Civilian Harm and Military Legitimacy in War

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Abstract

The legitimacy of armed forces in the eyes of civilians is increasingly recognized as crucial not only for battlefield effectiveness but also for conflict resolution and peacebuilding. However, the micro-determinants of "military legitimacy" are poorly understood. We argue that perceptions of military legitimacy are shaped by two key dimensions of warfare: just *cause* and just *conduct*. Leveraging naturally occurring variation during one of the most deadly urban battles in recent history—the multinational campaign to defeat the Islamic State in Mosul, Iraq—we evaluate our theory with a mixed-methods design combining original survey data, satellite imagery, and interviews. Civilians living in neighborhoods where armed forces were less careful to protect civilians view those forces as less legitimate than civilians elsewhere. Surprisingly, these results persist after conditioning for personal experiences with harm, suggesting that perceptions are influenced not only by victimization—consistent with previous studies—but also by beliefs about the morality of armed forces' conduct and the cause for which they are fighting.

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1 Introduction

In December 2017, Iraqi Prime Minister Haider al-Abadi declared victory over the Islamic State [IS] after the nine-month battle for Mosul, Iraq's second largest city. The city had endured more than three years of the insurgent group's harsh rule since 2014 as the capital of its so-called "caliphate," a territory the size of Great Britain spanning large swathes of Iraq and Syria at its height in 2015 (Johnston et al., 2019: 39). Speaking to a crowd of Iraqi troops, al-Abadi congratulated them, thanked the U.S.-led multinational Coalition for their support, and alluded to the painful price of victory paid "by the blood of our martyrs."[1] The Battle of Mosul, which was described by senior military commanders at the time as "the most significant urban combat ... since World War II,"[2] achieved the objective of expelling IS from its last major stronghold in Iraq, but at an enormous cost: at least 11,000 civilians and 8,200 Iraqi forces were killed,[3] 138,000 homes suffered more than 6 billion dollars worth of damage (World Bank, 2018: 14), and irreplaceable cultural heritage sites dating back to the seventh century were destroyed (Isakhan and Meskell, 2019).

How did Iraqi civilians feel about this "dream of liberation," as Prime Minister al-Abadi described it in his victory speech? According to one resident of Mosul interviewed for this study in August 2023:

> "It wasn't worth ... all of this damage. They destroyed the infrastructure, the schools, the hospitals, government institutions, and services just to kill a few thousand IS fighters ... Most importantly, you cannot replace a human soul. There were way too many causalities and many more in the west than in the east."[4]

[1] Maher Chmaytelli and Ahmed Aboulenein, "Iraq declares final victory over Islamic State," *Associated Press* (Dec. 9, 2017), https://www.reuters.com/article/us-mideast-crisis-iraq-islamicstate-idUSKBN1E30B9/.

[2] U.S. Department of Defense, "Briefing by Gen. Townsend via Telephone from Baghdad, Iraq" (Mar. 28, 2017), https://www.defense.gov/News/Transcripts/Transcript/Article/1133033/department-of-defense-briefing-by-gen-townsend-via-telephone-from-baghdad-iraq/.

[3] Not including the more than 2,500 IS fighters believed to have been killed. See Jane Ferguson, "Why the human toll of the battle for Mosul may never be known," *PBS News Hour* (Dec. 19, 2018), https://www.pbs.org/newshour/show/why-the-human-toll-of-the-battle-for-mosul-may-never-be-known.

[4] Interview A.1.7

This statement is representative of a widespread sentiment among civilians who were exposed to the deadliest fighting in West Mosul: that the battle succeeded militarily, but was fought in a manner that the population perceived as excessively destructive and therefore illegitimate.

This paper seeks to understand that dynamic. Using an iterative mixed-methods design and building off of extensive field research in Iraq since 2016, this study triangulates between multiple sources of quantitative and qualitative data to inductively develop and evaluate a theory of the microfoundations of perceived military legitimacy in the eyes of civilians. Specifically, we investigate how the techniques, tactics, and personnel employed by counterinsurgents during the Battle of Mosul influenced civilian perceptions of military legitimacy. "Military legitimacy," a concept described by Barnes Jr (2013: 5) as "the balance between might and right,"[5] is increasingly recognized as a crucial factor not only for battlefield outcomes but also for conflict resolution and peacebuilding (Gelpi, 2003; Dandeker and Gow, 2013). However, the determinants of military legitimacy remain poorly understood.

We leverage naturally occurring observational variation arising from a distinctive feature of Mosul's geography. The Tigris River, which divides East Mosul from West Mosul, made it necessary for the Coalition to liberate the city in two phases. The battle began in East Mosul for plausibly exogenous reasons discussed further in Section 6. A major shift then occurred in the Coalition's strategy between the battles for East and West Mosul, which we argue was also plausibly exogenous, enabling us to compare the attitudes of residents of Mosul ("Moslawis") in the immediate aftermath of their exposure to two very different styles of warfare.[6]

In East Mosul, Iraq's elite multi-ethnic U.S.-trained Counter-Terrorism Service (CTS, also known as the "Golden Division") went to great lengths to minimize harm to civilians at the expense of their own safety, suffering heavy casualties. In contrast, the battle for West Mosul relied on less disciplined ground troops, the Iraqi Federal Police, a predominately Shia

[5]Previous work has used similar concepts of "combatant legitimacy" (Bassiouni, 2007) and "military legalism" (Brooks and Erickson, 2022), but we prefer "military legitimacy" because it encompasses multiple dimensions of warfare: not only the conduct of individual combatants but also higher-level strategic decisions and compliance with rules of engagement and laws of war.

[6]Although our design resembles other "natural experiments" that have used geographic or administrative boundaries to divide populations into treatment and control groups (Keele and Titiunik, 2016), we refrain from using this term because of the complexity of our "bundled treatment," which presents a number of threats to causal inference discussed in Section 6 that we address but cannot definitively rule out. Nonetheless, we cautiously interpret our results as suggestive of the roles of military strategy and tactics in shaping civilian perceptions of military legitimacy.

force with a history of human rights violations against Sunni civilians, and was fought with overwhelming airpower and artillery that caused heavy collateral damage. At the time, U.S. Secretary of Defense James Mattis described the change in strategy as a shift from "attrition tactics to annihilation tactics" (Wasser et al., 2021: 113). Through analysis of publicly available military documents and statements by Iraqi and U.S. officials, we characterize the shift in strategy as a "bundled treatment" consisting of three primary components: (1) composition of ground forces, (2) choice of munitions, and (3) rules of engagement.

We measure the effects of this bundled treatment on civilian perceptions and experiences using an original survey of 1,458 respondents in Mosul, which we augment with geolocated satellite data on building destruction before and after the battle. Our results suggest that all three aspects of the bundled treatment were the likely consequence of plausibly exogenous factors not related to underlying differences in the attitudes or other attributes of civilians in East and West Mosul. We validate our quantitative results and further explore causal mechanisms with rich qualitative data collected over multiple rounds of careful field research in Mosul before and after the implementation of the 2018 household survey. The data include interviews with Iraqi civilians, government and military officials, and humanitarian and healthcare professionals conducted in 2016 and 2017 while the battle was still ongoing. Additionally, the research team returned to Mosul in August 2023 to conduct another round of follow-up interviews and observations in seven of the same neighborhoods included in the 2018 survey.

