estimates of casualties are also provided, from the BIJ, and shown for child and civilian deaths. Strike precision is the proportion of those killed from drone strikes that were the intended target.

4.1.2 Trends in Drone Strike Casualties

Cumulative Deaths from U.S. Strikes We first visualize the arc of the U.S. drone program and its cumulative human toll in Pakistan. We visualize cumulative deaths over time and plot them below. We observe a period from 2005 to 2008 – during the Bush administration – where civilian deaths in Pakistan accounted for a majority if not the totality of casualties as a result of U.S. drone strikes in that country. This poor targeting and precision of strikes improves during the transition to the Obama administration – denoted with blue shading in the plots below. We observe an increase in combatant casualties in tandem with a growth in civilian casualties through the initial years of the Obama administration. This aligns with
the endogeneity of operational ability in the certainty standard that governs civilian risk: strikes conducted with improved technology and capabilities are still liable to harm civilians so long as they are governed by the standard of reasonable certainty.

Figure 1: Plots display cumulative total, civilian, and combatant casualties from 2002-2019. Data retrieved from the Bureau of Investigative Journalism (BIJ). Plotted values represent the midpoint of minimum and maximum casualty estimates provided in the BIJ data. Shading reflects the Obama administration.

**Civilian Casualties**  We study the shift to a near certainty standard that conditioned strike approval on assurance of no civilian harm. We plot civilian casualties resulting from strikes below and provide them at the strike- and monthly-level – we opt for the latter level of aggregation in our primary RD specification. The vertical line in these plots denotes our policy cutoff: July 2011. Mean civilian casualties are superimposed on either side of the policy cutoff in red lines.
Figure 2: Data sourced from the Bureau of Investigative Journalism. Observations are midpoint of casualty estimates and error bars are min/max estimates. The superimposed dotted lines on either side of July 2011 represent the outcome variable (y axis) mean for the period before and after near certainty standard implementation. Shading reflects the Obama administration.

We observe that the mean civilian casualty value reduces to almost zero at both the strike- and monthly-level after implementation of the near certainty standard. This reduction in civilian deaths drives our RD specification and creates a discontinuity at the implementation of the policy.

**Strike Precision** The near certainty standard was put in place to mitigate civilian harm though scholars argue that the observed reductions may be more attributable to fewer strikes rather than an increase in strike-level precision (Plaw, Fricker, and Williams 2011). To the extent scholars do study the implications of the Obama administration’s near certainty standard for targeting accuracy, they merely rely on descriptive trends – “fewer injuries implies more decisive lethal operations” (Lindsay 2020). Rather, we construct a measure of strike precision as the proportion of non-civilian deaths among total deaths from a given strike. This measure should take – based on principles of *jus in bello* – a value of 1 for every strike meaning that no civilians were at risk and only targeted individuals were killed. We illustrate presidential administrations and means analogous to the plots of civilian deaths.

Figure 3: Data sourced from the Bureau of Investigative Journalism. Observations are proportion of those killed who were non-civilians (enemy combatants who were targeted by the strike). The superimposed dotted lines on either side of July 2011 represent the outcome variable (y axis) mean for the period before and after near certainty standard implementation. Shading reflects the Obama administration.
We observe the pre-period mean strike precision to be 0.686 – less than 70 percent of those killed in strikes before the near certainty standard were the intended target. The mean value of strike precision following the Obama administration’s adoption of the near certainty standard grows to 0.95 or 95 percent precision in successful targeting.

4.2 Regression Discontinuity Results

We estimate regression discontinuity models for the following outcomes: (1) civilian casualties, (2) strike precision, and (3) civilian casualties per strike. Table 2 presents RD estimates for monthly-level outcomes using the policy cutoff from our structural break analysis – July 2011 – and two bandwidths: the MSERD optimal and a manual bandwidth of four years.

|                  | CivCas | CivCas | StrPrec | StrPrec | Civ P/S | Civ P/S |
|------------------|--------|--------|---------|---------|---------|---------|
| Conventional     | −11.139 | −9.523 | 0.177   | 0.089   | −1.983  | −0.861  |
|                  | (0.058) | (0.015) | (0.066) | (0.117) | (0.070) | (0.144) |
| Bias-Corrected   | −12.564 | −8.526 | 0.196   | 0.119   | −2.160  | −1.074  |
|                  | (0.032) | (0.030) | (0.041) | (0.036) | (0.049) | (0.068) |
| Robust           | −12.564 | −8.526 | 0.196   | 0.119   | −2.160  | −1.074  |
|                  | (0.069) | (0.144) | (0.088) | (0.147) | (0.100) | (0.230) |

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Regression discontinuity estimates are provided for three outcomes: monthly civilian casualties, strike precision defined as the proportion of casualties from a strike that were intended targets, and civilian casualties per strike. The cutoff date is set to July 2011. These are linear, parametric models following the specification detailed in Section 3.2.1 that are fit with an MSERD optimal bandwidth in odd numbered columns and a bandwidth of 4 years in others.

There is a statistically significant discontinuity at this cutoff for all three of our outcome variables. We estimate a discontinuity in civilian casualties that results in a 12 death reduction per month. It is important to note that this aggregate measure of monthly civilian casualties may reflect changes in strike frequency. Our model estimates a reduction of 2 civilian casualties per strike following the implementation of this higher certainty standard. This estimated reduction is similar in magnitude to the average civilian casualty estimate before the policy was implemented. We augment this further in our Monte Carlo simulation, below. Finally, we estimate an increase in strike precision of 19.6 percentage points. The mean value of this measure before the certainty standard had changed was 0.82 – providing context to our estimate that we approach 100% strike precision following this change. We find no measurable discontinuity in strike level outcomes and discuss this further in our robustness checks below.
4.3 Robustness Checks

Our primary analysis is an extension of the canonical RD design. We employ a series of robustness checks to verify the validity of the RD design with emphasis placed on additional concerns we face using calendar time as our running variable. We turn to guidance by Hausman and Rapson (2018) for a checklist of robustness checks to validate the assumptions of our RDiT specification. We attempt to address each of their checklist items and provide justification in situations where we are unable to. We present these checks below.

(1) Plot Raw Data Regression discontinuity designs rely on a change in the behavior of data around some cutoff $c$. In an RDiT specification, the behavior of observations across time (trends) also provide an important context for the time before a policy was implemented. This is especially important as we consider bandwidth and cutoff selection. As such, we plot the raw values of our outcome (civilian casualties) across time and fit linear trends on either side of our chosen cutoff below:

![Civilian Casualties from U.S.-Backed Drone Strikes in Pakistan](image1)

Figure 4: One observation removed for visualization [Oct 2006, 81 Deaths]. Data sourced from the Bureau of Investigative Journalism. Observations are midpoint of casualty estimates and error bars are min/max estimates. Vertical line drawn at July [1], 2011 – the point of structural change in the trend of our outcome. Linear fit smoother applied for each side of this cutoff.

