Bombing the Way to State-Building? Lessons from the Vietnam War*

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Abstract: The United States has employed a variety of strategies to defeat insurgents and strengthen states over the past half-century, ranging from the top-down deployment of military force to bottom-up initiatives to win hearts and minds by promoting civic engagement and economic development. This study exploits novel opportunities for identification provided by the Vietnam War to examine these diverse strategies. It identifies the impacts of bombing civilian population centers in South Vietnam by exploiting discontinuities in an algorithm used to target air strikes. Military planners used a Bayesian algorithm to assign hamlets a continuous security score, but due to computational limitations the score had to be rounded to the nearest whole number before it could be read from the mainframe computer's memory. Hamlets just barely below the rounding threshold are significantly more likely than those just above it to be bombed in the following months but are identical beforehand. IV estimates exploiting the security score rounding thresholds to instrument air strikes document that the bombing of civilian population centers led more Vietnamese to join the communist insurgency, worsened security conditions, and lowered public goods provision and non-communist civic engagement. The study also exploits a spatial discontinuity across neighboring military corps regions, one commanded for idiosyncratic historical reasons by the U.S. Marines and the other commanded by the U.S. Army. The Marines emphasized a relatively bottom-up approach that embedded soldiers in communities and promoted hearts and minds initiatives, whereas Army strategy emphasized the use of military search and destroy raids to eliminate insurgents. Relative to the Army's search and destroy strategy, the Marines' hearts and minds approach plausibly increased access to health care and primary school completion rates, reduced insurgent attacks, and improved attitudes towards the U.S. and all levels of South Vietnamese government.

Keywords: nation building, development aid, Vietnam War

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1 Introduction

Interventions in weakly institutionalized societies, such as Vietnam and Afghanistan, have been central to U.S. foreign policy over the past half-century. These have been amongst the most costly expenditures in the U.S. federal budget and may have important national security consequences. Yet given their importance, empirical evidence about impacts remains relatively limited. The United States has employed a variety of strategies to defeat insurgents and strengthen states, ranging from the top-down deployment of military force to bottom-up initiatives to win hearts and minds by promoting civic engagement and economic development. This study identifies the causal effects of key interventions employed during the Vietnam War by exploiting two natural experiments: one that varies the intensity of a top-down approach - air strikes - and another that compares a top down military approach to a bottom up hearts and mind approach. Specifically, it estimates the impacts of bombing civilian population centers by exploiting rounding discontinuities in an algorithm used to target air strikes. It also exploits a spatial discontinuity across neighboring military corps regions, one commanded for idiosyncratic historical reasons by the U.S. Marines and the other commanded by the U.S. Army. The Marines emphasized a hearts and minds approach that embedded soldiers in communities and promoted development projects, whereas Army strategy focused on the use of military search and destroy missions to eliminate insurgents.

The Vietnam War provides an excellent laboratory in which to examine questions of central importance to state building and counterinsurgency. State-building was a key U.S. policy objective in South Vietnam, as a capable state was needed to provide a bulwark against the spread of Communism after U.S. withdrawal. More than twice as many tons of explosives were dropped during the conflict as during World War II, and 12 billion USD of development aid were deployed, one of the largest aid allocations to a single country in U.S. history (Butterfield, 2004). Spending on the Vietnam War during the Lyndon Johnson administration was seventeen times greater than on the War on Poverty, and the Department of Defense (DoD) estimated in 2003 that the Vietnam War has cost US taxpayers over one trillion USD (Appy, 2015). Importantly, the United States, spurred by Secretary of Defense Robert McNamara, utilized quantitative metrics for resource allocation to an unprecedented extent. This resulted in rich data and unique opportunities for causal identification.

The study first examines the military force approach, which emphasizes eliminating insurgents and building a state by establishing social control. In its extreme, it is summed up by the Vietnam era adage: "get the people by the balls and their hearts and minds will follow" (Kodosky, 2007). Bombing was a key component of the U.S. military strategy, with the Air Force receiving over half of all war-related appropriations (Thayer, 1975). Air strikes were viewed as central not just for eliminating insurgents but also for building a state. Walt (nn.

"Air Marshall") Rostow, an MIT economist who was one of the Johnson administration's most influential advocates for air strikes, argued that successfully countering Communism required "a ruthless projection to the peasantry that the central government intends to be the wave of the future" (Rostow to Rusk, 1961). Another influential advocate for the use of air power in state-building, Sammuel Huntington (1968), wrote that air strikes could be used to establish social control and then modernization would organically follow.

This study focuses on bombing in villages with civilian populations. In South Vietnam, 10% of air strikes supported ground operations and most of the remainder targeted Viet Cong (Communist) supply lines and insurgents, who were oftentimes embedded in civilian villages (Thayer, 1975). The bombing of industrial centers played a minimal role. Officially, civilian casualties were extremely rare, but critics have argued that the civilian death toll was higher, with civilians incorrectly labeled as insurgents (Turse, 2013). While targeting abilities have improved since Vietnam, the impacts of bombing near civilian populations remain policy relevant. The Islamic State and other modern insurgents also tend to embed themselves within civilian areas, and have done so more tightly as targeting has improved. Hence, air strikes continue to have the potential to fundamentally impact civilian populations. For example, a dataset from the Bureau of Investigative Journalism suggests that since 2004, civilians have represented 25% of the deaths in U.S. drone strikes of Pakistan.

A major challenge of executing a large-scale air campaign is obtaining the intelligence needed to track enemy targets in real time. Declassified studies by the Defense Office for Systems Analysis reveal that over half of air attacks in South Vietnam did not respond to real-time intelligence, and declassified Air Force histories document that one of the factors used in allocating weekly pre-planned bombing missions was hamlet security (Thayer, 1975; Project CHECO, 1969).[1] This study documents that a hamlet level security score produced by the U.S. military was used to target air strikes between 1970 and U.S. withdrawal. Rounding discontinuities in this score are used to identify the causal impacts of air strikes.

Specifically, a Bayesian algorithm combined data from 169 questions on security, political, and economic characteristics into a single security rating. The output ranged continuously from 1 to 5 but due to computational constraints had to be rounded to the nearest whole number before it could be read from the mainframe computer's memory. We obtained the rounded scores and the underlying question responses from the U.S. National Archives and located the information needed to compute the continuous score from uncatalogued materials at Fort McNair. We are able to reproduce all rounded scores.

A regression discontinuity (RD) around the rounding thresholds identifies the causal impacts of the security score, which is in turn used to instrument bombing. Identification

[1]Other relevant factors included goals in the military region, security of friendly forces, location of combat maneuver battalions, and enemy movements.

requires that 1) all factors besides security score assignment change smoothly at the rounding thresholds, 2) the security score is strongly correlated with bombing, and 3) the security score only impacts outcomes through the allocation of air power.

RD estimates document that hamlets near the rounding thresholds are similar in all observable ways prior to the score assignment, but in the quarter following assignment hamlets that fall just below the rounding cutoffs are significantly more likely to be targeted than those that fall just above. There is not evidence that the score was used systematically at the hamlet level for other resource allocations, and in particular it is uncorrelated with the allocation of South Vietnamese and U.S. ground troops and naval attacks. Moreover, opportunities for manipulating the score around the thresholds are likely to have been minimal, as the continuous score was not read from the computer's memory. The security score was piloted during 1969 - it was computed but not disseminated - and placebo checks document that there are no effects during this period.

IV estimates exploiting the security score discontinuity show that the bombing of South Vietnamese villages led more Vietnamese to join the communist insurgency and worsened security conditions. Specifically, following bombing Viet Cong (VC) insurgent recruitment and propaganda drives increased, more households participated in the VC, the village was more likely to harbor a VC base, the VC were more likely to extort hamlet residents, VC initiated attacks increased, and more U.S. soldiers died in VC attacks. Moreover, local authorities became less likely to enforce the law. There is little evidence for spillover effects, across nearby areas or within VC administrative divisions. The deterioration in security caused by bombing in turn entered the next quarter's security score, increasing the probability of bombing in the future. This potentially created a vicious cycle in which bombing, while defeating some insurgents, led even more to join the cause.

While U.S. intervention aimed to build a strong non-communist state in South Vietnam, bombing instead weakened local government and non-communist civic society. Over the course of the war, it reduced the provision of health services, schools were more likely to be closed due to security threats, and local tax collection fell. Public opinion data show citizens in more heavily bombed hamlets were more likely to feel that local leaders should prioritize security above other public goods, and they rated local officials as less competent. Moreover, the governance committee in more heavily bombed villages was less likely to have all its positions filled, and village heads were less likely to control local bureaucrats. Finally, civic participation in a wide range of non-insurgent community activities fell, and fewer non-communist political parties were active. These results help elucidate why efforts to build a strong non-communist state in South Vietnam fell short.

We find little evidence across outcomes for spillover effects, measured in proximate geographic areas or within VC administrative units. It appears that bombing in nearby areas

- or in the same VC administrative unit - either has little impact, or the impacts on the revenge motive versus the intimidation motive cancel each other out.

To shed light on whether a more bottom-up approach could be relatively more effective, supplementary results exploit a spatial regression discontinuity between Military Corp Region I of South Vietnam, commanded by the U.S. Marines Corp (USMC), and Military Corp Region II, commanded by the U.S. Army. The Marines pioneered the idea of winning hearts and minds during their exploits in the Caribbean in the 1920s, and their mission statement in Vietnam emphasized providing security by embedding soldiers in communities and winning hearts and minds through development programs (US Marine Corps, 2009). Their approach was motivated by the view that "in small wars the goal is to gain decisive results with the least application of force...the end aim is the social, economic, and political development of the people" (US Marine Corps, 1940). While the USMC engaged in conventional warfare, they also invested intensively in a Civic Action Program (CAP) that provided public goods through health, education, basic infrastructure, and civic engagement programs. In contrast, the Army emphasized search and destroy missions, which aimed to locate and neutralize VC insurgents using top-down military raids (Daddis, 2011).

Identification requires all factors besides the commanding military force to vary smoothly at the corps region boundary. The study documents that geography and urbanization are balanced. While pre-period data are quite limited, data from the French colonial period provide some evidence that pre-period characteristics were relatively balanced. Soldier composition could also be an important feature distinguishing the Army from the Marines, but available data suggest that soldiers in these branches were relatively similar. Importantly, mean Armed Forces Qualifying Test (AFQT) scores and the share of soldiers from the lowest AFQT score groups did not differ between the service branches.

Regression discontinuity estimates comparing nearby hamlets on either side of the corps region boundary document that public goods provision was higher on the USMC side of the boundary for public goods targeted by the CAP program, providing evidence that CAP had real impacts. Primary school completion was nearly twice as high in hamlets just barely to the USMC side of the boundary, access to health care was higher, and public works projects were more likely to have been recently undertaken. Moreover, hamlets just to the Marines' side of the boundary were attacked less by the Viet Cong, and soldiers there skirmished less with the Viet Cong. Finally, public opinion data document that citizens in the USMC corps region reported more positive attitudes towards the United States and towards all levels of South Vietnamese government, and were less likely to express anti-American sentiments, than individuals in the Army corps region. While it is not possible to fully isolate the causal mechanisms, and small sample sizes near the boundary imply that estimates should be interpreted with caution, the results are consistent with the view that the USMC hearts

and minds strategy was more effective than the Army's more exclusive reliance on force.