Our results are striking. We first present evidence that the shift in strategy between the two phases of the battle—from "attrition" in East Mosul to "annihilation" in West Mosul—contributed to significantly higher levels of civilian harm and property destruction in West Mosul compared with otherwise similar neighborhoods in East Mosul as measured by self-reported harm and satellite imagery. Additionally, we find strong evidence that the two phases of the battle resulted in markedly different attitudes toward IS and counter-insurgent forces in West and East Mosul. In West Mosul, where the Coalition made several changes that reflected less concern for protection of civilians, respondents perceived counter-insurgents as less legitimate than respondents in East Mosul: a rating difference of 9% to 15% on Likert-scale questions reflecting military legitimacy.

Finally, we find that these results persist even after conditioning on respondents' personal experiences with physical and material harm. Even comparing households who were similarly

victimized, respondents in West Mosul still perceived counter-insurgents as less legitimate than respondents in East Mosul. This novel result suggests that perceptions of military legitimacy are influenced not only by specific incidents of harm perpetrated by combatants—as has been well-established by previous studies—but also by beliefs about the morality of armed forces' conduct and the cause for which they are fighting.

Our findings highlight civilians' sensitivity to differences in technologies of violence and variation in the conduct of different armed forces fighting on the same side. Consistent with the literature on just war theory (Dill and Shue, 2012; Draper, 2017; Bolinger, 2021; Strawser, 2023), we find qualitative evidence that civilians distinguish between "just harm," caused by combatants who are exercising due care in pursuit of military objectives that civilians perceive as legitimate, and "unjust harm" that is caused by recklessness or perpetrated in the name of objectives that civilians view as morally wrong or strategically misguided. A quote from one of our interviewees encapsulates the distinction:

> "The Army ... made a big mistake by leading [IS] to ... West Mosul ... **They could have led them to the desert with much less damage."**[7]

Put simply, Moslawis' perceptions of armed forces appear to be shaped by both *how* and *why* they harmed civilians.

2 A Theory of Military Legitimacy

We define "military legitimacy" as civilians' perception of an armed force as wielding violence in a manner that maintains "legal and moral authority" on the battlefield such that the military is deemed worthy of civilian support (Ayres and Thurnher, 2018: 224). Concepts of legitimacy have long been used to describe states (Weber, 1964: 382), legal authorities and institutions (Tyler, 2006), and organizational actors more generally (Suchman, 1995). At its most basic, legitimacy is a condition that inheres "when people are influenced by an authority or institution not by means of the use of power but because they believe that the decisions made and rules enacted by that authority or institution are in some way 'right' or

[7] Interview A.1.4

'proper' and ought to be followed" (Tyler et al., 2007: 10).[8]

Military legitimacy shares important properties with concepts of legitimacy in other contexts. Most importantly, legitimacy only exists to the extent that it is perceived by the individuals over whom some actor purports to exercise authority. In this way, military legitimacy builds off of recent scholarship emphasizing civilians' agency and sophistication in responding to armed conflict (Schubiger, 2021; Masullo, 2021). Similarly, much as scholars of legal institutions link legitimacy to "procedural justice"—that is, the perception that authorities follow procedures that people experience as being fair (Tyler, 2003). We hypothesize that military legitimacy depends upon tactics and strategies that civilians experience as being fair and situationally appropriate, including by following the international humanitarian law principles of "just cause" (*jus ad bellum*) and "just conduct" (*jus in bello*). In other words, civilians are capable of distinguishing between "just" and "unjust harm," where the former results from just conduct or is necessary to achieve a just cause (Dill and Shue, 2012; Draper, 2017; Bolinger, 2021; Strawser, 2023), and military legitimacy in most contexts will require that civilians perceive combatants and commanders as exercising "due care" in their efforts to avoid harming innocent civilians (Condra and Wright, 2019).[9] In short, it matters for the study of conflict not just *what* civilians experience at the hands of armed actors, but also *how* they experience it, and *why*.

Perceived military legitimacy is believed to be particularly important in the context of counterinsurgency, which is still the most prevalent form of conflict since the end of the Cold War (Jones, 2017) despite predictions of the return of great power competition and proxy wars (Jenne and Siroky, 2023). In insurgencies, the opposing parties are competing to control and govern territory and the civilian population therein (Boot, 2013: 562). They are also competing for legitimacy in the eyes of civilians, giving rise to what has been described as "contested legitimacy" (Hammond, 2008: 63). There is broad consensus on actions that undermine military legitimacy: war crimes such as abducting civilians (Gilbert, 2022) and

[8]In the study of law and legal authorities, definitions of legitimacy often emphasize the tendency of legitimate authorities to command obedience via "The belief that some decision made or rule created by these authorities is 'valid' in the sense that it is 'entitled to be obeyed' by virtue of who made the decision or how it was made." In conflict, "obedience" to military actors takes various forms, including cooperation/collaboration, the absence of resistance, or acceptance of a post-conflict government.

[9]The U.S. military has itself adopted a similar definition of legitimacy: "In [military operations other than war], legitimacy is a condition based on the perception of a specific audience of the legality, morality, or rightness of a set of actions ... It may be reinforced by restraint in the use of force, the type of forces employed, and the disciplined conduct of the forces involved." (*JP 3-07, Joint Doctrine for Military Operations Other Than War*, 1995: II-5)

willfully or recklessly causing harm to civilians (Butler, 2002: 6). Importantly, accidents or mistakes made in good faith do not necessarily reduce a military's overall perceived legitimacy (Gow, 2013: 106). However, there is still much to be learned about the conditions under which civilians perceive armed forces as legitimate.

Although several studies discuss efforts by states and rebel groups to build legitimacy in the context of civil wars, often through governance and service provision (Arjona, 2016; Condra and Wright, 2019; Lyall, Zhou and Imai, 2020; Revkin, 2021; Mampilly and Stewart, 2021), "military legitimacy" is a distinct concept that reflects perceptions of the armed forces of a state or non-state actor, which do not necessarily mirror perceptions of the legitimacy of the actor's civilian leadership and institutions.

Our study builds upon the literature on the effects of counterinsurgent tactics and civilian harm on individual behaviors or attitudes. A series of related papers have suggested that civilians who experience violence at the hands of either party to a counterinsurgent conflict will seek to harm the perpetrator and aid the opponent by sharing information with the latter (Condra and Shapiro, 2012; Zhukov, 2013; Shaver and Shapiro, 2021). Alternatively, Lyall, Blair and Imai (2013) find that the effects of wartime victimization are conditioned by in-group bias with the perpetrator. Fabbe, Hazlett and Sinmazdemir (2023) demonstrate that regime-perpetrated violence is unlikely to increase support for *either* party, instead becoming more supportive of a prospective peace agreement, and Berman, Clarke and Majed (2023) show that protest behavior in Iraq is positively correlated with casualties caused by the U.S. coalition.