In these plots, the circular dots are midpoints of civilian casualty estimates. The whiskers extending from each circular dot represent the minimum and maximum estimated civilian casualties for that observation, as provided by the BIJ. The cutoff $c$ is represented by the vertical line placed at July [1], 2011 – the estimated breakpoint in the running variable from our structural break analysis that corresponds to information gathered during our interviews with senior Obama-era officials.

We do not observe a significant discontinuity for strike-level civilian casualties. This aligns with the broader goal of this policy – minimizing civilian casualties invariant of strike frequency by implementing higher scrutiny at the strike-level. While a linear discontinuity does not exist at the cutoff for strike-level casualties, our ANOVA results support a measurable, statistically significant difference in our outcome conditional on exposure to the near certainty standard. Additionally, we do not see a discontinuity in monthly strike
frequency which bolsters our assertion that the mechanism that produced monthly reductions occurred at the strike-level.

(2) Parallel RD Specifications  We fit identical, “parallel,” regression discontinuity models to other outcomes within our data. We are interested in empirically testing if the mechanism at cutoff $c$ creates discontinuities in outcomes outside of our framework. If we see a discontinuity in these other outcomes, we have reason to doubt that the effect of our policy mechanism is isolated to civilian casualties. We perform a series of three parallel RD specifications. For outcomes we use: (1) strike frequency, (2) combatant casualties, and (3) weather. We include these three as they fall outside the scope of the policy and should not be affected in a way that creates the discontinuity we observe in our civilian casualty outcomes. We find no measurable, statistically significant discontinuities in any of these falsification models.

(3) RDiT Calibration  In addition to the structural break analysis, we further validate our chosen cutoff by running a “rolling” RD specification. We conduct this test to inspect the RD estimates at different cutoffs $c$ by iteratively changing $c$ for every month in the two and a half years prior to the Obama administration’s official announcement of the near certainty standard. This specification iterates $c$ monthly from October 2010 to May 2013. We plot the distribution of these estimates across cutoff values to demonstrate the alignment of the most significant RD estimate with the confidence interval from our structural break analysis. This analysis corroborates our assertion that the policy implementation date advanced by Obama-era officials aligns with a discontinuity at our chosen cutoff. To determine how removing the implementation period impacts our RDiT specification, which addresses the issue of selection into treatment, we conduct a donut RD below.
Figure 5: RDiT specification “rolling” across policy implementation period: October 2010 to May 2013. Shading reflects confidence interval from structural break analysis: May 2011 to August 2011. Triangular points on the graph are statistically significant at the $\alpha = 0.05$ level. All models used a 48 month (4 year) bandwidth, triangular kernel, and a first-order polynomial (parametric linear RD).

(4) “Donut” RD Specification  A “donut” regression discontinuity specification is a robustness check to mitigate concerns about short-run selection, anticipation, or avoidance effects. This specification is particularly useful in scenarios where observations could potentially “sort” across the cutoff to align with their preferences – it is performed by removing observations in a specified event window (the donut). In our setting, being observed in the data at all is random and we would not expect any potential sorting by way of this randomness. Instead, we adopt a donut RD specification to evaluate differential effects across the implementation period of Obama’s near certainty standard. Our primary cutoff $c$ aligns with a structural break in our analysis, July 2011, which comports with the initial rollout of the policy. Obama’s public announcement of this policy – after being broadly implemented – provides a separate cutoff on May 23, 2013. We identify this window between 2011 and 2013 as the implementation period for this policy and conduct an analysis where the largest donut we test spans this entire distance. We divide this initial window into four donut specifications, centered around April 2012 and expanding in diameter by roughly 6 months until we estimate our full donut RD.

We estimate a donut RD design on both strike- and monthly-level civilian casualties, analogous to the setting from our raw data plots. In the plots below, the shaded area is our full donut that estimates the discontinuity with the observations that remain on either end of the cutoff. The donut RD plot for monthly civilian casualties is provided below:
The discontinuity in this specification, shown in raw values above, provides a stronger estimate than our standard RDiT (a reduction of ~15 civilian casualties per month). There are a number of explanations for this finding. Importantly, it results from removal of the policy rollout period that includes strikes resulting in nontrivial civilian casualties during two separate operations in July 2012. Given our data scarcity and the importance of including these two strikes, we offer this donut specification only to reflect the effect of this policy outside of its implementation period. We favor our primary specification based on its inclusion of all our data.

(5) Other Checks The checklist also suggests providing several additional robustness checks, including polynomial overfitting, geographic placebo parallel RDs, serial autoregression, and an augmented local linear methodology posed by the authors. We fit a linear trend at our discontinuity and provide evidence of robustness to varying polynomial order – though our local linear regression estimates are strongest (Pei et al. 2020). We are unable to perform parallel RD specifications in placebo geographies due to the same data limitations that prevent us from implementing a DiD design. We test for serial autoregression and find no motivation for a lagged dependent variable specification. Autoregression in our time series would suggest that the civilian casualties in time $t$ would be predictive of casualties in time $t + n$ where $n \in 1, \cdots, t_k$. This is not the case in this setting as civilian casualties represent, in their existence, a deviation from military strategy and goals. The expectation for our outcome of civilian casualties should be zero and are viewed
as-if random otherwise (Rigerink 2021). The final recommendation is the use of the Hausman and Rapson (2018) augmented local linear methodology. The authors argue that this procedure conditions on important regressors and can provide a more effective estimate on a smaller bandwidth. Our setting and specification provide strong estimates with a linear fit on either side of our cutoff, invariant of covariate inclusion.

5 Discussion

5.1 Key Assumptions & Limitations

Our results rely on three key assumptions. First, we assume that civilian casualties resulting from U.S. drone strikes are as-if random – it is impossible to predict civilian deaths during future strikes (Rigerink 2021). Indeed, a recent report claims drone strikes “hit their targets with near-unerring accuracy” (Khan 2021). This assumption aligns with the just war component of *jus in bello* and its principle of distinction that implies civilian casualties result from human error or the policy for risk mitigation (Crawford 2013). Second, we contrast existing explanations of these reductions in civilian risk that emphasize improvements in drone technology (Plaw, Fricker, and Williams 2011) and posit that the near certainty standard is the primary mechanism for the reduction of civilian casualties in Pakistan. While technological advances may have increased the operational capacity of drone warfare, they are endogenous to the near certainty standard that governs the risk faced by civilians.