Whether in debates about counterinsurgency policies in the Middle East or in discussions about how Latin American governments can regain control of territory effectively ruled by drug lords, policymakers regularly decide how to allocate resources between military force versus hearts and minds programs. Often some degree of foreign advocacy and financing is involved, even if the home government plays the principal role. Yet given how central these questions are to policy and how many resources and lives they affect, empirical evidence remains relatively limited.

The most closely related study to the current one is an examination by Kocher et al. (2011) of how bombing in Vietnam impacted an index of Viet Cong insurgent activity. The study uses the Viet Cong activity index in July and August of 1969 to instrument for bombing in September of 1969 and finds positive impacts on the Viet Cong activity index in subsequent months of 1969. We employ an identification strategy in which treatment is orthogonal to insurgent activity in the pre-period - hence the tretment and control groups would have plausibly been similar in the absence of bombing - and examine a longer period and broader set of outcomes. Miguel and Roland (2011) also examine bombing in Vietnam, focusing on long-run economic impacts. They use distance to the 17th parallel to instrument for district level bombing and do not find persistent effects. This study examines more immediate impacts on security and state-building.

This study also relates to a rich literature on counterinsurgency and law enforcement in more recent conflicts. For example, Condra et al. (2010) show that counterinsurgency-generated civilian casualties in Afghanistan, but not Iraq, exert long-run impacts on insurgent violence, over a period of six weeks to six months. Consistent with this study's results exploiting the USMC natural experiment, Berman et al. (2011) document that improved public service provision reduced insurgent violence in Iraq. Using a randomized experiment, Beath et al. (2012) show that participating in the largest development program in Afghanistan improves perceptions of well-being, attitudes towards the government, and levels of security in surrounding areas, but only in relatively secure regions. Finally, Dell (2015) documents that a top-down military force approach to combating the drug trade backfired in Mexico, generating significant increases in violence. Vietnam-era strategies offer novel opportunities for identification that can further enrich our understanding of varied efforts by the state to create a monopoly on violence.

Finally, the study relates to the social science literature on state-building, shedding light on theories that have long proven difficult to test empirically. Diverse evidence shows that state capacity matters for economic development (Besley and Persson, 2011; Michalopoulos and Papaioannou, 2013), and our own work documents this in Vietnam (Dell et al., 2015). Social scientists have also hypothesized about how to build states, with work by moderniza-

tion theorists such as Huntington and Rostow playing a particularly influential role. While Rostow also advocated development aid, both Huntington and Rostow emphasized the use of force in state-building (Milne, 2008). In contrast, Scott (1985, 2009) argues that the top-down approach can backfire, as citizens have many ways to undermine a state they do not support, even without joining an organized rebellion. Moreover, when states try to impose a simplified order - what Scott calls legibility - from above, their failure to understand complex local realities and tendency to disrupt them can lead the scheme to fail (Scott, 1998). Using a Bayesian algorithm to quantify and impose security across Vietnam fits well with Scott's description of a central state imposing legibility through coercion.

This study shows that approaches to state-building and counterinsurgency that emphasize establishing social control through top down force can backfire, plausibly because citizens are more angry than intimidated and have ample opportunities for resistance. We also document that the top-down approach weakened pre-existing local governance structures, without replacing them with a more effective state. In contrast, the bottom-up hearts and minds approach provided basic public goods and plausibly improved security and citizens' attitudes towards the state, relative to a more exclusive focus on search and destroy missions.

The rest of the study is organized as follows: Section 2 discusses the broader historical background needed for interpreting the results. Section 3 examines the impacts of bombing civilian population centers, first providing historical background on how air strikes were targeted (Section 3.1), then outlining the empirical approach (Section 3.2) and data sources (Section 3.3), and finally presenting the results (Section 3.4). Next, Section 4 presents supplementary results comparing the top down to bottom up approach by examining the spatial discontinuity between the Army and USMC corps regions. Finally, Section 5 concludes.

2 Historical Background

The Vietnam War provides an excellent laboratory in which to examine questions of central importance to state building and counterinsurgency. In 1954, the Geneva Accords temporarily divided Vietnam at the 17th Parallel, until nationwide elections could be held in 1956. When elections were not held, the Viet Minh established a Communist state led by Ho Chi Minh in the North, and Ngo Dinh Diem declared leadership of a non-communist state in the South. A communist insurgency began in South Vietnam, led by Viet Cong (VC) insurgents.

It is widely documented that the South Vietnamese central government faced significant difficulties penetrating below the provincial level (Appy, 2015). The Viet Cong took advantage of this, making inroads in areas that had received few benefits from belonging to the South Vietnamese state. Following a 1967 constitutional reform, governance at the local level was participatory, with citizens electing village councils and in principal interacting regularly

with elected officials. Most tax collection and public goods provision responsibilities were decentralized to the local level.

In 1965, the U.S. deployed around 200,000 troops to South Vietnam. Troop levels peaked at over half a million in 1968, and the U.S. withdrew in January of 1973. A key U.S. objective was to build a strong South Vietnamese state, which could provide a bulwark against communism after the U.S. withdrew. Hence a variety of top-down and bottom-up strategies were deployed to defeat insurgents, impose social control, and create a functioning state. Different service branches pursued distinct strategies: the Air Force focused on air strikes, the Army's strategy centered around search and destroy raids, and the USMC made hearts and minds initiatives a central part of their mission. In principal, these efforts were pursued in conjunction with the South Vietnamese, but relations could be strained. These different approaches to counterinsurgency and state-building are the focus of this study.

3 The Top Down Approach: Bombing

3.1 McNamara and the Whiz Kids

The United States utilized an unprecedented number of quantitative metrics during the Vietnam War, spurred by the systems analysis perspective that Secretary of Defense Robert McNamara brought to the Department of Defense (DoD). McNamara pioneered the use of operations research in the private sector during his tenure in the 1950s as President of Ford Motor Company. Upon being named Secretary of Defense by Kennedy in 1961, McNamara surrounded himself with "Whiz Kid" analysts from the Rand Corporation, aiming to bring economics, operations research, game theory, and computing into DoD operations. This produced policies and data that offer unique opportunities for estimating causal impacts.

While serving as Defense Secretary (1961-1968), McNamara launched a variety of data systems to monitor the progress of the Vietnam War. Field data were key-punched into mainframe computers in Saigon and Washington and used to determine resource allocation. The resulting electronic data would have likely been destroyed, but a large number of data tapes - produced by the two IBM 360 mainframe computers in Saigon and Washington - were subpoenaed during the early 1970s by an IBM lawsuit. Much of this study's outcome data are drawn from these tapes.

Quantitative ratings of the security of South Vietnamese hamlets form the basis of this study's strategy for identifying the causal effects of bombing South Vietnamese population centers. In 1967, the U.S. and South Vietnam began the Hamlet Evaluation System to rate the security of South Vietnamese hamlets. Initially, U.S. military district senior advisers rated security by giving hamlets A-E letter grades based on their subjective perceptions,

but two 1968 studies showed that these subjective ratings did not always correlate well with objective conditions on the ground. Thus, in 1968 the U.S. hired a defense consulting firm to develop an objective metric of hamlet security, and this study will use discontinuities in this metric to causally identify the impacts of the top down state building approach.

To compute the hamlet security score, 169 monthly and quarterly questions about security, politics, and economics were collected by US and South Vietnamese advisory personnel affiliated with CORDS (Civil Operations and Revolutionary Development Support), a joint civilian-military pacification agency of the governments of South Vietnam and the United States. Most questions were classified into nineteen submodels, with 4 to 16 questions per submodel. Bayes Rule was used to aggregate question responses within each submodel into a continuous numerical score ranging from 1 to 5. The sub-model scores were rounded to the nearest whole number - creating the discontinuities that will be exploited for identification - and combinatorial logic combined the rounded scores into an overall security score. Meeting minutes held at Fort McNair document that military personnel were unable to read the continuous scores from the mainframe's memory due to computational challenges.

Specifically, the algorithm starts with a flat prior that each hamlet is equally likely to belong to one of five security classes, ranging from A (very secure) to E (very insecure). The algorithm then updates using Bayes Rule, the question responses, and conditional probability matrices, which give the probabilities that each question would take on different response values if the hamlet was very secure (A), somewhat secure (B), and so forth. The successive application of Bayes Rule yields a posterior probability that a hamlet belongs to each of the five latent security classes for that submodel. An A is assigned 5 points, a B 4 points, a C 3 points, a D 2 points, and an E 1 point. Then the expected value of the posterior distribution is computed, using the points assigned to each latent class. Finally, this expected value is rounded to the nearest whole number to produce a score for that sub-model. For example, a hamlet with a numerical score of 4.4999 is round down to a 4/B (somewhat secure), whereas a hamlet with a numerical score of 4.5001 is rounded up to a 5/A (very secure).

Combinatorial logic was used to aggregate the rounded submodel scores into an overall security score, which was disseminated to military planners. The algorithm combined the rounded scores, produced by the Bayesian logic, two or three at a time, and outputs were in turn further combined. Figure 1 illustrates that the two-way logic for combining scores is symmetric, taking an average of the two component scores and rounding down. Intermediate scores were also created during this process, covering military, political, and economic topics. While national and provincial trends in these intermediate scores were disseminated, the coding manuals for creating reports document that only the overall score was systematically reported at the hamlet level, and hence we focus on it. The aggregation logic is shown in Figure 2. It changed somewhat between 1970 and 1971 to de-emphasize economic submodels,

but the conditional probabilities remained the same.

To better understand how this algorithm provides a source of identification, consider the following simplified example. Suppose the security score only combined two submodels, whose continuous scores are shown on the x- and y-axes of Figure 1, panel (a). The thick lines show the thresholds between different output scores, and their location is determined by the rounding of the input scores and the decision logic used to combine them. The thresholds create a sharp regression discontinuity, and identification can be achieved by comparing nearby hamlets on either side of the thresholds. For example, a hamlet with continuous submodel scores of 4.7 (rounded to 5/A) and 4.4999 (rounded to 4/B) - which would produce a 4/B output score - could be compared to a hamlet with input scores 4.7 (rounded to 5/A) and 4.5 (rounded to 5/A) - whose output score would be a 5/A.

The security score combined 19 submodels, creating a 19 dimensional equivalent of Figure 1, panel (a). The study computes the location of the A-B, B-C, C-D, and D-E thresholds and calculates the distance - in continuous score space - from each observation to the nearest threshold. To compute the continuous scores, which were never saved from the mainframe's memory, we obtained the question responses from tapes now held at the U.S. National Archives and the conditional probability matrices from uncatalogued documents at Fort McNair. The tapes also contain the rounded scores that were disseminated to planners, and we reproduce all rounded scores besides one: a 3.4999994 that the mainframe computed as a 3.5 because it had limited precision digits.