This literature has often been narrowly focused on estimating the effects of collateral damage on civilian support for armed forces without sufficiently theorizing the mechanisms through which different strategies, technologies, and forms of violence may have varying effects on civilian attitudes. Thus, we argue that military legitimacy is a channel through which combatants' actions can affect civilian attitudes beyond a mere contest of coercion. Our focus on legitimacy may help explain Dell and Querubin's (2018) finding that a U.S. military strategy in Vietnam emphasizing "overwhelming firepower"—as opposed to winning "hearts and minds"—often redounded to the benefit of communist insurgents, resulting in greater public support for the Viet Cong.

The concept of "military legitimacy" enriches our theoretical understanding of the determinants of civilian support. We focus not simply on which armed forces are supported by

civilians, but the degree to which they are perceived as *worthy* of support (i.e., legitimate). While this distinction is subtle, its implications are significant. Much of the previous literature on counterinsurgency takes an instrumental approach to "winning hearts and minds" from the perspective of combatants, who value civilians as sources of information, material support, and other strategic benefits. In contrast, we take a civilian-centric approach. While military legitimacy does have strategic benefits for armed forces, it is also intrinsically valuable for civilians because it is associated with compliance with the laws of war and eventually provides a "solid foundation for transitioning from war to peace" (Ayres and Thurnher, 2018).

Our theoretical framework suggests two claims that we operationalize and test in Section 4. First, civilians are capable of perceiving variation in the "due care" shown by counterinsurgents, defined as reasonable efforts to minimize harm to civilians in a particular context (Walzer, 2015: 156). Second, civilians are more likely to regard counterinsurgents as legitimate when they are perceived as exercising "due care" to protect civilians, and less legitimate when they intentionally or negligently harm civilians.

3 Context: The Battle for Mosul

We study the determinants of military legitimacy in the context of counterinsurgency. Some of the previous literature treats "counterinsurgency" as a monolithic category without recognizing important variation in strategy, technology, terrain, and other relevant variables, which has resulted in over-claiming the generalizability of findings. While our study is not equipped to construct and rigorously test the implications of a full typology of counterinsurgency scenarios, we are extremely clear about the unique features and scope conditions of our context.

The fight against IS was an internationalized counterinsurgency campaign against a transnational terrorist group that controlled substantial territory in Iraq and Syria. The conflict could also be considered a "conventional" intrastate war, and it involved the largest multinational coalition in modern military history. The Battle of Mosul was the apex of this conflict. Mosul, Iraq's second largest city with a predominately Sunni Arab population of around 1.2 million, was controlled by IS for more than three years until its recapture by

U.S.-backed Iraqi forces in a devastating battle from October 2016 until July 2017 (Revkin, 2021). Since Mosul is divided by the Tigris River, the battle to retake the city necessarily unfolded in two phases summarized below in Table 1.

Table 1: Summary of Major Changes During the "Operational Pause" Between East and West Mosul

Phase 1: Battle for East Mosul (October 2016—January 2017)	**3-Week "Operational Pause"**	**Phase 2: Battle for West Mosul** (February 2017—July 2017)
Led by **Iraq's elite Counter-Terrorism Service** ("Golden Brigade"), trained by U.S., fought house-to-house urban warfare with minimal air support	Recovery	Dramatic **shift from ground to air war**
	Repairs	**Increase in the rate of airstrikes** and use of **"wide impact area"** weapons (e.g., close-range rockets, mortars, RPGs) driven by depletion of elite CTS and, in some neighborhoods, narrower streets
The CTS were **instructed to minimize civilian casualties** but in doing so, they suffered enormous losses: 75% combatant casualty rate	Reinforcements	**Decrease in precision** of airstrikes due to changes in rules of engagement
	Strategic shift from ground to air war	Ground operation led by **Iraqi Federal Police, a poorly trained and undisciplined** paramilitary force (trained by Italy because Leahy Law bars U.S. assistance over human rights concerns)
"**We have to be very careful**. We can't just bomb a neighborhood and then go clear it, we have to fight from house to house and that is **costing us men**." — a CTS brigade commander	Changes in rules of engagement	**"I did not receive any instructions** on who to shoot and not to shoot." — a Federal Police officer
	Changes in munitions	

3.1 Phase 1: East Mosul (October 2016–January 2017)

East Mosul was liberated first by Iraq's elite Counter-Terrorism Service ("CTS," also known as the "Golden Division") who fought their way into IS-controlled neighborhoods with minimal air support. Iraqi commanders refrained from using heavier weapons and instructed civilians to shelter in their homes rather than flee the city, hoping to avert a displacement crisis (Baudot, 2020: 15). Many residents of East Mosul praised the CTS for their protection of civilians. According to one,"We were expecting the worst ... but our Iraqi brothers saved

us."[10]

Our interviewees highlighted the CTS's professionalism, skill, and concern for protection of civilians, commenting on the noteworthy absence of misconduct in comparison with other Iraqi ground forces deployed in West Mosul and other areas, notably the Federal Police, who were frequently accused of looting, sexual violence, extra-judicial killings, and other crimes against civilians (Human Rights Watch, 2016). One interviewee associated the absence of looting in his neighborhood with the protective presence of the CTS, noting, "There was no looting in this neighborhood because the Golden Division was here, but I did hear about looting in other neighborhoods."[11]

One family described how a CTS soldier bravely took the initiative to transport their elderly injured grandfather to the hospital in the midst of the fighting, in stark contrast with the Federal Police: "The federal police were the ones harming us and bombing us. But the Golden Division [CTS] were the ones helping us." Another Moslawi emphasized the CTS's efforts to minimize harm:

> "They [the CTS] ... caused very little damage because they used snipers and ... some of the same techniques as IS, moving through holes between houses, which allowed them to liberate neighborhoods from the ground not using airstrikes."[12]

Although this strategy was commended for limiting collateral damage, the CTS suffered massive casualties that depleted its fighting force by around 75 percent (Amnesty International, 2017: 11). As an Iraqi brigade commander described the challenges of fighting urban warfare among civilians: "Our soldiers have to be very careful. We can't just bomb a neighborhood and then go clear it, we have to fight from house to house and that is costing us men," noting that his soldiers felt a particular "responsibility to give a better image of the army to the people" because of the previous Iraqi government's repression of Mosul.[13]

[10]Sahr Muhammedally, "Policy Brief on Civilian Protection in the Current Mosul Campaign," *Center for Civilians in Conflict* (Feb. 27, 2017), https://civiliansinconflict.org/publications/policy/policy-brief-civilian-protection-current-mosul-campaign/.