Finally, our policy implementation date is technically unknown. As such, we choose our sharp cutoff \( c \) based on primary research and validate it with myriad robustness checks. This estimated cutoff is corroborated by the known, lagged announcement of the near certainty standard and the swift, full-compliance nature of military guidance. Guidance for the near certainty standard was being disseminated in the 18 to 30 months prior to the May 23, 2013 announcement and the structural break analysis identified a breakpoint in this range, as did our “rolling” RDiT method. Additionally, a primary role of military officials is to rapidly disseminate policy guidance through the chain-of-command (Owens 2011). This swift implementation of military policy lends itself to our sharp RD design – one which relies on the cutoff to discreetly identify a discontinuity.

This study is also vulnerable to limitations outside the scope of our econometric specification. The intended targets in Pakistan may have adjusted their behavior in ways that created more patience in military strategy and reduced civilian casualties due to human error. Drone strikes in Pakistan increased commensurately with the Obama administration’s surge of forces to Afghanistan – in part as an additional line of defense (Ullah 2021). The high-value targeting strategy in Pakistan, by this time, had successfully identified and killed the most threatening terrorists. Only lower-tiered targets would have remained and their level of threat – an evaluation of their intent and capability to harm – would have likely diminished as well. This could have encouraged fewer strikes due to the lack of acceptable targets rather than greater restraint and scrutiny in
targeting. The evidence suggests otherwise. We do not observe a discontinuity in strike frequency at these cutoffs nor do we see evidence that non-civilian (combatant) casualties were impacted by exposure to the near certainty standard.

5.2 Economic Implications

Our primary analysis estimates an average treatment effect across the bandwidth of our RD specification. While useful in providing a causal estimate of the policy’s impact in reducing civilian casualties in Pakistan, the RD analysis does not provide an estimate for the long-run gains resulting from adoption of the near certainty standard. We follow a primary assumption of our specification – as-if randomness of civilian casualties from strikes – to project the potential for civilian deaths during U.S. drone strikes that occurred after the Obama administration’s implementation of a tighter targeting protocol.

We leverage as-if randomness to sample and match – with replacement – civilian casualty values during strikes authorized by the Obama administration before the PPG to strikes “treated” by the policy. We run this exercise as a Monte Carlo simulation with 5,000 iterations and average across matched civilian casualty values for each treated strike. We find that these values average to 2.8, which aligns with the pre-policy average for civilian casualties resulting from U.S. drone strikes authorized under the more permissive reasonable certainty standard. This outcome aligns with our RD results as (1) the mean civilian casualties for strikes carried out under near certainty is statistically non-different from zero and (2) the RD specification estimates a per strike reduction of 2.6 civilian casualties attributable to the discontinuity at the cutoff $c$. We use the results of our Monte Carlo simulation to calculate the total number of averted civilian casualties. First, we take the difference between the matched average civilian casualty values and the true outcomes. Second, we sum across these strike-level differences. We estimate 320 averted civilian casualties in Pakistan were attributable to the Obama administration’s adoption of the near certainty standard.
These averted, potential civilian casualties represent a large financial and psychological toll had they occurred. Admittedly, this toll is difficult to quantify and doing so may be morally dubious for some. Because a preponderance of the drone warfare literature discounts the economic costs of strikes, we nevertheless attempt to contextualize the averted loss by providing a VSL calculation based on existing estimates for individuals in Pakistan. These values represent the “local tradeoff rate between money and fatality risk” (Kniesner and Viscusi 2019). As such, they offer a reasonable estimate that economists often use to quantify what this tradeoff is worth given potential for future earnings and local characteristics. Estimates for a VSL in developing countries often underestimate this tradeoff rate and therefore vary significantly. In contrast, a common estimate of a VSL in the United States is approximately 10 million USD (Viscusi and Masterman 2017). We use low – 200,000 USD – and high – 800,000 USD – estimates for a VSL in Pakistan to scale our averted death calculation with these VSL values (Rafiq 2011; Viscusi and Masterman 2017). We estimate a VSL gain between 80 to 260 million USD for the 320 averted civilian casualties that we attribute to a change in the certainty standard. The body of our findings carry important policy implications that we discuss below.
5.3 Policy Implications

Our findings suggest several policy implications relevant to ongoing debates about whether and how U.S. officials should conduct counterterrorism drone strikes going forward. First, a heightened level of political scrutiny allows the United States to enjoy the intended benefits of drone warfare, such as protections for soldiers and civilians while surgically removing terrorists. Other countries that similarly use armed drones, such as France in Mali, have shown that enhanced oversight is the keystone of capitalizing on the dividends of UAVs while managing the public controversy of doing so (Vilmer 2017). U.S. officials openly recognize this benefit of added oversight. Lloyd Austin, a former four-star U.S. Army General and currently the Secretary of Defense, recently conceded the U.S. “must work harder” to reduce civilian casualties (Myers 2021). This admission corroborates the earlier finding by Tirman (2011) that “despite policies that claim to protect civilians in war zones,” U.S. officials “do not in practice do so adequately or consistently.”

Second, our findings not only indicate that a near certainty standard can help prevent civilian casualties during U.S. drone strikes but also that these shortfalls in policy can impose broad economic and human costs that are rarely captured by U.S. payments to families of killed civilians. Policy-makers should consider these when managing the consequences of tragic errors. It is unclear how the U.S. calibrates its compensation to families of unintended – civilian – victims of strikes. The available evidence suggests, however, that such “solatia” payments are wholly inadequate, even in developing countries such as Pakistan where the earning potential of citizens is comparatively less than it is for developed states. A recent report shows Congress has only authorized 3 million USD a year for compensation payments. In 2019, the U.S. military made 71 payments to families in Afghanistan and Iraq ranging from 131 to 35,000 USD (Schmitt 2021a). Even at the low-end of our VSL calculation for Pakistan – 200,000 USD – these payments dramatically shortchange victims’ families, perhaps contributing to continued grievances (N. Johnston and Bose 2020). While scholars have often constructed the legitimacy of U.S. drone warfare in terms of the target (Dill 2015), the economic cost of preventable civilian deaths should be considered by U.S. officials attempting to rehabilitate America’s image in the wake of egregious mistakes during drone strikes. This seems especially important if tragic mistakes result in no accountability among U.S. political and military officials, as was the case following the Biden administration’s botched strike in Afghanistan as well as a preponderance of previous incidents (Khan 2021; Schmitt 2021b).

According to our analysis, adopting the near certainty standard during drone strikes in declared theaters of war can further prevent civilian casualties. Admittedly, weighing non-combatant immunity in favor of military necessity exposes soldiers to additional battlefield risks by restricting commanders’ use of drone strikes for close-air-support, which is designed to defend U.S. forces in combat. For many war theorists, this is precisely the added risk that reflects soldiers’ martial virtue. Walzer (2015) argues that commanders must “risk soldiers before they kill civilians.” Luban adds “that accepting some extra risk to save civilians
belongs to the vocational code of the soldier – in old-fashioned but still relevant language it is part of the
soldier’s code of honor” (Benbaji 2014). A handful of military officials have adopted this logic operationally.
Retired U.S. Army General Stanley McChrystal introduced a valor award for “courageous restraint” while
leading counterinsurgency operations in Afghanistan to help institutionalize soldiers’ heightened liability to
be harmed while protecting civilians. Many more defense officials, however, do not endorse tying commanders’
hands to protect U.S. forces. Indeed, McChrystal’s initiative failed shortly following its implementation
because it achieved his intent too well: greater numbers of civilians were saved but at the price of more U.S.
casualties (Felter and Shapiro 2017). If the past is prologue, then, we suspect the Pentagon will also object
to tighter targeting protocols on drone strikes during active conflicts, though the gains for civilian protection
are unequivocal given our analysis, which is consistent with other recent studies (Khan 2021).