Meeting memos held in an uncatalogued collection at Fort McNair emphasize the arbitrariness of the algorithm's design. Military field officers were sent a survey stating "you have been selected to participate in the design of a Bayesian processor", which elicited the conditional probabilities for one of the submodels. When the surveys were returned, the probabilities had a high variance and often did not sum to one, leading the architect of the design John Penquite to state "I have changed my mind about expertise on the Vietnam situation. There are no experts." Conditional probabilities more than two standard deviations from the mean were dropped, and the remaining responses were averaged to create a conditional probability matrix for each question. When the same question enters multiple submodels, the conditional probabilities can be quite different. Moreover, the consulting firm ran out of time before considering how to aggregate submodels. The three-way decision table was designed to combine the military, political, and economic intermediate scores into the overall score; and it was decided to apply it to the aggregation more broadly. The rather arbitrary nature of the algorithm's design was evident to at least some of those involved in constructing the security score. Several proposals were submitted for revising the score but were never prioritized. This study documents that the discontinuities have a strong influence on the targeting of air strikes throughout the period that the score was calculated.

3.2 Empirical Strategy

Regressions of the following form identify the impacts of the security score on air strikes:

$$\begin{aligned} y_{hpt+n} =& \gamma_1 abv_{hpt} + \sum_{d=1}^{4} \upsilon_d D_{hptd} f(dist_{hpt}) + \sum_{d=1}^{4} \psi_d D_{hptd} f(dist_{hpt}) abv_{hpt} \\ &+ \sum_{d=1}^{4} \delta_d D_{hptd} + \alpha_t + \phi_p + \beta X_{hpt} + \epsilon_{hpt} \end{aligned} \tag{1}$$

where y_{hpt+n} is bombing in hamlet h, in province p, in quarter $t+n$. The security score is computed primarily from quarterly data, with just a few of the input questions updated on a monthly basis, and hence the unit of analysis is the hamlet x quarter. abv_{hpt} is an indicator equal to 1 if the hamlet is above the threshold. $f(dist_{hpt})$ is an RD polynomial in distance to the nearest score threshold, estimated separately on either side of the threshold. D_{htpd} is a set of indicators equal to 1 if threshold d (A-B, B-C, C-D, D-E) is the nearest threshold. The RD polynomial is estimated separately for each threshold. α_t is a quarter-year fixed effect, ϕ_p is a province fixed effect, and X_{hpt} contains dummies for all question responses that enter the security score calculations in period t, as well as controls for the lagged security score.

Baseline estimates use the Imbens-Kalyanaraman bandwidth and local linear regression. The baseline sample includes hamlets the first time they are close to the discontinuity. Estimates are robust to using alternative bandwidths and functional forms for the RD polynomial, including a 19 dimensional polynomial that controls for all underlying numerical scores, and change little when the fixed effects and controls are omitted. Second stage regressions take an analogous form, with *abv* as an instrument.

The study also examines the impact of cumulative bombing between 1970 and U.S. withdrawal. Some impacts may appear immediately after a village is bombed once, whereas others might develop only after repeated bombing. For example, if the impacts of bombing begin to cumulate, over time they could lead to changes in the priorities of local governments. To measure the cumulative impacts of bombing, the study first calculates the number of quarters that a hamlet was near a security score threshold, where near is defined as within the Imbens-Kalyanaraman bandwidth used in the RD. It then calculates the share of quarters near the threshold that the hamlet was above it, and this serves as an instrument for cumulative bombing. Specifically, it runs first stage regressions of the following form:

$$y_{hp} = \gamma_1 shabv_{hp} + \sum_{d=1}^{4} \delta_d D_{hpd} + \phi_p + \beta X_{hp69} + \epsilon_{hp} \tag{2}$$

where y_{hp} is average bombing between 1970 and U.S. withdrawal, $shabv_{hp}$ is the share of

quarters near the threshold that the hamlet is above it, D_{hpd} is a set of indicators equal to 1 if the hamlet is near discontinuity d, ϕ_p is a province fixed effect, and X_{hp69} contains indicators for all question responses that enter the security score calculations, averaged across the 1969 pre-period, as well as controls for the 1969 security score. The baseline limits the sample to hamlets that are always near the same threshold, for ease of interpretation, but results are robust to including hamlets near multiple thresholds. Results change little when the province fixed effects and controls are omitted. Because not all hamlets were surveyed during the 1969 pre-period, including these controls decreases the sample size somewhat.

3.3 Data

This study utilizes archival data on security, governance, civic society, and economic outcomes. The data are mostly drawn from the U.S. National Archives, except the information needed to reproduce the continuous hamlet security scores, which was obtained from uncatalogued materials at Fort McNair. A detailed description of all of the data sources used in the study - describing the variables, period of coverage, agency responsible for collection, and where they can be located in the archives - is provided in the appendix.

Our preferred data on bombing are from the Hamlet Evaluation System (HES), a joint data collection effort between U.S. district senior advisers and South Vietnamese officials. Data were collected between July of 1969 and 1973. The same set of questions was asked on a monthly or quarterly basis for the entire sample period in nearly all of the over 18,000 hamlets in South Vietnam.

HES records whether an airstrike or artillery fire struck a populated part of the village during the past month. Since we do not find any impacts of the security score on ground troop activity - using both data on ground troops from HES and data recording all daily troop movements - we expect any impacts of the security score on this measure to be driven primarily by differences in air strikes. We also examine Air Force data providing the coordinates and amounts of bombing ordinance dropped over South Vietnam between 1965 and 1973. Unfortunately, the system that tracked ordinance was migrated during our sample period, leading to fragmentary information. It is also difficult to infer whether the ordinance struck a populated area, as the data record the approximate coordinate where the ordinance was intended to be dropped, not what it hit, and we have only one coordinate per hamlet. Nevertheless, these data are used for robustness analysis.

We have also compiled data on the movements of all U.S. and South Vietnamese ground troops between 1966 and 1973. Coordinates and day identifiers allow us to precisely track ground troop movements, and the data also record enemy initiated attacks and casualties broken down by nationality. Viet Cong casualty estimates (the so-called body count) should

be taken with a grain of salt, as they were often based on thin information and potentially exaggerated, but U.S. troop deaths and movements are well-measured. Archival data also provide the locations of Viet Cong terrorist attacks against civilians and government installations between 1967 and 1973, a geo-referenced description of all small-unit activities undertaken by the U.S. Marines between 1968 and 1971, information on South Vietnamese self-defense forces and territorial forces between 1970 and 1974, and a variety of other rich data on security. Monthly and quarterly security information, as well as economic, governance, and civic society data, are obtained from a variety of questions in the HES.

Public opinion data on citizen attitudes towards local government, national government, and the war are available for a sample of hamlets through the Pacification Attitudes and Analysis Survey (PAAS). Like HES, PAAS was a joint U.S.-South Vietnamese effort administered by CORDS. PAAS was launched in March of 1970 and was conducted monthly until December of 1972, overlapping closely with the period in which the security score was used to target bombing, though unfortunately not all months have been preserved.[2] Each month, surveys were conducted in 6 randomly selected hamlets per province. 15 respondents were randomly selected per hamlet, with stratification on demographic characteristics. A total of 4,058 hamlets were surveyed during at least one month in our sample period. The number of months in which a given question was included in the questionnaire - and whether the question was asked in all or only a subset of hamlets - varies. Sample sizes for some interesting questions - such as those about anti-Americanism - are sufficiently small that few observations are left when we limit to hamlets near the security score discontinuities.

3.4 Results

The study's empirical strategy uses the security score to instrument for bombing, comparing places that are just barely above a security score threshold to those that are just barely below. The security score is computed primarily from quarterly data, with just a few of the input questions updated on a monthly basis. Hence, the hamlet-quarter is used as the unit of analysis. The data document whether a populated area of the village was struck by a bomb or artillery fire in a given month, and the dependent variable is the share of months during a quarter in which populated areas were hit. As discussed above, since the security score is uncorrelated with ground troop activity, any differences between hamlets above and below the security score thresholds are most likely driven by differences in air strikes. However, even if results were driven by both air and artillery fire, the study's main arguments about the use of top down force against civilian populated areas would remain unchanged.

[2]Tapes containing information for May, 1970 through February, 1971 and for August and September of 1971 were not preserved.

There is a strong first stage relationship, with hamlets that just barely receive a lower security score this quarter being significantly more likely to have inhabited areas hit by an air strike or artillery fire next quarter. Panel (a) of Figure 4 uses a local linear polynomial to plot air strikes, after removing the controls and fixed effects in equation (1), against the lagged distance to the nearest security score threshold. Dashed lines show 95% confidence intervals. A negative distance signifies that the hamlet is below the threshold. Strikes decrease discontinuously when the hamlet is just above the threshold as compared to just below. Results, available upon request, are robust to omitting the controls and fixed effects.

Panel (b) repeats this exercise, plotting bombing in a quarter against the contemporaneous distance to the score threshold. The data to compute the security score were not received by CORDS headquarters in Saigon until the close of the quarter, as the score was intended to retrospectively measure conditions in the quarter. Thus, there should be no contemporaneous impacts, and panel (b) documents that this is indeed the case.

Panel (c) plots the RD estimates from equation (1) quarter-by-quarter, examining how the security score relates to bombing in the four quarters before and after it was computed. There is no impact of being above the threshold before the score is calculated. The sample can be extended further back, but sample size declines substantially. The effect persists across the four quarters following the score's dissemination. The evidence below suggests that this is at least in part because a deterioration in security caused by initial bombing enters future score calculations, hence making bombing more likely in the future.

Panel (d) plots RD estimates using a range of bandwidths, showing that results are highly robust to the choice of bandwidth. As a placebo exercise, panel (e) documents that there are no impacts of the security score on bombing in the following quarter when using scores from 1969. During this time the system was in pilot, and the score was not disseminated.

Panel (f) documents that there is no relationship between the security score and whether ground troops were present in populated areas of the hamlet. These data are drawn from the Hamlet Evaluation System. Results, available upon request, are similar when using the geo-referenced locations of all ground troops to look separately at U.S. and South Vietnamese troops. There is no difference in troop presence, troop counts, or operation days, which measure how active troops were. Similarly, panel (g) shows that there is no impact of the score on U.S.-initiated naval attacks.[3]

Finally, panel (h) examines the relationship between the score and pre-period VC-initiated attacks, using a military database that combines South Vietnamese and U.S. data from 1964 through 1969. An indicator for whether a hamlet experienced a VC-initiated attack in a given quarter is regressed - quarter by quarter - on the variables in the cumulative

[3]Data on the allocation of naval personnel are only available at the district level. Because these attacks can only occur in hamlets near a river, they are fairly rare and concentrated in the Mekong Delta region.

specification given by equation (2). There is no systematic relationship between the share of quarters near the threshold between 1970 and 1972 that a hamlet was above the threshold and enemy initiated attacks between 1964 and 1969.