[11]Interview A.1.4

[12]Interview A.1.4

[13]Ghaith Abdul-Ahad, "The Battle for Mosul: 'I Have Never Seen Such Hard Fighting Like This,' *Frontline* (Jan. 31, 2017), https://www.pbs.org/wgbh/frontline/article/the-battle-for-mosul-i-have-never-seen-such-hard-fighting-like-this/.

3.2 Phase 2: West Mosul (February 2017–July 2017)

After East Mosul was liberated in January 2017, the Coalition took a three-week "operational pause" to rest, bring in reinforcements, and repair equipment (Table 1). Iraqi forces began their offensive to retake West Mosul in February 2017. With the CTS largely incapacitated by the East Mosul operation, the Coalition was forced to heavily rely on poorly trained Federal Police in West Mosul.

The Federal Police are a predominately Shia paramilitary force equipped with artillery. They were widely recognized as the least professional and least effective of the various Iraqi armed forces involved in the battle. They did not go through the Iraqi military's standard training pipeline (Group, 2017: 45), and received as little as two weeks of training from the Italian Carabinieri before their deployment to West Mosul. Under the Leahy Law, the U.S. military is not allowed to train some units of the Federal Police due to their history of human rights violations (Banful, 2011: 34). For example, Human Rights Watch documented widespread torture and extra-judicial killings in Federal Police stations in 2013, less than a year before IS suddenly captured Mosul (Human Rights Watch, 2013). Some individual Federal Police who were interviewed by journalists and NGOs appeared to have not received any training in rules of engagement or laws of war: "I did not receive any instructions on who to shoot and not to shoot," according to one officer (Baudot, 2020: 27). A CTS commander complained about the Federal Police, "They are acting with recklessness and madness," referring to their heavy use of rockets and artillery in West Mosul.[14] There were widespread allegations of looting, property destruction, and sexual violence against civilians by Federal Police in Mosul and surrounding areas (Gaston, 2017; Amnesty International, 2018). According to one of our interviewees, "The Federal Police were looting and stealing a lot from civilians and they were watching other people stealing and doing nothing."[15]

In addition to greater reliance on the Federal Police in West Mosul, another important difference was a change in the Coalition's rules of engagement. In late 2016, just before the end of Phase 1, the coalition issued "Tactical Directive 1," which dropped the previous

[14] Mustafa Salim & Loveday Morris, "In Mosul, Iraqi forces struggle to hang on to government compound days after retaking it," *Washington Post* (Mar. 10, 2017), https://www.washingtonpost.com/world/middle_east/in-mosul-iraqi-forces-struggle-to-hang-on-to-government-compound-days-after-retaking-it/2017/03/10/9080acec-0369-11e7-9d14-9724d48f5666_story.html.

[15] Interview A.1.3

requirement that all airstrikes be approved by a Coalition "strike cell" and empowered lower-ranking commanders to call in airstrikes faster and more easily in West Mosul than they had been able to in East Mosul.[16] This change was partially driven by the Coalition's concern that "the centralization of TEA [target engagement authority] ... limited the effectiveness of airpower and forced it to be employed in a restrained manner" during the first phase of the battle in East Mosul (Wasser et al., 2021: 83-84). Around the same time, military sources reported that the noncombatant casualty cutoff value (NCV) "was raised slightly" from its previous level of zero (Wasser et al., 2021: 84), meaning that the Coalition was willing to take the risk of causing some greater-than-zero number of civilian casualties without the approval of a senior commander.

As the battle for West Mosul unfolded, journalists and human rights organizations observed a sharp increase in the frequency of airstrikes and a corresponding increase in civilian casualties. After a U.S. airstrike killed at least 105 civilians in West Mosul on March 17, 2017, the Iraqi government asked the U.S.-led Coalition to temporarily pause airstrikes, but they resumed almost immediately. According to an internal review of the battle plan, the objective had shifted from "attrition" to "annihilation" by May 2017.[17] A Federal Police colonel in West Mosul admitted that Iraqi forces were frequently calling in airstrikes against IS snipers on rooftops without knowing if the buildings contained civilians: "It was impossible to know who was in homes. We had to advance, so when ISIS snipers would attack us, we had to call in airstrikes. Entire families were likely killed" (Baudot, 2020: 50).

Changes in munitions on the ground also contributed to higher levels of collateral damage in West Mosul. In East Mosul, ground forces had used relatively precise gun rounds and anti-tank guided missiles, but in West Mosul, narrower streets forced them to rely on unguided "wide-impact-area" weapons including close-range AT-4 rockets, rocket propelled grenades, mortars, and artillery projectiles (Baudot, 2020: 18, 48).

The Iraqi government and Coalition forces declared the whole of Mosul recaptured in July

[16] Susannah George & Balint Szlanko, "US changes rules of engagement for Mosul fight in Iraq" *Associated Press* (February 24, 2017), https://apnews.com/article/f084b4f094f440058e6b58318a67adce; Richard Hall, "Were high civilian casualties in Mosul unavoidable?" *Public Radio International* (July 13, 2017), https://www.pri.org/stories/2017-07-13/were-high-civilian-casualties-mosul-unavoidable.

[17] "Department of Defense Press Briefing by Secretary Mattis, General Dunford and Special Envoy McGurk on the Campaign to Defeat ISIS in the Pentagon Press Briefing Room," U.S. Department of Defense (May 19, 2017),https://www.defense.gov/News/Transcripts/Transcript-View/Article/1188225/department-of-defense-press-briefing-by-secretarymattis-general-dunford-and-sp/.

2017, but the liberation of West Mosul came at a heavy cost for civilians. Journalists and humanitarian actors quickly observed a qualitative difference in levels of collateral damage between East and West Mosul,[18] but our study is one of the first attempts to quantify this difference.[19]

4 Research Design: Comparing the Two Phases in the Battle for Mosul

In order to learn from the battle for Mosul and its aftermath, we combine quantitative analysis of survey and satellite data with qualitative interviews in an iterative, mixed-methods approach. Our quantitative research design is straightforward: in order to assess the relationship between counterinsurgent strategy and perceived military legitimacy, we compare the self-reported perceptions and lived experiences of civilians who were living in East and West Mosul during the battle against IS. We characterize the shift in strategy as a bundled treatment consisting of three primary components:

1. changes in the composition of Iraqi ground forces resulting from heavy casualties sustained by the elite multi-ethnic and cross-sectarian U.S.-trained CTS in East Mosul, which necessitated greater reliance on the less disciplined and predominately Shia Federal Police in West Mosul who were less trusted by Mosul's majority Sunni population (Knights, 2018: 7);

2. heavier use of airstrikes, artillery, and other wide-area munitions in West Mosul as compared with the careful house-to-house urban warfare that was credited with winning the battle for East Mosul, but at enormous cost to the elite CTS; and

[18] Chris Woods, director of Airwars, an organization that monitors airstrikes, described the change as follows: "One of the things that characterized the coalition campaign earlier on was the relative care they were taking over their strikes ... [Now] they are substituting caution for speed and ferocity. Nick Miriello, "The U.S.-led coalition in Syria and Iraq killed a staggering number of civilians in March, new report says," Vice News (Apr. 14, 2017), https://www.vice.com/en/article/paz9gn/the-us-led-coalition-killed-a-staggering-number-of-civilians-in-march-monitor-reports.