Finally, our analysis suggests that the U.S. should renew the debate for the global governance of armed drones,
especially if officials recognize the likelihood of civilian casualties following strikes without greater oversight.
While regulatory mechanisms do exist to counter the proliferation of the most advanced UAVs, such as the
Missile Technology Control Regime (MTCR), they are feckless and generally lack teeth in adjudicating the
necessary sanctions on violating countries (Mistry 2003). The U.S. is now the most flagrant violator of the
MTCR and allows U.S.-based manufacturers of armed drones such as General Atomics to directly negotiate
export contracts with foreign buyers with little recourse beyond public criticisms (Stohl and Dick 2021). The
frailty of existing regulatory mechanisms has caused some experts to advocate for an entirely new approach
to regulation optimized to limit the proliferation of drone technology rather than the platforms themselves.
This is unlikely to be popular given the lucrative profits at stake (Lushenko, Bose, and Maley 2022). India,
for instance, is reportedly finalizing a 3 billion USD purchase order for 30 MQ-9B SeaGuardian drones built
by General Atomics (Pandit 2021). Without broader oversight, the international trade of armed drones will
contribute to countries’ continued abuse of drone strikes, imposing additional costs on innocent civilians
captured in the crossfire (Lushenko, Bose, and Maley 2022).
6 References

Aaronson, Mike, Wali Aslam, Tom Dyson, and Regina Rauxloh, eds. 2014. Precision Strike Warfare and International Intervention. 0th ed. Routledge. https://doi.org/10.4324/9781315850528

Abizaid, Gen John P, and Rosa Brooks. 2015. “TASK FORCE CO-CHAIRS,” April, 81.

Aikins, Matthieu, Christopher Koettl, Evan Hill, and Eric Schmitt. 2021. “Times Investigation: In u.s. Drone Strike, Evidence Suggests No ISIS Bomb.” September 10, 2021. https://www.nytimes.com/2021/09/10/world/asia/us-air-strike-drone-kabul-afghanistan-isis.html

Alston, Philip. 2010. “Promotion and Protection of All Human Rights, Civil, Political, Economic, Social and Cultural Rights, Including the Right to Development.” Koninklijke Brill NV. https://doi.org/10.1163/2210-7975_HRD-9970-2016149

Anderson, Michael L. 2014. “Subways, Strikes, and Slowdowns: The Impacts of Public Transit on Traffic Congestion.” American Economic Review 104 (9): 2763–96. https://doi.org/10.1257/aer.104.9.2763

Aslam, Wali. 2013. The United States and Great Power Responsibility in International Society: Drones, Rendition and Invasion. New International Relations. Milton Park, Abingdon, Oxon ; New York: Routledge.

Auffhammer, Maximilian, and Ryan Kellogg. 2011. “Clearing the Air? The Effects of Gasoline Content Regulation on Air Quality.” American Economic Review 101 (6): 2687–2722. https://doi.org/10.1257/aer.101.6.2687.

B. DeRosa, Mary, and Mitt Regan. 2021. “Accountability for Targeted Killing.” In Counter-Terrorism, 61–76. Edward Elgar Publishing. https://doi.org/10.4337/9781800373075.00012

Bai, Jushan, and Pierre Perron. 1998. “Estimating and Testing Linear Models with Multiple Structural Changes.” Econometrica 66 (1): 47. https://doi.org/10.2307/2998540

Banka, Andris, and Adam Quinn. 2018. “Killing Norms Softly: US Targeted Killing, Quasi-Secrecy and the Assassination Ban.” Security Studies 27 (4): 665–703. https://doi.org/10.1080/09636412.2018.1483633.

Benbaji, Yitzhak, ed. 2014. Reading Walzer. 1 [edition]. London ; New York: Routledge, Taylor & Francis Group.

Chen, Yihsu, and Alexander Whalley. 2012. “Green Infrastructure: The Effects of Urban Rail Transit on Air Quality.” American Economic Journal: Economic Policy 4 (1): 58–97. https://doi.org/10.1257/pol.4.1.58

25
Clark, Ian. 2005. *Legitimacy in International Society*. Oxford; New York: Oxford University Press.

Crawford, Neta C. 2013. *Accountability for Killing: Moral Responsibility for Collateral Damage in America’s Post-9/11 Wars*. Oxford: Oxford University Press.

Cronin, Audrey Kurth. 2020. “Why Drones Fail.” May 1, 2020. https://www.foreignaffairs.com/articles/somalia/2013-06-11/why-drones-fail

Davis, Lucas W. 2008. “The Effect of Driving Restrictions on Air Quality in Mexico City.” *Journal of Political Economy* 116 (1): 38–81. https://doi.org/10.1086/529398

Dill, Janina. 2015. *Legitimate Targets? Social Construction, International Law and US Bombing*. Cambridge Studies in International Relations 133. Cambridge, United Kingdom: Cambridge University Press.

Ditzen, Jan, Yiannis Karavias, and Joakim Westerlund. 2021. “Testing and Estimating Structural Breaks in Time Series and Panel Data in Stata.” October 28, 2021. http://arxiv.org/abs/2110.14550

Fair, Christine, and Ali Hamza. 2016. “From Elite Consumption to Popular Opinion: Framing of the US Drone Program in Pakistani Newspapers.” *Small Wars & Insurgencies* 27 (4): 578–607. https://doi.org/10.1080/09592318.2016.1189491

Felter, Joseph H., and Jacob N. Shapiro. 2017. “Limiting Civilian Casualties as Part of a Winning Strategy: The Case of Courageous Restraint.” *Daedalus* 146 (1): 44–58. https://doi.org/10.1162/DAED_a_00421

Friedersdorf, Conor. 2016. “The Obama Administration’s Drone-Strike Dissembling.” March 14, 2016. https://www.theatlantic.com/politics/archive/2016/03/the-obama-administrations-drone-strike-dissembling/473541/

Hausman, Catherine, and David S Rapson. 2018. “Regression Discontinuity in Time: Considerations for Empirical Applications,” 23.