Table 1 reports the first stage estimates for both the short-run and cumulative specifications (equations (1) and (2), respectively). Column (1) examines the first stage relationship between being above the security score threshold in period t and bombing in $t+1$. Being above the threshold decreases the share of months with bombing or artillery fire that hit inhabited areas by 4.6 percentage points, relative to a baseline probably of 28 percent. The first stage F-stat, equal to 10.8, is strong. Column (2) shows that there are no impacts using scores from 1969, when the score was computed but not disseminated. Column (3) reports the first-stage for the cumulative specification. There is a strong relationship between bombing and share of quarters near the threshold spent above it, with a first stage f-stat of 9. Column (4) documents that the instrument, computed for the period between 1970 and 1972, is uncorrelated with bombing in 1969.

Next, we report IV estimates of the impact of bombing on a wide range of outcomes for both the immediate and the cumulative specifications. In the main text, we focus on impacts of bombing on the areas that were hit. In the appendix, we examine spillovers in detail, using two measures. First, we consider impacts in geographically contiguous areas. Second, we estimate impacts on other hamlets within the same VC administrative district. We find little evidence of spillovers along either of these dimension. It appears that bombing in nearby areas - or in the same VC administrative unit - either has little impact, or the impacts on the revenge motive versus the intimidation motive cancel each other out.

Outcome variables from the Hamlet Evaluation System are divided into four categories: security, governance, non-insurgent civic society, and economic. For each category we compute an index created using latent class analysis (LCA) that combines information from all questions in that category, addressing multiple hypothesis testing issues. Based on the observed question responses, latent class analysis estimates the posterior probability that each hamlet belongs to one of two latent classes associated with "high" and "low" values for each category: i.e. high security, high quality governance, etc. Due to space constraints, for the immediate specification we report estimates only for the LCA posterior probability. For the cumulative specification we also report estimates for a representative subset of individual outcomes used to compute the LCA index, with estimates for the complete set of outcomes reported in the appendix.

Table 2 reports instrumental variables estimates for security outcomes. Column 1 reports the immediate effect of bombing on the security LCA score in the contemporaneous quarter. The estimate, significant at the 5% level, suggests that moving from no strikes to the sample mean decreases the probability of being in the high (good) security class by 23 percentage

points. The mean of the bombing variable is 0.28, meaning that on average a populated area is hit by air or artillery fire slightly less than one month per quarter.

The remaining columns focus on the cumulative effects over the 1970-1972 period. Estimates for individual outcomes using the short-run specification tend to be qualitatively similar to those in the cumulative specification but noisier. The estimate in Column 2 confirms the patterns from the immediate analysis and suggests that moving from having no strikes over the three year period examined - which is quite rare - to the sample average (0.25) decreases the posterior probability of being in the high security class by around 50 percentage points.

Columns 3 through 9 examine some representative security outcomes that enter the computation of the LCA index. Estimates show that bombing leads more hamlet households to participate in the VC infrastructure (Column 3), a parallel VC government that coordinated VC recruitment and extortion. This indicates that while air strikes plausibly do neutralize some VC, they lead even more to join the cause. Moreover, bombing leads to a higher probability of VC military presence in the hamlet (Column 4) and a greater presence of VC bases in the nearby countryside (Column 5). The security situation also deteriorates, with bombing causing an increase in VC-initiated attacks on local security forces (Column 6) and more VC terrorist attacks against civilians (Column 7). Estimates in Columns 8 and 9 document that bombing increases the fraction of quarters with VC attacks on property and the share of hamlet residents extorted by the VC, respectively. All estimates are significant at the 1% or 5% level. First stage F statistics are between 8 and 10, and - as documented in the appendix - would be larger if the controls were omitted, without changing the estimate much. The magnitudes of the estimates are non-trivial. For example, moving from no strikes - a rare occurrence - to the sample mean increases the share of households participating in the VC Infrastructure by 35 percentage points, relative to a sample mean of 0.18.

Next, Table 3 examines the impact of bombing on a wide range of governance outcomes. Column 1 reports the estimate for the immediate effect of bombing on the governance LCA index in the same quarter. The point estimate is statistically insignificant, which is not surprising since governance outcomes may change slowly and only adjust in the longer run to the cumulative effects of bombing. Indeed the estimate in Column 2, which reports the cumulative effect of bombing during 1970-1972 on the governance latent class index during this period, is negative and statistically significant at the 5% level. An increase in bombing from zero to the sample mean would lead the posterior probability that the hamlet belongs to the high governance class to decrease by 35 percentage points.

Columns 3 through 10 report the estimates for some HES governance outcomes included in the LCA posterior. Bombing leads to worse performance by local officials, as measured by whether they enforce the law (Column 3) or exercise control over the Popular Forces

(Column 4) - a regional military unit - and the police (Column 5). Bombing also decreases the probability that all village committee positions are filled (Column 6) and decreases the share of the budget funded by local tax revenues (Column 7). It likewise decreases some types of public goods provision. Hamlets exposed to more strikes between 1970 and 1972 are less likely to have medical services available (Column 8), local health workers are less likely to regularly visit all neighborhoods (Column 9), and school attendance is more likely to be reduced by security concerns (Column 10). These estimates are statistically significant at the 5% or 10% level.

These estimates are complimented by Table 4, which examines citizens' perceptions of security and local governance. The data are drawn from public opinion surveys, aggregated to the hamlet level. Air strikes lead to higher perceived VC terrorism (Column 1), an increased probability of citizens reporting VC extortion (Column 2), and increased voluntary and forced VC recruitment in the hamlet (Columns 3 and 4). All estimates are significant at the 5% level with the exception of forced recruitment, which is rare and significant at the 10% level. The magnitudes are substantial. For example, moving from no bombing to the sample mean increases the likelihood of respondents reporting VC terrorism by 23 percentage points.

Moreover, bombing decreases citizens' assessment of local officials' performance in ensuring security (Column 5) and police performance in fighting the VC (Column 6). More bombing makes citizens less likely to believe that the police should devote most of its time to preserving law and order (Column 7) and more likely to believe that it should focus on fighting the VC (Column 8). While getting the police to prioritize fighting the VC was a U.S. objective, this was likely driven by the increase in VC activity and it plausibly resulted in a deterioration of civilian law and order.

Table 5 examines civic society outcomes. The estimate in Column 1 for the LCA posterior suggests that there is an immediate negative impact of bombing on civic society, though it is only significant at the 10% level. The estimate of the cumulative effect on the LCA civic society posterior reported in Column 2 is negative and statistically significant at the 1% level. Moving from no bombing to the sample mean decreases the probability of being in the high civic society group by 37 percentage points. Columns 3 through 9 report estimates for the individual HES outcomes that are used to compute the latent class index. More bombing reduces the fraction of households that participate in Popular Self-Defense Forces (Column 3) - a local non-communist self-defense organization - and in groups organized by the Rural Development Cadre (Column 4). Additionally, bombing reduces the fraction of households participating in civic organizations (column 5), organized youth activities (Column 6), and self-development projects (Column 7). While the point estimate for whether the village council meets regularly with citizens is negative (column 8), it is not statistically significant. Finally, bombing decreases the number of non-communist political parties active in the

village (Column 9). Combined with the results in Tables 2 and 3, this shows that bombing made citizens more likely to support the communists and weakened non-communism, which was the opposite of the U.S. objective.

Next, Table 6 considers economic outcomes. Column 1 reports the immediate effect of bombing on the LCA economic posterior. The estimate is statistically insignificant, as is the cumulative estimate in column (2). Column 3 through 9 report estimates for individual HES outcomes used in the index. The estimates suggest that bombing decreases the availability of non-rice foodstuffs (Column 3) and manufactures (Column 4), reduces the likelihood that there is a surplus of goods available (Column 5), and increases the probability that fields are left uncultivated as a result of the insecurity (Column 8). Estimates for the presence of a market in the hamlet (Column 6), vehicle access (Column 7), and the share of households who require welfare assistance to subsist (column 9) are not statistically different from zero.

Finally, in Table 7 we report estimates on enemy-initiated attacks on ground troops, as well as casualties of friendly and enemy troops, using the cumulative specification. The estimate in Column 1, significant at the 5% level, documents that more airstrikes between 1970-1972 increases the likelihood of enemy (VC) initiated attacks on US and South Vietnamese troops. The estimates for Viet Cong troop deaths (Column 2), U.S. troop deaths (Column 3), and South Vietnamese troop deaths (column 4) near the hamlet are all positive, but only the impact on U.S. troop deaths is statistically significant. Increasing from no bombing to the sample mean increases the number of U.S. soldiers killed near the hamlet in a given quarter by 0.25. Note that the number of troops near the hamlet are not significantly higher, but they are more likely to be killed. Columns (5) through (7) document that while impacts on casualties (deaths and injuries) are also positive, they are not statistically significant. Overall, these results suggest that the intensification of the air campaign in South Vietnam may have cost American lives rather than saving them.

As an additional validity test, in Table 8 we report a series of placebo exercises for some of the immediate and cumulative estimates reported in Tables 2 - 7. For the immediate effects, we estimate IV regressions of bombing on the lagged value of the latent class posteriors in the quarter prior to score assignment. If indeed our estimates capture the effect of bombing, as instrumented by discontinuities in the HES security score, we should observe no effect of bombing on the security index in the previous quarter. Indeed, the estimates reported in Columns 1 through 4 of Panel A for the lagged security, governance, civic society and economic LCA posteriors, respectively, are small and statistically insignificant, except for the impact on the economic LCA, which is marginally significant at the 10% level. This is the only significant impact in this table, and about what we would expect from sampling error. For the cumulative estimates, we regress the average value of each LCA during 1969 (when the HES score was being piloted and had not yet been disseminated) on the instrumented

value of bombing during 1970-1972. The estimates in Columns 5-8 of Panel A for each of the posteriors are again small and statistically insignificant. Finally, columns 9 through 12 report a similar placebo exercise for the analysis of ground troop casualties. We regress the average value of each outcome variable reported in columns (1) through (4) of Table 7 during 1969 on the instrumented value of bombing during 1970-1972. Reassuringly, all estimates are small and statistically insignificant. This provides compelling evidence that the security score was as if randomly assigned near the score cutoffs.

We have also examined long-run effects on outcomes today, using a specification analogous to that used to measure cumulative effects during the war. We combined data from the Vietnamese Household Living Standards Survey (2002-2012), The Vietnamese Enterprise Census (2011), and the Provincial Competitive Index (2010-2012), which surveys firms on their perceptions of provincial government officials. We find small and insignificant impacts on household consumption and individual income; on schooling, on a variety of variables relating to firms; including FDI; and on perceptions of officials' performance. The main impact we find is that the cohort of fighting age during the war is much more likely to have been ill recently in more heavily bombed villages. These estimates are reported in the appendix. The reasons why effects do not persist in the long-run is beyond the scope of this paper, but these results are not particularly surprising given the major economic and political upheaval following the war. Further discussion of these issues is provided by Miguel and Roland (2011).