[19] We are aware of only one other study that uses quantitative survey data to compare levels of damage between East and West Mosul with a smaller sample and less granular locational data (Lafta, Al-Nuaimi and Burnham, 2018).

3. an important change in the Coalition's rules of engagement, "Directive 1," which decentralized authority over use of force, enabling lower-level Iraqi commanders to call in airstrikes and artillery faster and with less oversight.

By comparing survey responses collected from East and West Mosul in the immediate aftermath of the Battle for Mosul in 2018, we can empirically test our expectation that this bundle of changes, which reflected reduced concern for protection of civilians, will be associated with reduced perceptions of military legitimacy, even conditional on personal exposure to collateral damage.

Formally, we make the following predictions:

Hypothesis 1. *Respondents in West Mosul, relative to respondents in East Mosul, should view counterinsurgent forces as less legitimate.*

Hypothesis 2. *Conditional on a respondent's personal exposure to conflict-related harm, and relative to respondents in East Mosul, respondents in West Mosul should view counterinsurgent forces as less legitimate.*

Our comparisons of respondents from East and West Mosul control for all observable differences between the two sides of the city, and we show that these observables are largely balanced between East and West (Table 6). A causal interpretation of our results requires the assumption that, conditional on demographic controls, a neighborhood's location with respect to the Tigris River is exogenous and not correlated with unobserved determinants of collateral damage or civilian attitudes, outside of the shift in strategy and tactics described above. While we have reason to believe that the shift in strategy and tactics between East and West Mosul was primarily driven by plausibly exogenous factors, war is nonetheless an intrinsically human endeavor in a real-world setting, meaning that we cannot fully rule out endogeneity in exposure to the bundled treatment. For this reason, we caution against a narrowly causal interpretation of our findings. Section 6 further discusses evidence on the drivers of the shift in strategy between East and West Mosul as well as assumptions and challenges related to inference.

4.1 Data and Research Ethics

Our study is based on an original household survey of a random sample of 1,458 residents of East and West Mosul and qualitative data from field research in Mosul and other areas of northern Iraq. The survey was conducted in March 2018, approximately eight months after Mosul was recaptured from IS by Iraqi forces, by a gender-balanced team of Iraqi enumerators. The survey methodology is discussed in detail in the Appendix.

Research in conflict-affected areas presents a number of potentially serious risks to participants, and researchers have a professional and moral responsibility to do no harm Wood (2006). Conflict-affected populations are particularly vulnerable for several reasons including possible recent exposure to violence, the risk of retraumatization, and unequal power dynamics between international researchers and local participants (Cronin-Furman and Lake, 2018). In order to minimize these risks, the study underwent a rigorous process of obtaining ethics approval from Anonymous University's Institutional Review Board (IRB)[20] and followed best practices for participant and researcher safety including a detailed informed consent process, frequent reminders of respondents' right to end the survey at any time, and strong data security protocols (Koehler et al., 2020). Figure 1 is a map of the city of Mosul with approximate survey locations indicated by green dots.[21]

We supplement our original survey data with observational, spatial data. The United Nations Satellite Centre (UNITAR - UNOSAT) acquired and cleaned satellite imagery of Mosul in August 2017 at the conclusion of the battle.[22] A total of 19,888 battle-affected structures were identified within the city.[23] By matching the coordinates of damaged buildings to a respondent's location, we can detect whether there was any significant structural damage to the residential unit associated with the geographic coordinates. UN Habitat provided neighborhood shapefiles with population and residential unit estimates.[24]

Additionally, we complement our quantitative analysis with qualitative semi-structured

[20]The Human Subjects Committee of Anonymous University's Institutional Review Board (IRB) approved this study on December 14, 2017 (Protocol #Anonymous).

[21]To further protect the anonymity of respondents, we plot respondents' sampling coordinates after adding random error terms of up to 100 meters.

[22]Data available at The Humanitarian Data Exchange.

[23]UNITAR - UNOSAT also categorized the degree of destruction (moderate, severe, destroyed) and the type of structure (e.g., church, mosque, school, university, market).

[24]Data available at ARCGIS.

interviews and in-person observation of features of the urban geography of Mosul. The design of the survey was informed by in-depth interviews conducted in recently liberated neighborhoods in the outskirts of East Mosul over the course of several research trips in 2017, while West Mosul was still occupied by IS, and in 2018, after IS's defeat when it was possible to conduct interviews in both East and West Mosul.[25] Between 2018 and 2022, one of the authors spent more than two years in Iraq based in Erbil and Baghdad conducting academic research,[26] and working as a researcher and advisor for humanitarian organizations. This work included several more visits to Mosul and continuous engagement with Iraqi colleagues and interlocutors from Mosul. In August 2023, after quantitative analysis of the 2018 survey data and spatial analysis of the satellite data raised new questions about the determinants of military legitimacy that could not be adequately addressed with quantitative data alone, the authors returned to Mosul again as a team to conduct follow-up interviews and observe variation in urban geography in seven neighborhoods (four in West Mosul and three in East Mosul) that we randomly selected from the list of 47 neighborhoods that comprised the sampling frame in the 2018 survey.[27]

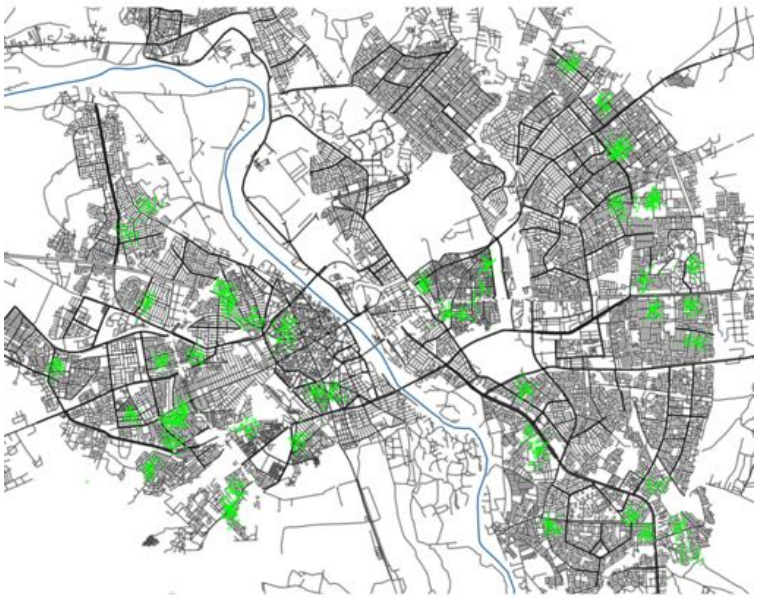
Since the 2018 survey was conducted anonymously for the safety of respondents, we did not attempt to re-interview any of our original respondents, opting to interview a convenience sample of eight individuals we encountered while walking through the neighborhoods. We used a screening question to identify potential interviewees who were living in Mosul during the battle for Mosul, our inclusion criterion. This second round of field research provided further evidence for the assumptions of our design and the underlying mechanisms of our theory. Excerpts of key quotes from these interviews and photos of the neighborhoods are provided in Appendix Section A.