Imbens, Guido W., and Thomas Lemieux. 2008. “Regression Discontinuity Designs: A Guide to Practice.” *Journal of Econometrics* 142 (2): 615–35. https://doi.org/10.1016/j.jeconom.2007.05.001

Jaffer, Jameel, ed. 2016. *The Drone Memos: Targeted Killing, Secrecy, and the Law*. New York: The New Press.

Johnston, Nicolas, and Srinjoy Bose. 2020. “Violence, Power and Meaning: The Moral Logic of Terrorism.” *Global Policy* 11 (3): 315–25. https://doi.org/10.1111/1758-5899.12784

Johnston, Patrick, and Anoop Sarbahi. 2016. “The Impact of US Drone Strikes on Terrorism in Pakistan.” *International Studies Quarterly* 60 (2): 203–19. https://doi.org/10.1093/isq/sqv004
Khan, Azmat. 2021. “Hidden Pentagon Records Reveal Patterns of Failure in Deadly Airstrikes.” The New York Times, December. https://www.nytimes.com/interactive/2021/12/18/us/airstrikes-pentagon-records-civilian-deaths.html

King, Gary, Robert O. Keohane, and Sidney Verba. 1994. Designing Social Inquiry: Scientific Inference in Qualitative Research. Princeton, N.J: Princeton University Press.

Kniesner, Thomas J., and W. Kip Viscusi. 2019. “The Value of a Statistical Life.” In Oxford Research Encyclopedia of Economics and Finance, by Thomas J. Kniesner and W. Kip Viscusi. Oxford University Press. https://doi.org/10.1093/acrefore/9780190625979.013.138

Kreps, Sarah E. 2016. Drones: What Everyone Needs to Know. First edition. New York, NY: Oxford University Press.

Kreps, Sarah E., and Paul Lushenko. 2021. “Analysis | What Happens Now to u.s. Counterterrorism Efforts in Afghanistan? Washington Post.” September 21, 2021. https://www.washingtonpost.com/politics/2021/09/21/what-happens-now-us-counterterrorism-efforts-afghanistan/. 

Liddick, E. M. 2021. “No Legal Objection, Per Se.” April 21, 2021. http://warontherocks.com/2021/04/no-legal-objection-per-se/ 

Lindsay, Jon R. 2020. Information Technology and Military Power. Cornell Studies in Security Affairs. Ithaca ; London: Cornell University Press.

Lushenko, Paul. 2018. “The 75th Ranger Regiment Military Intelligence Battalion.” MILITARY REVIEW, 12.

Lushenko, Paul, Srinjoy Bose, and William Maley, eds. 2022. Drones and Global Order: Implications of Remote Warfare for International Society. Contemporary Security Studies. Abingdon, Oxon ; New York, NY: Routledge.

Martin, Geoff, and Erin Steuter. 2017. Drone Nation: The Political Economy of America’s New Way of War. Lanham, Maryland: Lexington Books.

Martin, Matt, and Charles Sasser. 2010. Predator: The Remote-Control Air War over Iraq and Afghanistan: A Pilot’s Story. Minneapolis, MN: Zenith Press.

Mistry, Dinshaw. 2003. Containing Missile Proliferation: Strategic Technology, Security Regimes, and International Cooperation in Arms Control. Seattle: University of Washington Press.

Moyn, Samuel. 2021. Humane: How the United States Abandoned Peace and Reinvented War. https://www.overdrive.com/search?q=7AD56903-BD24-40A3-8EA3-7AD86E8D59C8

Myers, Meghann. 2021. “‘We Must Work Harder,’ SECDEF Says as Pentagon Grapples with Civilian Casualties of Airstrikes. Military Times.” November
Odom, William E. 2008. “Intelligence Analysis.” *Intelligence and National Security* 23 (3): 316–32. [https://doi.org/10.1080/02684520802121216](https://doi.org/10.1080/02684520802121216).

Owens, Mackubin Thomas. 2011. *US Civil-Military Relations After 9/11: Renegotiating the Civil-Military Bargain*. New York: Continuum.

Page, James Michael, and John Williams. 2021. “Drones, Afghanistan, and Beyond: Towards Analysis and Assessment in Context.” *European Journal of International Security*, October, 1–21. [https://doi.org/10.1017/eis.2021.19](https://doi.org/10.1017/eis.2021.19).

Pandit, Rajat. 2021. “$3 Billion Predator Drone Deal: India Seeks Clarity from US on Price, Tech Transfer | India News - Times of India.” August 25, 2021. [https://timesofindia.indiatimes.com/india/3bn-predator-drone-deal-india-seeks-clarity-from-us-on-price-tech-transfer/articleshow/85611977.cms](https://timesofindia.indiatimes.com/india/3bn-predator-drone-deal-india-seeks-clarity-from-us-on-price-tech-transfer/articleshow/85611977.cms).

Plaw, Avery, Matthew S Fricker, and Brian Glyn Williams. 2011. “Practice Makes Perfect?” 5: 20.

Primoratz, Igor, ed. 2007. *Civilian Immunity in War*. Oxford ; New York: Oxford University Press.

Rafiq, Muhammad. 2011. *Estimating the Value of Statistical Life in Pakistan*. SANDEE Working Paper 63. Kathmandu: South Asian Network for Development; Environmental Economics.

“Remarks by the President at the National Defense University.” 2013. May 23. [https://obamawhitehouse.archives.gov/the-press-office/2013/05/23/remarks-president-national-defense-university](https://obamawhitehouse.archives.gov/the-press-office/2013/05/23/remarks-president-national-defense-university).

Renic, Neil C. 2020. *Asymmetric Killing: Risk Avoidance, Just War, and the Warrior Ethos*. New York, NY: Oxford University Press.

Rigterink, Anouk S. 2021. “The Wane of Command: Evidence on Drone Strikes and Control Within Terrorist Organizations.” *American Political Science Review* 115 (1): 31–50. [https://doi.org/10.1017/S0003055420000908](https://doi.org/10.1017/S0003055420000908).

Riza, M. Shane. 2013. *Killing Without Heart: Limits on Robotic Warfare in an Age of Persistent Conflict*. First edition. Washington, D.C: Potomac Books.

Sanger, David E. 2017. “4 Cyber, Drones, and Secrecy,” 19.