Overall, the estimates in Tables 2 - 7 underscore how military attacks that impact civilian populations may backfire, particularly in a context such as South Vietnam where large-scale air strikes were launched based on limited intelligence. Bombing of civilian population centers facilitated Viet Cong recruitment, in turn increasing insurgent attacks on local government sympathizers and US troops. This plausibly led to a general decline in law and order, public goods provision, and civic engagement.

4 Top Down Versus Bottom Up: Army and Marines

4.1 Hearts and Minds in South Vietnam

In contrast to the military force approach, which emphasizes establishing social control, a more bottom-up approach to counterinsurgency and state-building in weakly institutionalized settings prioritizes gaining the trust and support of citizens by providing public goods and economic opportunities. The Marines played a path-breaking role in developing the idea of hearts and minds initiatives, which they experimented with during their exploits in the Caribbean in the 1920s. According to the 1940 USMC Manual: "in small wars the goal is to

gain decisive results with the least application of force...the end aim is the social, economic, and political development of the people" (US Marine Corps, 1940).

During the Vietnam War, military leadership engaged in extended debates about the role that military force versus development aid should play in gaining the allegiance of South Vietnamese citizens. US Army leadership favored search and destroy raids that aimed to locate and neutralize VC insurgents. Development aid could be undertaken by USAID later, once peace was solidified, and civic action programs were argued to be too logistically complicated (Daddis, 2011). In contrast, key voices in the USMC leadership hypothesized that insecurity and poverty were jointly determined and hence must be addressed simultaneously. The Marines designated their Civic Action Program (CAP) as one of the four pillars of their mission in Vietnam. According to the official USMC history: "Marines units built schools, roads, marketplaces, and hospitals; set-up the Medical Civic Action Program (MEDCAP) to provide the rural population with regular medical care and to help develop hygienic and sanitary practices; and provided training and equipment to local and regional militia under the CAP and Combined Unit Pacification Program (CUPP) to enhance security in the rural areas" (US Marine Corps, 2009).

For historical reasons, the U.S. Marines commanded Corps Region I, the northernmost of the four military corps regions in South Vietnam, whereas the U.S. Army commanded neighboring Corps Region II. Figure 3 shows the boundary between these regions. The Marines are an expeditionary force of amphibious first responders, who can be rapidly deployed to address emerging crises, before yielding command to regular forces. Lyndon Johnson deployed the Marines to Vietnam in 1965 to protect a key airbase in Da Nang, located in Corps Region I. In the coming years, more Marines were deployed to address the unfolding crisis in Vietnam, reaching a peak of 85,000 troops in 1968. The Marines were given command of Corps Region I upon arrival and retained it until March of 1970, when the Army assumed command, and the final Marines units left Vietnam in April of 1971.

There are plausibly many differences between the Army and USMC that could lead their impacts to differ. Nevertheless, the literature heavily emphasizes the difference in hearts and minds initiatives as the most pertinent distinction in Vietnam (i.e. Daddis, 2011). The Appendix compares a wide range of demographic characteristics of all Army and USMC casualties. While casualties are not a representative sample, this information cannot be released for individuals who are still living. USMC casualties were modestly more likely to be from the Northeast, whereas US Army casualties were modestly more likely to be from the South, but there are no differences in racial composition.

Information on Armed Forces Qualifying Test (AFQT) scores, draft status, and high school completion are available for all service members. The Army had a higher share of soldiers from the Selective Service, but this varied from year to year. The USMC relied

extensively on the draft from 1968 until withdrawal. After 1967, all branches had to recruit men with lower standards to meet their demand. The AFQT test must be taken by both draftees and volunteers, and average Army and Marines AFQT scores were not different, nor were the shares of soldiers drawn from the lowest AFQT score groups different (Dawson, 1995). High school completion rates for Army soldiers were actually slightly higher.

4.2 Empirical Design

To compare the impacts of the USMC to those of the Army, the study uses a spatial regression discontinuity across the Corps Region I-II boundary:

$$y_{hs} = \alpha_0 + \alpha_1 USMC_{hs} + f(x_{hs}, y_{hs}) + \beta G_{hs} + \alpha_s + \epsilon_{hs} \tag{3}$$

where $USMC_{hs}$ is a dummy equal to 1 if hamlet h, along boundary segment s, is in Corp Region I, and $f(x_{hs}, y_{hs})$ is an RD polynomial in latitude and longitude. The baseline utilizes a local linear specification. G_{hs} is a vector of geographic controls, and α_s is a boundary segment fixed effect that splits the boundary into two segments. We focus on a narrow bandwidth of 25 kilometers around the boundary, with the appendix documenting robustness to alternative bandwidths. Standard errors are clustered by village. The identification assumptions for a spatial RD are the same as those for the RD in security score space: all factors besides the commanding military force must change smoothly at the boundary between Corps Region I and II.

In Columns 1-3 of Table 9 we show estimates for key geographic characteristics. The dependent variable in Column 1 is a dummy for whether the hamlet is urban. Reassuringly, the estimate is small and statistically insignificant, suggesting no difference in urbanization across the boundary. Columns 2 and 3 consider elevation and slope, respectively, documenting that there are no statistically significant differences.

Next, we examine pre-characteristics obtained from 1929 French colonial maps. While there are some differences, overall characteristics were similar on either side of the boundary in 1929. Data from the French period in Vietnam are limited and tend to be highly aggregated, and these maps provide a rare source of hamlet level information. Geo-referenced maps are used to compute whether there are various types of landmarks located near the hamlet: factories (column 4), markets (column 5), military posts (column 6), telegraphs (column 7), and train or tram stations (column 8). For the baseline, we use a radius of 2 kilometers around the hamlet center, with the appendix showing robustness to alternative bandwidths. While most of these are relatively rare, all but military posts are statistically identical across the boundary. Military posts are higher on the Marines side of the boundary, and the difference is significant at the 10% level. Columns 9 and 10 examine the density

of all roads (paved and unpaved) and paved colonial-built roads near the hamlet. Total roads are higher on the Marines side of the boundary, but paved roads are not. Data on other outcomes - like schooling or health care - are not available, and these were not widely available in colonial Vietnam.

4.3 Results

In this section, we compare outcomes across the Army-USMC corps region boundary, using the spatial regression discontinuity described by equation (3). Outcomes are averaged across all months for which data are available prior to the USMC withdrawal from Vietnam in April of 1971. The appendix lists the sample period of each dataset.

First we examine whether public goods targeted by the Marines' Civic Action Program (CAP) were higher on their side of the boundary. Data are drawn from HES, a data collection effort coordinated by a SVN-US civilian-military agency that was not directly affiliated with the USMC or Army command. Column 1 of Table 10 documents that primary school completion was 39 percentage points higher in hamlets in Corps I, commanded by the USMC. The magnitude is sizable, as the average completion rate in the whole sample was 31%. The estimates in Columns 2 and 3 show that hamlets in Corps I were 19 percentage points more likely to have medical services available, and 33 percentage points more likely to have public works under construction.

In columns 4 through 8, we examine differences across the boundary in security outcomes. Overall, there is some evidence that VC activity was lower on the USMC side of the boundary, but the differences in security are not as stark as the differences in CAP-provided public goods. The security posterior probability is 13 percentage points higher on the USMC side of the boundary, relative to an overall sample probability of 35% of being in the high security class, but the estimate is noisily estimated and not close to being statistically significant. Columns (5) through (8) examine some representative outcomes. VC initiated attacks on hamlets (column 5) and VC terrorist attacks against hamlet civilians (column 6) are significantly lower on the Marines side of the boundary. However, the share of hamlet households participating in the VC Infrastructure (parallel government) is not statistically different across the boundary (column 7). VC infrastructure responsibilities included recruitment and extortion, and neither of these are different across the boundary. The appendix shows that civic society and economic outcomes likewise did not differ systematically across the boundary.[4]

Next, columns 9 through 12 examine enemy initiated attacks on friendly troops, as well as

[4]We could also examine long-run outcomes, but are under-powered to do so since the boundary is short and most modern datasets are a sample, in contrast to the historical data, in which all hamlets were surveyed.

troop deaths. Estimates suggest that conflict was lower on the USMC side of the boundary. Specifically, column 9 documents that enemy initiated attacks were 12 percentage points lower in Corps Region I. This may be a direct effect of fewer search and destroy missions, as these missions were frequently ambushed by Viet Cong. VC, US, and South Vietnamese troop deaths were all lower on the USMC side of the boundary - and the differences are not small - but only the impact on South Vietnamese deaths is statistically significant.

Finally, column 13 examines the bombing of civilian population centers. As expected given that security enters the algorithm that targets air strikes, bombing was 11 percentage points lower on the USMC side of the boundary, but the difference is not statistically significant. It is possible nonetheless that bombing magnified initial security differences resulting from the different strategies of the Army and USMC. CAP targeted public goods also enter the security score algorithm, but are among the less influential questions and alone cannot explain much of the potential difference in air strikes. It should also be noted that bombing doesn't affect all CAP-targeted public goods, such as primary completion.

A key objective of the USMC hearts and minds strategy was to influence citizens' attitudes, and public opinion survey data can shed light on whether the USMC was successful in doing this, relative to the Army. Table 11 examines attitudes of South Vietnamese citizens towards Americans and towards South Vietnamese government, using data from PAAS. These are key outcomes of hearts and minds initiatives, and hence are important to examine, although the evidence must be interpreted with caution. The questions were only asked in a small sample of hamlets, and there are only 13 sampled hamlets within 25 kilometers of the corps region boundary. Hence, we instead use OLS to compare places within 100 km of the boundary, which is still a small sample. Moreover, while the surveys were conducted by local Vietnamese enumerators, there may well have been experimenter demand effects. Nevertheless, willingness to express more anti-American attitudes to an enumerator is itself plausibly an outcome of interest.

Column 1 documents that respondents in the USMC region were 16 percentage points more likely to like Americans, as compared to an overall sample mean of 0.24, and significantly less likely to hate Americans. Nearly all respondents who answered that they hated Americans were in the Army region. The omitted category, and modal response, is "neither likes nor hates Americans." Columns 3 through 5 document that in the USMC region, respondents were 39 percentage points more likely to state that there was no hostility towards the U.S. in their community, 11 percentage points more likely to state that America promotes harmony, and 38 percentage points more likely to state that the American presence was beneficial.

Moreover, respondents in the USMC region expressed more positive attitudes towards all levels of South Vietnamese government. They were more likely to respond that they were

fully confident in the effectiveness of the South Vietnamese government in general (column 6). Moreover, they were more likely to rate the South Vietnamese Army (ARVN) as effective (column 7), to rate the Popular Forces (PF) and Regional Forces (RF) - which are regional security forces - as effective (columns 8 and 9), and to rate the police as effective both in countering the VC and maintaining order (columns 10 and 11). Finally, they also rated local officials as more effective (column 12). While these results must be interpreted with caution, they are consistent with the hypothesis that hearts and minds were won (or lost less) by the bottom up approach, relative to a more exclusive focus on search and destroy raids.