[25] These interviews were approved by Anonymous University's IRB on XX 2017 (Protocol #Anonymous.

[26] For several related follow-on studies that were covered by subsequent IRB protocols approved by anonymous universities.

[27] The Human Subjects Committee of Anonymous University's Institutional Review Board (IRB) approved this follow up study on August 3, 2023 (Protocol #Anonymous).

Figure 1: Approximate Survey Locations



4.2 Empirical Strategy

We test Hypothesis 1 (predicting differences between East and West Mosul respondents' perceptions of the military legitimacy of counterinsurgent forces), with a simple regression of the following form:

$$\text{Military Legitimacy}_{ij} = \alpha + \beta \text{West}_j + \mathbf{X}_i'\Gamma + \mathbf{N}_j'\Pi + \epsilon_{ij}, \tag{1}$$

The dependent variable is a Likert-scale of survey questions eliciting the likelihood that one of the various Iraqi and Coalition armed forces would kill innocent civilians.[28] We consider this measure to be a plausible proxy for military legitimacy, capturing Ayres and Thurnher (2018)'s description of legitimacy as the "actual and perceived righteousness of [combatants']

[28] "In your opinion, how likely are the following actors (U.S., CTS, Iraqi Army, Federal Police, Popular Mobilization Forces (PMF) to kill innocent civilians?"

conduct." Our measure is similar to Condra and Wright (2019)'s survey question, which gauges the "perceived level of effort that the government and insurgents exert to avoid civilian casualties." Our measure admittedly only captures one facet of military legitimacy (efforts to avoid harming civilians), and scholars of legitimacy in other contexts have used different questions to measure other observable indicators of legitimacy including trust and obedience. However, we believe that our question was the best and most concrete way to operationalize legitimacy in the context of 2018 Mosul, and our qualitative data provides additional evidence in the words of civilians themselves.

Our treatment variable, West_j, indicates that the respondent was living in West Mosul during the battle;[29] $\mathbf{X}_i$ is a vector of individual-level demographic characteristics; and $\mathbf{N}_j$ is a vector of neighborhood-level geographic characteristics.[30] Our first hypothesis predicts that respondents from West and East Mosul will have systematically different perceptions of armed forces' military legitimacy. Why do we expect this? One obvious possibility is that civilian attitudes towards counterinsurgent forces merely reflect the much greater level of collateral damage that occurred in West Mosul. With Hypothesis 2 however, we test our prediction that civilian attitudes are not determined solely by *what* harms they experienced, but also by their perceptions of the *conduct* of the combatants who caused the harm. We operationalize Hypothesis 2 with regressions of the form:

[29]Because our survey was conducted approximately eight months after the liberation of Mosul, we cannot assume that a respondent's residence at the time of the survey was the same as the respondent's place of residence at the time of the battle. We account for this in two ways. First, we remove from the sample all individuals who responded "no" to a survey question asking whether they were living in Mosul during any part of the battle. Second, for individuals who reported that they had moved residences between the battle and the time of the survey, the survey asks them to identify the neighborhood they were living in at the time of the battle. For these individuals, we code the treatment variable (i.e., whether they were living in East or West Mosul) as well as neighborhood-level controls according to where they reported living during the battle.

[30]Individual controls are: education level, age, pre-IS household income, voting in the 2014 parliamentary election, support for Sharia law, attendance of Friday prayer, reported harm during IS rule (pre-battle), blaming IS for harm during rule (pre-battle), grievances with the Iraqi government (pre-IS), and having paid taxes to IS. Neighborhood controls are: residential unit density, population density, and street density. We take seriously the concern that controlling on post-treatment covariates can induce confounding (Dworschak, 2023; Montgomery, Nyhan and Torres, 2018). While our survey was fielded post-treatment (after the battle concluded), we are careful to only control for indicators which ask respondents to recall pre-treatment information or record characteristics that are immutable (ethnicity, age, etc). This inclusion restriction applies both to the controls in the regression analysis as well as Table 6, the balance table validating our design.

$$\text{Military Legitimacy}_{ij} = \alpha + \beta \text{West}_j + \theta \text{Collateral Damage}_{ij} + \mathbf{X}_i'\Gamma + \mathbf{N}_j'\Pi + \epsilon_{ij}. \quad (2)$$

Relative to equation (1), equation (2) controls for whether a respondent directly experienced collateral damage during the battle for Mosul, either through self-reported damage to their home or injury or death to members of their household, or through satellite measurements of damaged buildings nearby.[31] By holding fixed self-reported and satellite-detected harm and continuing to control for individual- and neighborhood-level characteristics, we can test whether it was some other aspect of the treatment—such as perceptions of armed forces' efforts to minimize collateral damage—that is driving our previous results.

We present our regression results from equations (1) and (2) in the section below, but first, we test our "first-stage" assumption. Is the shift in tactics, techniques, and procedures between the battle phases,[32] which we described qualitatively in Section 3, visible in our observational data? Table A7 confirms our assumption that the changing tactics resulted in greater household-level collateral damage in the second phase of the battle. Relative to respondents in East Mosul, respondents in West Mosul were more than 13 percentage points more likely to report that they had experienced damage to their home, and they were also almost 10 percentage points more likely to report that a member of their household had been killed during the battle. Figure 2 clearly visualizes the disparity in battle related damage between the two sides of the city.

Table A8 provides additional evidence that the bundled treatment resulted in visible differences on the ground. Here, we regress a binary variable asking a respondent whether armed actors were stealing or looting.[33] More than 22% of respondents reported looting by the Federal Police compared to 5% and 9% by the CTS and Iraqi Army respectively. This

[31] To capture personal exposure to conflict-related harm we use self-reported survey measures asking separately: "Was the house or apartment that you were living in during the battle seriously damaged? Was a member of your household injured? or Was a member of your household killed?" In addition to measures of self-reported harm, we create an indicator for detected harm using remote sensing satellite data. This provides an observational measure of battle-related building damage in the respondents location.

[32] John Spencer and Jayson Geroux, "Urban Warfare Project Case Study 2: Battle of Mosul," *Modern War Institute*, (Jan. 27, 2022), https://mwi.westpoint.edu/urban-warfare-project-case-study-2-battle-of-mosul/.

[33] "Have you witnessed or heard about cases in which the following forces (CTS / Iraqi Army / Federal Police / PMF) have stolen property or money (looting) from civilians in Mosul?"

Figure 2: Satellite Assessed Damage in Mosul UNITAR - UNOSAT

quantifies the relative lack of professionalism of the Federal Police, which had a much large presence in West Mosul. Relative to respondents in East Mosul, respondents in West Mosul were more than 10 percentage points more likely to report looting by the Federal Police.