Savage, Charlie. 2016. “U.s. Releases Rules for Airstrike Killings of Terror Suspects - the New York Times.” August 6, 2016. [https://www.nytimes.com/2016/08/07/us/politics/us-releases-rules-for-airstrike-killings-of-terror-suspects.html](https://www.nytimes.com/2016/08/07/us/politics/us-releases-rules-for-airstrike-killings-of-terror-suspects.html).
Schmitt, Eric. 2021a. “U.s. Pledges to Pay Family of Those Killed in Botched Kabul Drone Strike.” The New York Times, October. https://www.nytimes.com/2021/10/15/us/politics/kabul-drone-strike-victims-payment.html

———. 2021b. “No u.s. Troops Will Be Punished for Deadly Kabul Strike, Pentagon Chief Decides.” December 13, 2021. https://www.nytimes.com/2021/12/13/us/politics/afghanistan-drone-strike.html

Shah, Aqil. 2018. “Do u.s. Drone Strikes Cause Blowback? Evidence from Pakistan and Beyond.” International Security 42 (4): 47–84. https://doi.org/10.1162/isec_a_00312

Sheehan, Michael A., Erich Marquardt, and Liam Collins. 2021. Routledge Handbook of u.s. Counterrorism and Irregular Warfare Operations. 1st ed. London: Routledge. https://doi.org/10.4324/9781003164500

Stohl, Rachel, and Shannon Dick. 2021. “A New Agenda for US Drone Policy and the Use of Lethal Force.” Stimson Center. Stimson Center. April 29, 2021. https://www.stimson.org/2021/a-new-agenda-for-us-drone-policy-and-the-use-of-lethal-force/

Swan, Ryan. 2019. “Drone Strikes: An Overview, Articulation and Assessment of the United States’ Position Under International Law.” LLNL-TR–800242, 1580679, 976830. https://doi.org/10.2172/1580679

Tirman, John. 2011. The Deaths of Others: The Fate of Civilians in America’s Wars. New York: Oxford University Press.

Turse, Nick. 2021. “How Biden Is Trying to Rebrand the Drone War.” October 25, 2021. https://responsiblestatecraft.org/2021/10/25/how-biden-is-trying-to-rebrand-the-drone-war/

Ullah, Imdad. 2021. Terrorism and the US Drone Attacks in Pakistan: Killing First. 1st ed. Routledge. https://doi.org/10.4324/9781003145486

Vilmer, Jean-Baptiste Jeangene. 2017. “The French Turn to Armed Drones. War on the Rocks.” September 22, 2017. https://warontherocks.com/2017/09/the-french-turn-to-armed-drones/

Viscusi, W. Kip, and Clayton J. Masterman. 2017. “Income Elasticities and Global Values of a Statistical Life.” Journal of Benefit-Cost Analysis 8 (2): 226–50. https://doi.org/10.1017/bca.2017.12

Walzer, Michael. 2015. Just and Unjust Wars: A Moral Argument with Historical Illustrations. Fifth edition. New York: Basic Books, a member of the Perseus Books Group.

Zenko, Micah. 2017. “Obama’s Final Drone Strike Data.” January 20, 2017. https://www.cfr.org/blog/obamas-final-drone-strike-data
A Appendix

A.1 Errata

A.1.1 Manuscript Meta

8385 words, 7 in-text figures and 2 in-text tables.
All tables are attached as [TeX] files and all figures are attached as [PDF] files.
The references for this manuscript were generated from [ds_updated.bib], attached.

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A.2 Supplemental Information

A.2.1 Elite Interviews

In defining the sharp cutoff for our RDiT specification, we conducted several interviews with Obama-era officials, including senior policy-makers and intelligence analysts responsible for the implementation and oversight of the near-certainty standard. On November 5, 2021, we interviewed Luke Hartig. As Obama’s Senior Director for Counterterrorism at the National Security Council, Hartig was a principal author and manager of the near certainty standard risk mitigation process. We conducted a follow-up interview with Hartig on December 6, 2021. Additionally, we interviewed Jamil Jaffer on December 10, 2021. Jaffer served as the Senior Counsel to the House Permanent Select Committee on Intelligence during the Obama administration. He also served on the leadership team of the Senate Foreign Relations Committee as Chief Counsel and Senior Advisor under Chairman Bob Corker (R-TN), where he worked on key national security and foreign policy issues, including leading the drafting of the proposed Authorization for the Use of Military Force (AUMF) against the Islamic State in 2014 and 2015, the AUMF against Syria in 2013, and revisions to the 9/11 AUMF against al-Qaeda.

A.2.2 Methods

We model the impacts of the Obama administration’s policy in several specifications to evaluate the relationship between the change in the certainty standard and civilian casualties. We initially perform a structural break analysis to estimate any points of structural discontinuity in our time series data. We then perform a one-way ANOVA to evaluate the relationship between exposure to the policy on our civilian casualty outcomes, using the estimated structural breakpoint. Drawing on the previous two analyses, we fit a regression discontinuity model to provide a causal estimate for the impact of the near certainty standard on our outcomes in Pakistan during the Obama administration. We offer a set of robustness checks that validate the key assumptions of our RDiT design. Finally, we perform a VSL calculation on averted civilian casualties attributable to the Obama administration’s near certainty standard.

A.2.3 Structural Break and ANOVA Results

We begin our analysis by investigating two questions. First, we are interested if there exists a structural break in the trend of civilian casualties in our time series. Though Obama announced the near certainty standard on May 23, 2013, the implementation took place over the previous two years leading up to the announcement. We follow Ditzen, Karavias, and Westerlund (2021) and estimate structural breakpoints in our data and then test the significance of those estimates following Bai and Perron (1998). We estimate a calendar time structural break in the trend of civilian casualties within our implementation window at July [1], 2011 [p = .01, 95% CI: May-Aug 2011].
Secondly, we are interested in if – conditional on exposure to the near certainty standard that accompanied this policy – there is a significant difference in the means of treated and non-treated observations. We fit a series of one-way ANOVA models on the following outcomes at the strike-level: (1) civilian casualties, (2) strike precision, and (3) civilian casualties per strike. We find a statistically significant difference in the means of these outcomes conditional on exposure to the near certainty standard at both our structural break analysis estimate (July [1], 2011) and the Obama administration’s public announcement of the policy (May 23, 2013). We use differences across policy exposure to inform the potential outcomes framework for our RDiT specification and as such, model each of these ANOVA outcomes in our main RDiT specification.

References

[1] The bureau of investigative journalism (en-GB).
[2] Civilian immunity in war.
[3] Democratic Legitimacy. Princeton University Press.
[4] The drone memos: Targeted killing, secrecy, and the law.
[5] Drone Nation.
[6] Drones and global order: Implications of remote warfare for international society.
[7] Obama told aides, ‘turns out i’m really good at killing people’. Publisher: HuffPost.
[8] Opinion | death from above, outrage down below - the new york times.
[9] Precision strike warfare and international intervention.
[10] Reading walzer.
[11] Remarks by the president at the national defense university. Publisher: whitehouse.gov.
[12] Testing for smooth structural changes in time series models via nonparametric regression. 80(3):1157–1183.
[13] A u.s. drone strike in kabul was a ‘tragic mistake.’ - the washington post.
[14] U.s. pledges to pay family of those killed in botched kabul drone strike.
[15] Gen John P Abizaid and Rosa Brooks. TASK FORCE CO-CHAIRS. page 81.
[16] Max Abrahms and Jochen Mierau. Leadership matters: The effects of targeted killings on militant group tactics. 29(5):830–851.
[17] Matthieu Aikins, Christopher Koettl, Evan Hill, and Eric Schmitt. Times investigation: In u.s. drone strike, evidence suggests no ISIS bomb.
[18] Philip Alston. Promotion and protection of all human rights, civil, political, economic, social and cultural rights, including the right to development. Type: dataset.
[19] Michael L. Anderson. Subways, strikes, and slowdowns: The impacts of public transit on traffic congestion. 104(9):2763–2796.