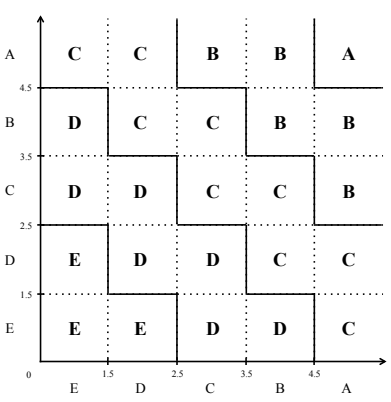
5 Conclusion

Interventions in weakly institutionalized societies have been central to U.S. foreign policy over the past half-century. While a variety of strategies have been employed to defeat insurgents and strengthen states, rigorous causal evidence about how different strategies influence security, governance, civic engagement, and economic outcomes remains limited.

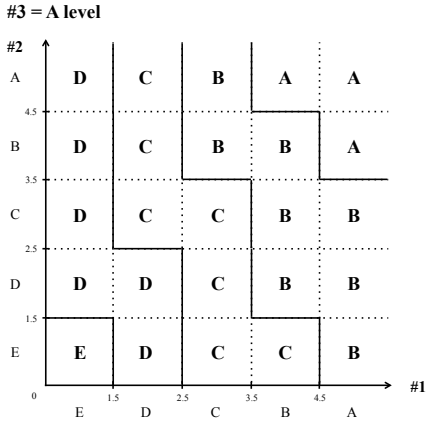
This study identifies the casual impacts of bombing South Vietnamese population centers by exploiting discontinuities in a scoring algorithm used to target air strikes. IV estimates document that the bombing of South Vietnamese hamlets led more Vietnamese to join the communist insurgency, worsened security conditions, and weakened governance and non-communist civic engagement. In contrast, a spatial regression discontinuity suggests that the Marines' bottom-up strategy of embedding soldiers in communities and emphasizing development projects plausibly improved public goods provision, security, and attitudes towards the U.S. and towards all levels of South Vietnamese government, relative to the Army's search and destroy approach.

This study highlights the ways in which the top down military force approach can backfire when targeted insurgents are embedded in civilian population centers. It also casts considerable doubt on the Vietnam era adage "get the people by the balls and their hearts and minds will follow" (Kodosky, 2007). Instead, a bottom-up approach that attempts to build support by providing citizens with concrete reasons to support the state appears relatively more promising. Studying the ways in which states can build support from the bottom up, while also providing security, is a fundamentally important area for future research.

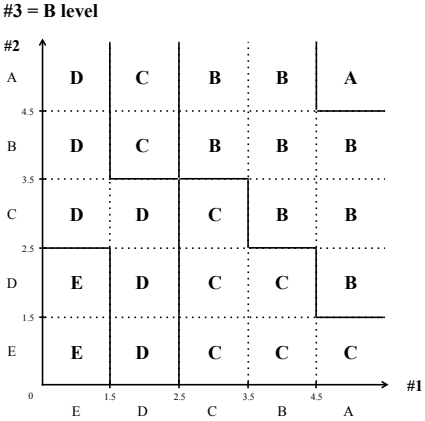
Figure 1: **Decision Logic**



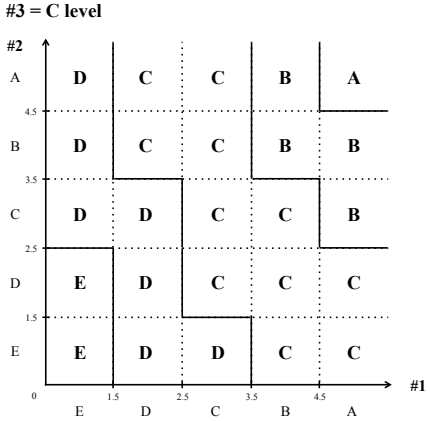
(a) 2-Way Logic



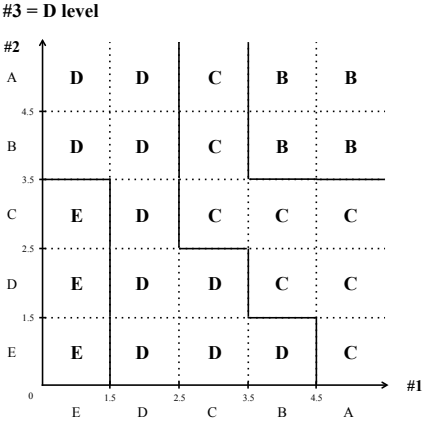
(b) 3-Way (A slice)



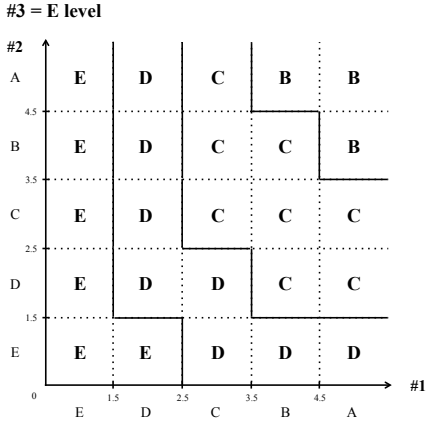
(c) 3-Way (B slice)



(d) 3-Way (C slice)

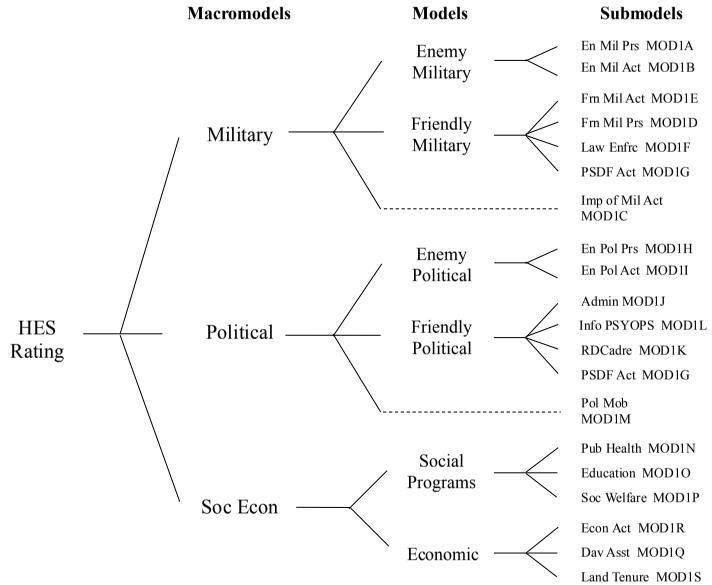


(e) 3-Way (D slice)

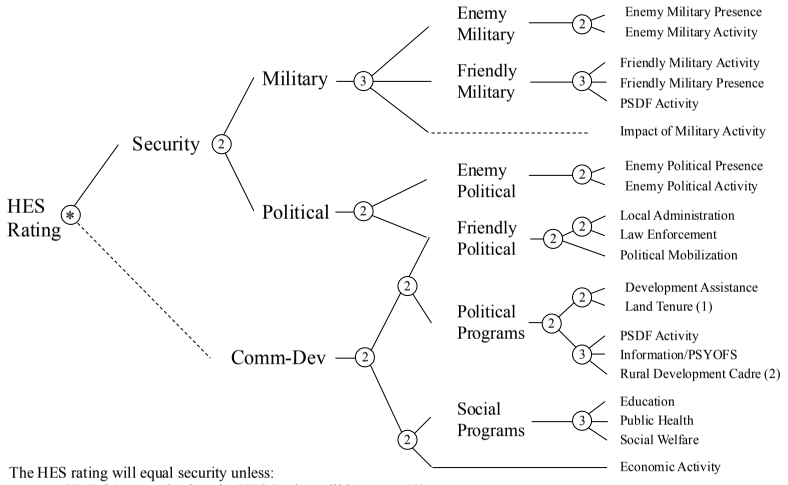


(f) 3-Way (E slice)

Figure 2: **Model Aggregation**



(a) *1970 Model Aggregation*



The HES rating will equal security unless:

1. HMBO1 = 1 or 2 when the HES Rating will be set to 'V'
2. Community Development (Comm-Dev) is three letter grades higher or lower than security whereupon it will be raised or lowered by one letter grade as applicable. If security is Not-evaluated (N) , the HES Rating will = 'N'

(1) If Land Tenure = 'N', use Development Assistance only.
(2) If RD Cadre = 'N', use a two way decision table rather than the three way table.