In addition to confirming greater damage and less professionalism in West Mosul, we also confirm that there was a difference in *how* civilians were harmed. We supplement our original data with descriptive analysis of Lafta, Al-Nuaimi and Burnham (2018)'s survey of 7,559 residents of Mosul fielded at the conclusion of each stage of the battle. Appendix, Section I first confirms our finding that individuals in West Mosul were more likely to experience injury and death during the battle. Further, this survey asked respondents whether harm was the result of airstrikes, explosions, gunshots, car-bomb, or other means. Among respondents who reported a death in their family, 48% of those in West Mosul attributed the death to an airstrike compared to 19% in East Mosul. This confirms our qualitative evidence of the increased reliance on air power in the second phase of the battle.

5 Results

We begin with our analysis of Hypothesis 1. Hypothesis 1 predicts that, relative to respondents in East Mosul, respondents from in West Mosul will perceive Coalition forces as more legitimate. The outcomes are one of several Likert-scale questions asking respondents how likely the different Coalition armed forces are to kill innocent civilians (1 = very unlikely 2 = unlikely 3 = somewhat likely 4 = very likely). We interpret each variable as a proxy for respondents' perception of that actor's overall military legitimacy. Table 2 provides a "naive" test of Hypothesis 1 by simply compare respondents on each side of the river through a standard difference-in-means t-test. In West Mosul, civilians perceive Coalition forces as more likely to kill innocent civilians.

Table 2: Naive Results: Difference-in-Means

	West Mosul (642)	East Mosul (591)	Difference-In-Means
US: Kill Civilians?	3.098	2.842	0.256***
	(1.149)	(1.208)	
CTS: Kill Civilians?	1.415	1.227	0.188***
	(0.705)	(0.583)	
Iraq Army: Kill Civilians?	1.467	1.23	0.237***
	(0.757)	(0.573)	
Iraq Police: Kill Civilians?	1.54	1.28	0.26***
	(0.834)	(0.668)	
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 3 reports results from our primary estimation strategy (Equation 1), where the left-hand-side variable is the same variables from Table 2. Consistent with Hypothesis 1, respondents from West Mosul are more likely than respondents from East Mosul to describe each of the five major Coalition forces as "somewhat" or "very likely" to kill innocent civilians. On average, and after controlling for individual- and neighborhood-level characteristics, respondents from West Mosul gave Likert-scale responses that are between 0.12 and 0.214 points higher than respondents from East Mosul—effects that represent between 5% and 15% increases relative to the unconditional mean.

Table 4 presents the results for Hypothesis 2, which predicts that respondents in West Mosul will rate Coalition forces as more likely to kill innocent civilians, even after controlling for their personal exposure to harm. We measure personal exposure to harm using both survey responses and satellite data. Column (1) controls for self-reported household damage, column (2) controls for self-reported death or injury to a household member, column (3)

Table 3: OLS Regression Results: Opinions of An Actors Tolerance for Civilian Harm

	Dependent variable:				
	US: Kill Civilians?	CTS: Kill Civilians?	Iraq Army: Kill Civilians?	Iraq Police: Kill Civilians?	PMF: Kill Civilians?
	(1)	(2)	(3)	(4)	(5)
Treated (West Mosul)	0.147	0.138***	0.195***	0.214***	0.124**
	(0.094)	(0.052)	(0.053)	(0.064)	(0.049)
Constant	3.388***	1.446***	1.272***	1.346***	1.576***
	(0.417)	(0.180)	(0.184)	(0.192)	(0.204)
Uncoditional Mean	2.995	1.326	1.357	1.42	1.44
Individual Controls	Yes	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes	Yes
Observations	917	923	921	923	920
Adjusted R^2	0.078	0.048	0.058	0.081	0.050
F Statistic	6.170*** (df = 15; 901)	4.128*** (df = 15; 907)	4.799*** (df = 15; 905)	6.409*** (df = 15; 907)	4.233*** (df = 15; 904)

Note: *p<0.1; **p<0.05; ***p<0.01
HC1 robust, neighboorhood-clustered standard errors

controls for satellite-detected building damage within 10 meters of the respondent's home, and column (4) controls for all three variables at once. Table 4 shows results only for the Iraqi Army's likelihood of killing civilians (our measure of military legitimacy). Appendix Section G shows similar results for the other major Coalition forces.

The uniformly positive and relatively sizeable estimated coefficients in Tables 4 provide support for Hypothesis 2: that civilian attitudes are not driven by exposure to physical and material harm alone. Table 4 shows that even after conditioning on various self-reported and satellite-detected harm, respondents in West Mosul are more likely than respondents in East Mosul to describe the U.S. military as "somewhat" or "very likely" to kill innocent civilians. In fact, the magnitude of the effects are approximately as large as the effect show in column (1) of Table 3, where we do not condition on personal exposure to harm. We interpret these results as suggesting that civilian attitudes toward armed forces may be influenced at least in part by civilians' perceptions of how the actors conduct themselves in battle, including the casualty-permissiveness of their tactics and the efforts they take to prevent civilian harm.

We acknowledge one possible alternative explanation for the results in Table 4. If residents of West Mosul were simply living among greater overall collateral damage, and our measures of individual-level harm do not fully capture the extent of the damage, then the results in Table 4 may simply reflect the scale of the destruction. However, the robustness of our results to expanding the radius of satellite-detected damage to within 50 or even 100 meters (in Appendix Tables A15–A18) from the respondents' homes suggests that our results are not simply picking up the fact that residents of West Mosul are more likely to live in proximity to neighborhood-level collateral damage.

Table 4: OLS Regression Results: Perceptions of Iraqi Army's Likelihood of Killing Civilians (Controlling for Harm)

	Dependent variable:			
	Army: Kill Civilians?	Army: Kill Civilians?	Army: Kill Civilians?	Army: Kill Civilians?
	(1)	(2)	(3)	(4)
Treated (West Mosul)	0.198***	0.195***	0.169***	0.172***
	(0.053)	(0.052)	(0.049)	(0.049)
Reported: House Damage	−0.021			−0.032
	(0.048)			(0.048)
Reported: HH Death or Injury		0.007		−0.003
		(0.049)		(0.048)
Detected: House Damage (10m)			0.161**	0.166**
			(0.066)	(0.069)
Constant	1.284***	1.272***	1.292***	1.310***
	(0.193)	(0.184)	(0.178)	(0.184)
Uncoditional Mean	1.357	1.357	1.357	1.357
Individual Controls	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes
Observations	921	921	921	921
Adjusted R^2	0.057	0.057	0.063	0.062
F Statistic	4.505*** (df = 16; 904)	4.495*** (df = 16; 904)	4.877*** (df = 16; 904)	4.350*** (df = 18; 902)

Note: *p<0.1; **p<0.05; ***p<0.01
HC1 robust, neighboorhood-clustered standard errors

Table 5 provides additional support and suggests a potential mechanism for Hypothesis 2. 5 shows how respondents attribute blame for harms they experienced during during the battle.[34] The questions about blame attribution were asked only to individuals who reported experiencing harm (either property damage or injury or death of a household member), a smaller sub-group of the full sample, which reduces our power to detect effects. Nonetheless, we do detect several significant effects, all in the same direction, that provide further insight into our primary results on military legitimacy. Respondents in West Mosul, compared with those in East Mosul, are approximately 7 percentage points less likely to blame IS for any household harm, and they are almost 16 percentage points less likely to blame IS for injuries to a household member (an effect of almost 20% relative to the mean), and more likely to blame Coalition forces.