[20] G. Arce and T. Sandler. Counterterrorism a game-theoretic analysis. 49:183–200.

[21] M.W. Aslam. A critical evaluation of american drone strikes in pakistan: Legality, legitimacy and prudence. 4(3):313–329.

[22] Wali Aslam. The United States and Great Power Responsibility in International Society: Drones, Rendition and Invasion. New International Relations. Routledge.

[23] Maximilian Auffhammer and Ryan Kellogg. Clearing the air? the effects of gasoline content regulation on air quality. 101(6):2687–2722.

[24] Mary B. DeRosa and Mitt Regan. Accountability for targeted killing. In Counter-Terrorism, pages 61–76. Edward Elgar Publishing.

[25] Jushan Bai and Pierre Perron. Estimating and testing linear models with multiple structural changes. 66(1):47.

[26] N. Bakshi and Edieal J. Pinker. Public warnings in counterterrorism operations: Managing the 'cry-wolf' effect when facing a strategic adversary.

[27] N. Bakshi and Edieal J. Pinker. Public warnings in counterterrorism operations: Managing the "cry-wolf" effect when facing a strategic adversary. 66:977–993.

[28] Andris Banka and Adam Quinn. Killing norms softly: US targeted killing, quasi-secrecy and the assassination ban. 27(4):665–703.

[29] O. Baron, O. Berman, and Arieh Gavious. A game between a terrorist and a passive defender.

[30] Peter Bergen and Katherine Tiedemann. The effects of the u.s. drone program in pakistan. page 8.

[31] Stefan Borg. Below the radar. examining a small state’s usage of tactical unmanned aerial vehicles. 20(3):185–201. Publisher: Routledge _eprint: https://doi.org/10.1080/14702436.2020.1787159.

[32] Daniel Brunstetter. Over-the-horizon counterterrorism: New name, same old challenges.

[33] K. Burak. Asymmetric warfare in an asymmetric world: A theoretical analysis of canadian antiterrorism policy and spending.

[34] Alessandro Casini and Pierre Perron. Structural breaks in time series.

[35] Langlois Catherine and Jean-Pierre P. Langlois. Rational deterrence by proxy: Designing cooperative security agreements.

[36] Yihsu Chen and Alexander Whalley. Green infrastructure: The effects of urban rail transit on air quality. 4(1):58–97.
[37] Fotini Christia, Spyros I. Zoumpoulis, Michael Freedman, Leon Yao, and Ali Jadbaiae. The effect of drone strikes on civilian communication: Evidence from Yemen. Pages 1–9.

[38] Ian Clark. *Legitimacy in International Society*. Oxford University Press.

[39] Neta C. Crawford. *Accountability for Killing: Moral Responsibility for Collateral Damage in America’s Post-9/11 Wars*. Oxford University Press.

[40] Audrey Kurth Cronin. Why drones fail. Publisher: Foreign Affairs.

[41] Eva Cárceles-Poveda and Y. Tauman. A strategic analysis of the war against transnational terrorism. 71:49–65.

[42] David Kilcullen and Andrew Exum. Opinion | death from above, outrage down below - the new york times.

[43] Lucas W. Davis. The effect of driving restrictions on air quality in Mexico City. 116(1):38–81.

[44] James Der Derian and Alexander Wendt. ‘quantizing international relations’: The case for quantum approaches to international theory and security practice. 51(5):399–413.

[45] Mary DeRosa and Mitt Regan. Accountability for targeted killing. In *Counter-Terrorism*, pages 61–76. Edward Elgar Publishing.

[46] Janina Dill. *Legitimate targets? social construction, international law and US bombing*. Number 133 in Cambridge studies in international relations. Cambridge University Press.

[47] Jan Ditzen, Yiannis Karavias, and Joakim Westerlund. Testing and estimating structural breaks in time series and panel data in Stata.

[48] W. Enders and T. Sandler. THE EFFECTIVENESS OF ANTITERRORISM POLICIES: A VECTOR-AUTOREGRESSION-INTERVENTION ANALYSIS. 87:829–844.

[49] Christine Fair and Ali Hamza. From elite consumption to popular opinion: framing of the US drone program in Pakistani newspapers. 27(4):578–607.

[50] Joseph H. Felter and Jacob N. Shapiro. Limiting civilian casualties as part of a winning strategy: The case of courageous restraint. 146(1):44–58.

[51] Conor Friedersdorf. The Obama administration’s drone-strike dissembling. Publisher: The Atlantic.

[52] Andrew Gelman and Guido Imbens. Why high-order polynomials should not be used in regression discontinuity designs. 37(3):447–456.

[53] Anna Getmansky and Thomas Zeltzoff. Terrorism and voting: The effect of rocket threat on voting in Israeli elections. 108(3):588–604.

[54] Catherine Hausman and David S Rapson. Regression discontinuity in time: Considerations for empirical applications. page 23.
[55] Won-June Hwang. How are drones being flown over the gray zone? 37(3):328–345.

[56] Guido W. Imbens and Thomas Lemieux. Regression discontinuity designs: A guide to practice. 142(2):615–635.

[57] Nicolas Johnston and Srinjoy Bose. Violence, power and meaning: The moral logic of terrorism. 11(3):315–325.

[58] Patrick Johnston and Anoop Sarbahi. The impact of US drone strikes on terrorism in pakistan. 60(2):203–219.

[59] Azmat Khan. Hidden pentagon records reveal patterns of failure in deadly airstrikes.

[60] Gary King, Robert O. Keohane, and Sidney Verba. Designing Social Inquiry: Scientific Inference in Qualitative Research. Princeton University Press.

[61] Thomas J. Kniesner and W. Kip Viscusi. The Value of a Statistical Life. Oxford University Press.

[62] Matthew Adam Kocher, Thomas B. Pepinsky, and Stathis N. Kalyvas. Aerial bombing and counterinsurgency in the vietnam war: BOMBING AND COUNTERINSURGENCY IN VIETNAM. 55(2):201–218.

[63] Christina Korting, Carl Lieberman, Jordan Matsudaira, Zhuan Pei, and Yi Shen. Visual inference and graphical representation in regression discontinuity designs.

[64] Sarah E. Kreps. Drones: What Everyone Needs to Know. Oxford University Press, first edition edition.