(b) *1971-72 Model Aggregation*

Figure 3: **Corps Region Boundary**

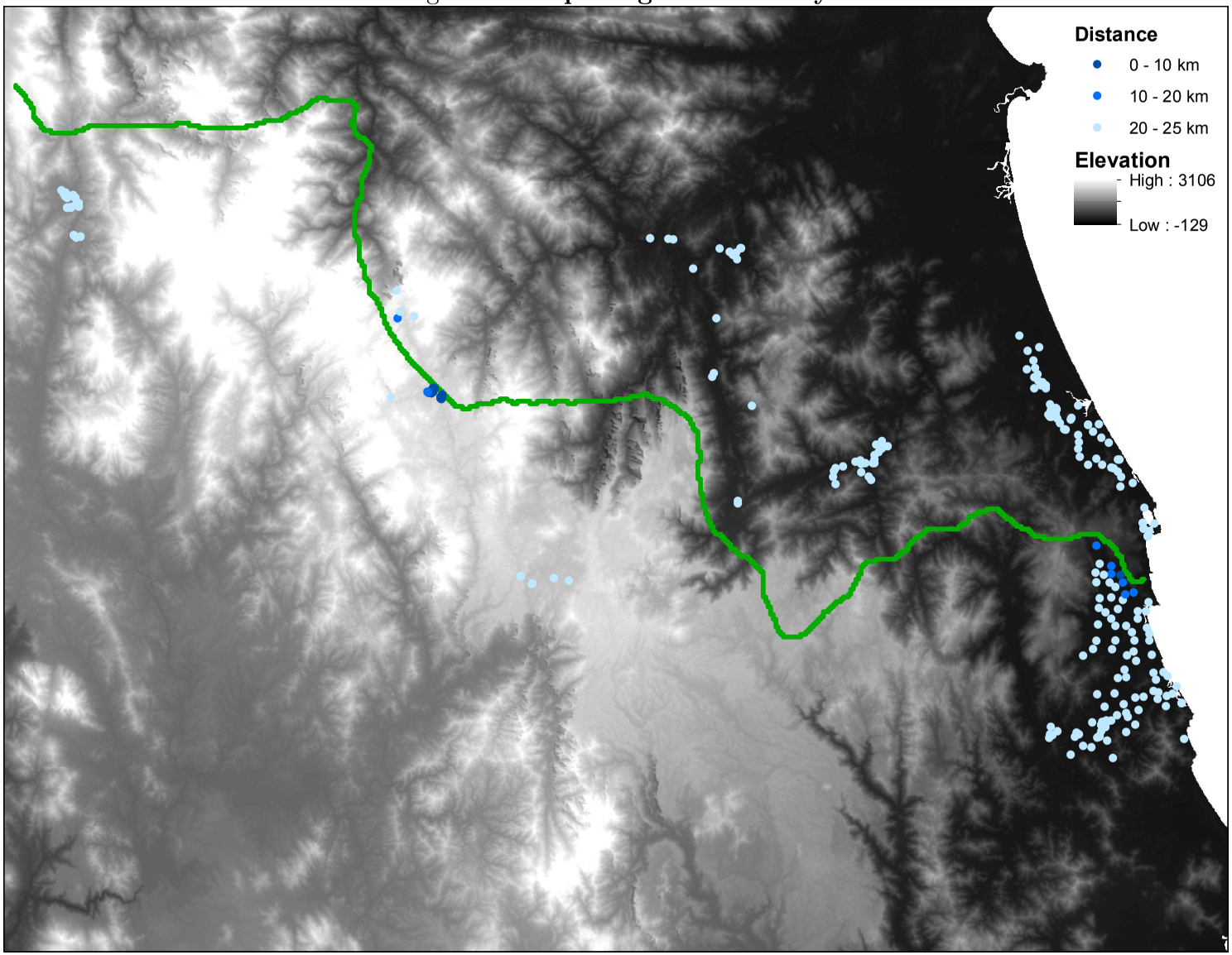
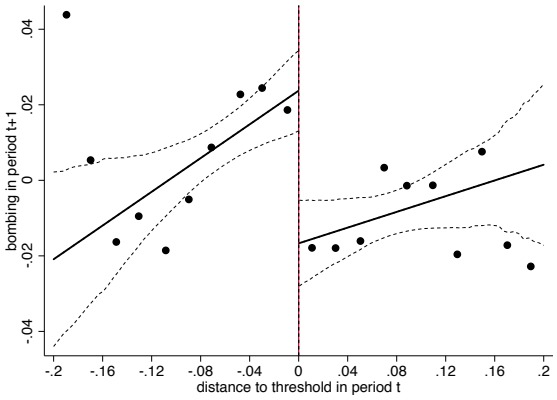
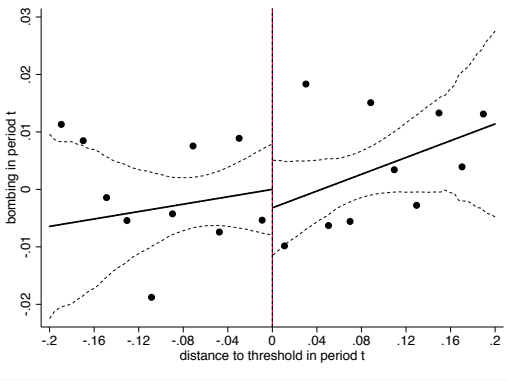


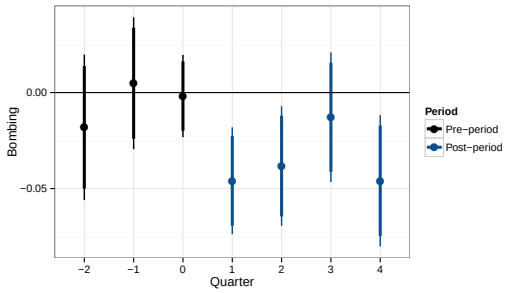
Figure 4: **First Stage**



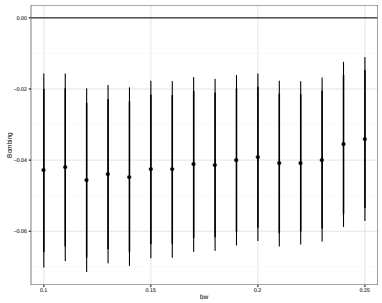
(a) *Bombing post-period*



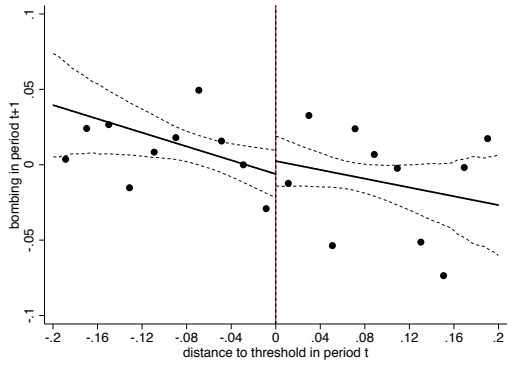
(b) *Bombing pre-period*



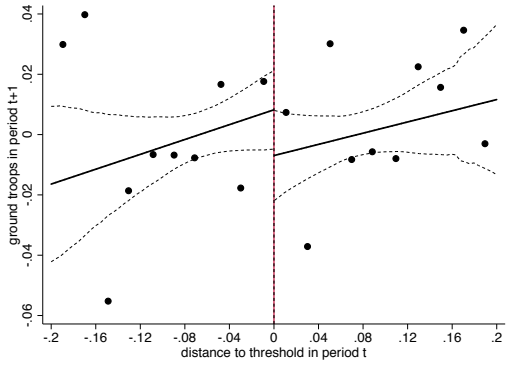
(c) *Estimate by Quarter*



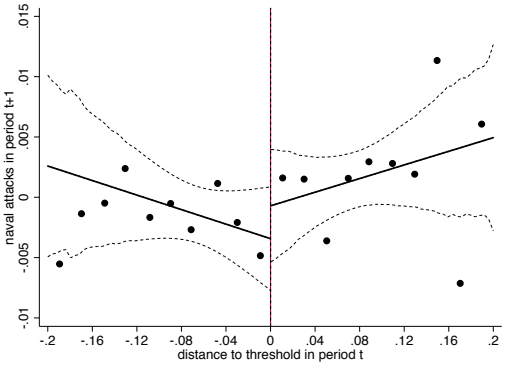
(d) *Bandwidth Robustness*



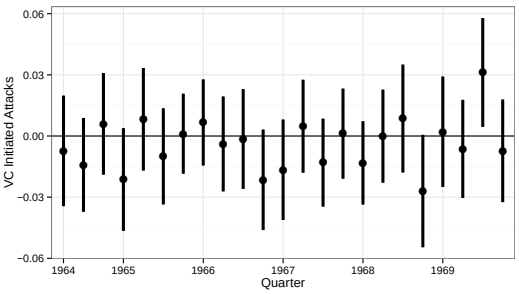
(e) *1969 Placebo*



(f) *Ground Troop Presence*



(g) *U.S. Navy Initiated Incidents*



(h) *1964-1969 VC-Initiated Attacks*

Table 1: First Stage Results

	Dep Var is Share Months Bomb/Artillery:			
	$t+1$	Cum	$t+1$	Cum
Sample Period:	70-72	69	70-72	69
	(1)	(2)	(3)	(4)
Above	-0.046	0.011		
	(0.014)***	(0.020)		
Share Above			-0.027	-0.008
			(0.009)***	(0.008)
Obs	11,321	4,510	5,460	5,454
Clusters	2182	1454	1609	1606
Mean	0.28	0.38	0.25	0.35

Notes: The dependent variable measures the share of months that friendly air or artillery fire was directed in or near a populated area. *Above* is an indicator equal to one if the security score is above the threshold in quarter t. *Share Above* is the share of quarters near the threshold that the hamlet is above the threshold, where near is defined by the Imbens-Kalyanaraman optimal bandwidth. When the immediate specification is used, the regression also includes a linear RD polynomial - estimated separately on either side of the threshold for each discontinuity - as well as discontinuity fixed effects, quarter-year fixed effects, province fixed effects, and pre-period controls. When the cumulative specification is used, the specification also includes discontinuity fixed effects, province fixed effects, and pre-period controls. Robust standard errors clustered by village are in parentheses *** $p < 0.10$; ** $p < 0.05$; ** $p < 0.01$.

Table 2: IV Estimates: Security

	Dependent variable is:								
	Security $t+1$	Post Prob Cum	% Part. VC	VC Pres	VC Base	VC Init. Attack	VC Terr. Attack	VC Prop.	% VC Extort
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Bombing	-0.831	-2.154	1.488	1.271	2.025	0.619	0.553	0.939	1.563
	(0.323)**	(0.666)***	(0.589)**	(0.453)***	(0.777)***	(0.242)**	(0.228)**	(0.356)***	(0.583)***
Obs	11,321	5,460	5,442	5,460	5,460	5,445	5,460	5,456	5,454
Clusters	2182	1609	1605	1609	1609	1605	1609	1607	1605
F stat	10.47	8.68	7.87	8.68	8.68	9.20	8.68	8.48	8.63
Mean	0.62	0.70	0.18	0.18	0.24	0.11	0.06	0.08	0.28

Notes: *Bombing* measures the share of months that friendly air or artillery fire was directed in or near a populated area. Bombing is instrumented by *Above* in the immediate specification in column (1) and *Share Above* in the cumulative specification in the remaining columns (see Table 1). When the immediate specification is used, the regression also includes a linear RD polynomial - estimated separately on either side of the threshold for each discontinuity - as well as discontinuity fixed effects, quarter-year fixed effects, province fixed effects, and pre-period controls. When the cumulative specification is used, the regression also includes discontinuity fixed effects, province fixed effects, and pre-period controls. Robust standard errors clustered by village are in parentheses *** $p < 0.10$; ** $p < 0.05$; ** $p < 0.01$.

Table 3: IV Estimates: Governance

	Dependent variable is:									
	Gov. $t+1$	Post. Prob. Cum	Enforce Law	Head Controls PF	Police	Committee Filled	% Budg. Tax	Med. Serv. Hamlet	Hlth Wrk Visit Ham	Schl. Lack Security
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Bombing	0.352	-1.440	-1.607	-1.094	-1.054	-1.124	-0.857	-2.067	-1.344	0.637
	(0.256)	(0.577)**	(0.696)**	(0.583)*	(0.594)*	(0.495)**	(0.373)**	(0.830)**	(0.625)**	(0.320)**
Obs	11,321	5,460	5,456	5,330	5,399	5,460	5,039	5,460	5,460	5,459
Clusters	2182	1609	1608	1569	1585	1609	1461	1609	1609	1609
F stat	10.47	8.68	8.60	8.59	8.43	8.68	13.96	8.68	8.68	8.70
Mean	0.81	0.83	0.70	0.58	0.57	0.83	0.47	0.32	0.28	0.05

Notes: *Bombing* measures the share of months that friendly air or artillery fire was directed in or near a populated area. Bombing is instrumented by *Above* in the immediate specification in column (1) and *Share Above* in the cumulative specification in the remaining columns (see Table 1). When the immediate specification is used, the regression also includes a linear RD polynomial - estimated separately on either side of the threshold for each discontinuity - as well as discontinuity fixed effects, quarter-year fixed effects, province fixed effects, and pre-period controls. When the cumulative specification is used, the regression also includes discontinuity fixed effects, province fixed effects, and pre-period controls. Robust standard errors clustered by village are in parentheses *** $p < 0.10$; ** $p < 0.05$; ** $p < 0.01$.