[65] Sarah E. Kreps and Paul Lushenko. Analysis | what happens now to u.s. counterterrorism efforts in afghanistan?

[66] Sarah E. Kreps and Paul Lushenko. Analysis | what happens now to u.s. counterterrorism efforts in afghanistan? Section: Monkey Cage.

[67] Sarah E Kreps and Geoffrey PR Wallace. International law, military effectiveness, and public support for drone strikes. 53(6):830–844.

[68] Catherine C. Langlois and Jean-Pierre P. Langlois. The escalation of terror: Hate and the demise of terrorist organizations. 28:497–521.

[69] H. Lapan and T. Sandler. Terrorism and signalling. 9:383–397.

[70] E.M. Liddick. No legal objection, per se. Publisher: War on the Rocks.

[71] Jon R. Lindsay. Information Technology and Military Power. Cornell Studies in Security Affairs. Cornell University Press.

[72] Paul Lushenko. The 75th ranger regiment military intelligence battalion. page 12.

[73] Rafat Mahmood and Michael Jetter. Military intervention via drone strikes.
[74] Emily Manna. A thesis submitted to the faculty of the graduate school of arts and sciences of georgetown university in partial fulfillment of the requirements for the degree of master of public policy in public policy. page 28.

[75] Geoff Martin and Erin Steuter. Drone Nation: The Political Economy of America’s New Way of War. Lexington Books.

[76] Matt Martin and Charles Sasser. Predator: The Remote-Control Air War over Iraq and Afghanistan: A Pilot’s Story. Zenith Press.

[77] Dinshaw Mistry. Containing missile proliferation: strategic technology, security regimes, and international cooperation in arms control. University of Washington Press.

[78] Samuel Moyn. Humane: How the United States Abandoned Peace and Reinvented War.

[79] Samuel Moyn. Humane: How the United States Abandoned Peace and Reinvented War. Farrar, Straus and Giroux, first edition edition.

[80] Meghann Myers. ‘we must work harder,’ SECDEF says as pentagon grapples with civilian casualties of airstrikes. Section: Pentagon & Congress.

[81] William E. Odom. Intelligence analysis. 23(3):316–332.

[82] Per Baltzer Overgaard. The scale of terrorist attacks as a signal of resources. 38:452–478.

[83] Mackubin Thomas Owens. US Civil-Military Relations after 9/11: Renegotiating the Civil-Military Bargain. Continuum.

[84] James Michael Page and John Williams. Drones, afghanistan, and beyond: Towards analysis and assessment in context. pages 1–21.

[85] James Michael Page and John Williams. Drones, afghanistan, and beyond: Towards analysis and assessment in context. pages 1–21. Publisher: Cambridge University Press.

[86] Rajat Pandit. $3 billion predator drone deal: India seeks clarity from US on price, tech transfer | india news - times of india.

[87] Avery Plaw, Matthew S Fricker, and Brian Glyn Williams. Practice makes perfect? 5:20.

[88] Avery Plaw, Matthew S Fricker, and Brian Glyn Williams. Practice makes perfect? 5:20.

[89] R. Powell. Defending against terrorist attacks with limited resources. 101:527–541.

[90] Muhammad Rafiq. Estimating the value of statistical life in Pakistan. Number 63 in SANDEE working paper. South Asian Network for Development and Environmental Economics.

[91] Neil C. Renic. Asymmetric Killing: Risk Avoidance, Just War, and the Warrior Ethos. Oxford University Press.
[92] Anouk S. Rigterink. The wane of command: Evidence on drone strikes and control within terrorist organizations. 115(1):31–50. Publisher: Cambridge University Press.

[93] M. Shane Riza. Killing without Heart: Limits on Robotic Warfare in an Age of Persistent Conflict. Potomac Books, first edition edition.

[94] B. Rosendorff and T. Sandler. Too much of a good thing? 48:657–671.

[95] T. Sandler. 4-2009 games and terrorism: Recent developments.

[96] T. Sandler and H. Lapan. The calculus of dissent: An analysis of terrorists’ choice of targets. 76:245–261.

[97] T. Sandler and D. M. Terrorism & game theory. 34:319–337.

[98] T. Sandler and Kevin Siqueira. Games and terrorism. 40:164–192.

[99] T. Sandler and Kevin Siqueira. Games and terrorism recent developments.

[100] T. Sandler and Kevin Siqueira. Global terrorism: Deterrence versus pre-emption.

[101] T. Sandler, J. Tschirhart, and J. Cauley. A theoretical analysis of transnational terrorism. 77:36–54.

[102] David E Sanger. 4 cyber, drones, and secrecy. page 19.

[103] Charlie Savage. U.S. releases rules for airstrike killings of terror suspects - the new york times.

[104] Eric Schmitt. No US troops will be punished for deadly kabul strike, pentagon chief decides. Section: U.S.

[105] Eric Schmitt. U.S. pledges to pay family of those killed in botched kabul drone strike.

[106] Aqil Shah. Do U.S. drone strikes cause blowback? evidence from pakistan and beyond. 42(4):47–84.

[107] Michael A. Sheehan, Erich Marquardt, and Liam Collins. Routledge Handbook of U.S. Counterterrorism and Irregular Warfare Operations. Routledge, 1 edition.

[108] Gary Solis. Targeted killing and the law of armed conflict. 60(2):21.

[109] Rachel Stohl and Shannon Dick. A new agenda for US drone policy and the use of lethal force • stimson center.

[110] Liyang Sun and Sarah Abraham. Estimating dynamic treatment effects in event studies with heterogeneous treatment effects. page 53.

[111] Ryan Swan. Drone strikes: An overview, articulation and assessment of the united states’ position under international law.

[112] John Tirman. The Deaths of Others: The Fate of Civilians in America’s Wars. Oxford University Press.

[113] Nick Turse. How biden is trying to rebrand the drone war. Publisher: Responsible Statecraft.

[114] Imdad Ullah. Terrorism and the US Drone Attacks in Pakistan: Killing First. Routledge, 1 edition.
[115] Jean-Baptiste Jeangene Vilmer. The french turn to armed drones.

[116] W. Kip Viscusi and Clayton J. Masterman. Income elasticities and global values of a statistical life. 8(2):226–250.

[117] Michael Walzer. *Just and Unjust Wars: A Moral Argument with Historical Illustrations*. Basic Books, a member of the Perseus Books Group, fifth edition edition.

[118] Michael Walzer. *Just and Unjust Wars: A Moral Argument with Historical Illustrations*. Basic Books, a member of the Perseus Books Group, fifth edition edition.

[119] Michael Walzer. *Just and unjust wars: a moral argument with historical illustrations*. Basic Books, a member of the Perseus Books Group, fifth edition edition.

[120] Hugh White. Civilian immunity in the precision-guidance age. page 19.

[121] Micah Zenko. Obama’s final drone strike data. Publisher: Council on Foreign Relations.