Table 4: IV Estimates: Public Opinion Outcomes

	Dependent variable is:							
	VC Terr.	VC Extort	Voluntary Recruitment	Terr.	Local Off. Eff.	Police Effective	Police Should Prioritize Law&Ord	VC
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Bombing	0.949	1.157	1.157	0.168	-0.942	-0.468	-0.894	1.001
	(0.375)**	(0.537)**	(0.486)**	(0.091)*	(0.524)*	(0.273)*	(0.386)**	(0.436)**
Obs	1,779	965	959	689	1,083	1,430	1,043	1,043
Clusters	743	429	428	398	497	614	543	543
F stat	29.35	14.56	15.54	14.98	16.81	27.49	14.23	14.23
Mean	0.18	0.23	0.12	0.01	0.41	0.85	0.22	0.39

Notes: *Bombing* measures the share of months that a friendly air or artillery fire was directed in or near a populated area. Bombing is instrumented by *Share Above* (see Table 1). Regressions also include discontinuity fixed effects and province fixed effects. Robust standard errors clustered by village are in parentheses *** $p < 0.10$; ** $p < 0.05$; ** $p < 0.01$.

Table 5: IV Estimates: Non-Insurgent Civic Society

	Dependent variable is:								
	Civic Society Posterior Prob.		Percent Households with a Member Active in					Council Meets Regularly	Number Political Parties
			PSDF	RD	Civic	Youth	Dev		
	$t+1$	Cum	Units	Cadre	Org	Org	Proj		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Bombing	-0.410	-1.509	-1.397	-0.567	-0.586	-0.981	-1.646	-0.784	-2.519
	(0.244)*	(0.574)***	(0.530)***	(0.322)*	(0.321)*	(0.541)*	(0.547)***	(0.555)	(1.385)*
Obs	11,321	5,460	5,456	5,350	5,451	5,459	5,120	5,451	5,450
Clusters	2182	1609	1607	1585	1606	1608	1486	1606	1606
F stat	10.47	8.68	8.73	13.11	9.48	8.91	14.35	9.02	8.99
Mean	0.67	0.70	0.50	0.32	0.26	0.72	0.25	0.54	1.34

Notes: *Bombing* measures the share of months that friendly air or artillery fire was directed in or near a populated area. Bombing is instrumented by *Above* in the immediate specification in column (1) and *Share Above* in the cumulative specification in the remaining columns (see Table 1). When the immediate specification is used, the regression also includes a linear RD polynomial - estimated separately on either side of the threshold for each discontinuity - as well as discontinuity fixed effects, quarter-year fixed effects, province fixed effects, and pre-period controls. When the cumulative specification is used, the regression also includes discontinuity fixed effects, province fixed effects, and pre-period controls. Robust standard errors clustered by village are in parentheses *** $p < 0.10$; ** $p < 0.05$; ** $p < 0.01$.

Table 6: IV Estimates: Economic Outcomes

	Dependent variable is:								
	Econ. $t+1$	Post. Prob. Cum	Non-Rice Food	Manuf. Avail	Surplus Goods	Market Hamlet	Access Vehicle	No Farm Security	% HH Assist.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Bombing	0.079	-0.723	-0.892	-1.027	-1.297	-0.663	-0.192	0.733	0.008
	(0.177)	(0.446)	(0.508)*	(0.563)*	(0.626)**	(0.550)	(0.165)	(0.444)*	(0.157)
Obs	11,321	5,460	5,445	5,449	5,457	5,458	5,458	5,381	5,440
Clusters	2182	1609	1603	1605	1607	1608	1608	1583	1602
F stat	10.47	8.68	8.91	8.97	8.86	8.69	8.69	9.95	9.07
Mean	0.67	0.69	0.72	0.62	0.45	0.39	0.24	0.26	0.06

Notes: *Bombing* measures the share of months that friendly air or artillery fire was directed in or near a populated area. Bombing is instrumented by *Above* in the immediate specification in column (1) and *Share Above* in the cumulative specification in the remaining columns (see Table 1). When the immediate specification is used, the regression also includes a linear RD polynomial - estimated separately on either side of the threshold for each discontinuity - as well as discontinuity fixed effects, quarter-year fixed effects, province fixed effects, and pre-period controls. When the cumulative specification is used, the regression also includes discontinuity fixed effects, province fixed effects, and pre-period controls. Robust standard errors clustered by village are in parentheses *** $p < 0.10$; ** $p < 0.05$; ** $p < 0.01$.

Table 7: IV Estimates: Casualties

	Dependent variable is:						
	Ene. Init. Attack	VC	US	SVN	VC	US	SVN
		Troop Deaths			Casualties		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bombing	0.899	107.812	0.999	22.450	104.868	5.451	112.345
	(0.352)**	(95.953)	(0.521)*	(15.000)	(96.960)	(4.267)	(68.700)
Obs	5,459	5,459	5,459	5,459	5,459	5,459	5,459
Clusters	1609	1609	1609	1609	1609	1609	1609
F stat	8.75	8.75	8.75	8.75	8.75	8.75	8.75
Mean	0.19	5.57	0.04	1.56	5.89	0.34	7.13

Notes: *Bombing* measures the share of months that friendly air or artillery fire was directed in or near a populated area. Bombing is instrumented by *Share Above* (see Table 1). The regressions also include discontinuity fixed effects, province fixed effects, and pre-period controls. Robust standard errors clustered by village are in parentheses *** $p < 0.10$; ** $p < 0.05$; ** $p < 0.01$.

Table 8: IV Estimates: Economic Outcomes

	Dependent variable is:											
	Secur.	Gov.	Civ. Soc.	Econ.	Secur.	Gov.	Civ. Soc.	Econ.	En. Init.	VC	US	SVN
	Posterior Probability				Posterior Probability				Attack	Deaths		
	Previous Quarter				1969					1969		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Bombing	-0.029	0.273	0.298	-0.706	-0.340	0.087	-0.132	0.131	0.030	8.102	0.497	0.632
	(0.303)	(0.287)	(0.364)	(0.396)*	(0.318)	(0.388)	(0.279)	(0.234)	(0.074)	(7.249)	(0.461)	(0.798)
Obs	11,321	11,321	11,321	11,321	5,460	5,460	5,460	5,460	5,459	5,459	5,459	5,459
Clusters	2182	2182	2182	2182	1609	1609	1609	1609	1609	1609	1609	1609
F stat	10.47	10.47	10.47	10.47	8.68	8.68	8.68	8.68	8.75	8.75	8.75	8.75
Mean	0.57	0.74	0.58	0.63	0.57	0.67	0.47	0.60	0.01	0.35	0.01	0.04

Notes: *Bombing* measures the share of months that friendly air or artillery fire was directed in or near a populated area. Bombing is instrumented by *Above* in the immediate specification in columns (1) through (4) and *Share Above* in the cumulative specification in the remaining columns (see Table 1). When the immediate specification is used, the regression also includes a linear RD polynomial - estimated separately on either side of the threshold for each discontinuity - as well as discontinuity fixed effects, quarter-year fixed effects, province fixed effects, and pre-period controls. When the cumulative specification is used, the regression also includes discontinuity fixed effects, province fixed effects, and pre-period controls. Robust standard errors clustered by village are in parentheses *** $p < 0.10$; ** $p < 0.05$; ** $p < 0.01$.

Table 9: Army and Marines: Balance Checks

	Dependent variable is:									
	Urban	Elev.	Slope	Factory	Market	Military Post	Telegraph	Tram or Train	Total Road (Km)	Colonial
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Marines	0.024	-81.140	-1.696	0.006	-0.028	0.306	-0.014	0.040	2.339	-0.098
	(0.035)	(109.376)	(1.566)	(0.010)	(0.040)	(0.161)*	(0.038)	(0.047)	(0.821)***	(0.730)
Obs	281	281	281	281	281	281	281	281	281	281
Clusters	63	63	63	63	63	63	63	63	63	63
Mean	0.04	294.87	3.31	0.01	0.03	0.06	0.02	0.05	1.67	0.67

Notes: Marines is an indicator equal to one if the observation is in Corps Region I. Regressions also include a linear RD polynomial in latitude and longitude and a boundary segment fixed effect. Robust standard errors clustered by village are in parentheses *** $p < 0.10$; ** $p < 0.05$; ** $p < 0.01$.

Table 10: Army and Marines: RD Results

	Dependent variable is:												
	Prim Schl Comp	Med Serv Avail	Pub Work Cons	Secur Post Prob	VC Init Attack	VC Terr Attack	% HH Part VC	VC Prop Drive	VC Attack Troops	VC	US Troop Deaths	SVN	Share Months Bombed
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Marines	0.399	0.190	0.336	0.130	-0.501	-0.079	0.082	-0.061	-0.121	-6.035	-0.228	-1.579	-0.111
	(0.083)***	(0.054)***	(0.143)**	(0.128)	(0.060)***	(0.025)***	(0.099)	(0.053)	(0.030)***	(3.745)	(0.228)	(0.644)**	(0.104)
Obs	52	274	53	281	272	265	275	275	281	281	281	281	56
Clusters	52	61	53	63	60	57	62	59	63	63	63	63	56
Mean	0.31	0.09	0.47	0.35	0.24	0.07	0.63	0.11	0.11	6.16	0.30	1.25	0.28

Notes: Marines is an indicator equal to one if the observation is in Corps Region I. Regressions also include a linear RD polynomial in latitude and longitude, as well as geographic controls and a boundary segment fixed effect. Robust standard errors clustered by village are in parentheses *** $p < 0.10$; ** $p < 0.05$; ** $p < 0.01$.

Table 11: Army and Marines: Attitudes Towards America and South Vietnam

	Dependent variable is:											
	Respondent		No	America		Fully				Police		Local
	Likes Americans	Hates	Hostility Am.	Promotes Harmony	Presence Beneficial	Conf in GVN	ARVN	PF Effective	RF	Effective VC	Order	Council Effective
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Marines	0.158	-0.086	0.392	0.111	0.383	0.139	0.110	0.288	0.287	0.179	0.175	0.190
	(0.082)*	(0.023)***	(0.110)***	(0.058)*	(0.079)***	(0.041)***	(0.060)*	(0.066)***	(0.158)*	(0.051)***	(0.039)***	(0.055)***
Obs	117	117	115	116	117	250	181	179	85	408	344	288
Clusters	66	66	65	66	66	112	102	109	54	178	156	145
Mean	0.24	0.04	0.48	0.18	0.51	0.43	0.79	0.35	0.55	0.77	0.28	0.56

Notes: Marines is an indicator equal to one if the observation is in Corps Region I. Regressions also include geographic controls. Robust standard errors clustered by village are in parentheses *** $p < 0.10$; ** $p < 0.05$; ** $p < 0.01$.

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