Table 5 provides additional support for Hypothesis 2 and suggests a potential explanatory

[34] "Which of the following (IS/ U.S. / CTS / Iraqi Army / Federal Police / PMF) do you believe was responsible for the damage to your house or apartment, for the injury of a member of your household, or for the killing of a member of your household during the Battle of Mosul?" This variable is collapsed, indicating whether the respondent attributed blame to IS (1) or any counter-insurgent actor (0).

Table 5: OLS Regression Results: Attribution of Blame for Harm

	Dependent variable:				
	IS Blame: House Damage	IS Blame:HH Injured	IS Blame:HH Killed	IS Blame:HH Injury or Killed	IS Blame:Any Harm
	(1)	(2)	(3)	(4)	(5)
Treated (West Mosul)	−0.069*	−0.157***	−0.106	−0.111**	−0.039
	(0.038)	(0.053)	(0.083)	(0.047)	(0.031)
Uncoditional Mean	0.789	0.817	0.833	0.844	0.837
Individual Controls	Yes	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes	Yes
Observations	672	235	138	282	719
Adjusted R^2	0.097	0.073	0.114	0.088	0.086
F Statistic	5.788*** (df = 15; 656)	2.230*** (df = 15; 219)	2.177** (df = 15; 122)	2.811*** (df = 15; 266)	5.487*** (df = 15; 703)

Note: *p<0.1; **p<0.05; ***p<0.01
HC1 robust, neighboorhood-clustered standard errors

mechanism. Because the samples in Table 5 are restricted to individuals who self-reported experiencing harm during the battle, these regressions implicitly condition on personal exposure to harm. In other words, Table 5 suggests that civilians in West Mosul, who were exposed to the bundled treatment, are more likely to assign blame to Coalition forces even after conditioning on individual experiences with harm. These results are robust to the full set of individual and neighborhood level controls, including blame attribution for harm during IS rule. This result is particularly striking given that IS became increasingly brutal in its treatment of civilians in West Mosul—using them as human shields and gunning down hundreds who were trying to flee—as it became clear that defeat was inevitable. After the Coalition rejected an attempt by IS leaders to negotiate a retreat out of the city, IS fighters were incentivized to fight to the death knowing that they would face capital punishment if captured.[35] The fact that casualty-permissive counter-insurgent forces are more likely to be blamed for harm than IS may help to explain why attitudes toward the Coalition are more negative in West Mosul even after controlling for personal exposure to harm and pre-existing attitudes.

6 Identifying Assumptions and Threats to Inference

We interpret our quantitative results—in combination with our qualitative evidence—as highlighting the importance of tactics and strategy in shaping civilian perceptions of military legitimacy. Below, we discuss some of the assumptions that support our interpretation as

[35]Sarah El Deeb, "Tense Standoff Spells Endgame for IS Militants in Syria," *Associated Press* (Feb. 18, 2019), https://apnews.com/article/350baf7eab724e40944a68ebac672052.

well as potential threats to inference. Our empirical strategy rests on two assumptions: (1) exposure to the bundled treatment is exogenous and (2) that we are able to control for all systematic differences between East and West Mosul. We address potential violations of these two assumptions below.

First, it is possible that exposure to the bundled treatment is itself endogenous. This might have been the case if the sequencing of the phases of the battle or the shift in strategy and tactics between the two phases were themselves driven by factors correlated with civilian attitudes. Second, even if the shift in strategies was fully exogenous, our estimates could still be biased if pre-existing differences between respondents living in East and West Mosul created omitted variable bias.

Regarding the first challenge, our extensive field research described in Appendix Section A.2 and our review of secondary sources support our conclusion that the sequencing and shifts in strategy between the two phases of the battle were driven by plausibly exogenous factors that were unrelated to any systematic variation in civilian attitudes between East and West Mosul. Below, we address several questions that might raise endogeneity concerns.

First, why did the counter-insurgents attack Mosul from the East rather than from the West? The initial strategy was to push IS westward into the desert away from populated Iraqi cities and toward the border with Syria in order to surround IS in a so-called "kill box" in between Mosul and Tel Afar, the nearest city approximately 40 miles west. We are aware of no evidence that Iraqi or coalition military planners viewed East Mosul as a more favorable starting location due to any differences in civilian attitudes there. Wasser et al. (2021) describe several strategic considerations unrelated to civilian attitudes that favored starting in East Mosul:

> "[Iraqi forces] ... cleared the city from east to west. This approach leveraged the existing Kurdish defensive line and allowed the ISF to freely stage in Peshmerga-controlled territory prior to the assault (it also prevented inadvertent ISF-Peshmerga friendly fire incidents because both sides were firing from the same direction)...." (Wasser et al., 2021: 167-168)

Second, given the decision to begin in East Mosul, what drove the various strategic and tactical shifts comprising our bundled treatment? Here, too, the evidence supports

a variety of plausibly exogenous factors. We have already discussed how changes in the composition of ground forces—from the elite multi-ethnic CTS in East Mosul to lesser-trained and predominately Shia Federal Police in West Mosul—were necessitated by the CTS's severe losses (Amnesty International, 2017). In addition, the shift from house-to-house ground fighting with support from relatively precise munitions to greater reliance on unguided "wide-impact-area" explosives was influenced by the urban terrain of West Mosul, particularly its denser buildings and narrower streets in comparison with East Mosul (Baudot, 2020: 18, 48), which one of our interviewees described as "like Old Italy."[36] Finally, Tactical Directive 1 and other changes comprising the shift from "attrition" to "annihiliation" were partially reactive to IS's evolving strategy,[37] and influenced by lessons learned by Iraqi and Coalition commanders during the first phase of the battle (Awadi and Haus, 2017; Wasser et al., 2021: 83-84). Altogether, we do not find evidence that commanders were making decisions on the basis of any differences between East and West Mosul that are not captured in our controls.

Regarding our second assumption, we cannot definitively rule out the possibility of omitted variable bias, but we can test for balance across observable characteristics. Table 6 compares key observable variables across East and West Mosul by regressing our treatment indicator by key covariates and conducting a joint F test of orthogonality. The attitudinal indicators in Table 6 ask respondents to recall pre-treatment attitudes and experiences prior to IS's capture of Mosul in 2014. With the exception self-reported pre-IS household economic security, which was slightly higher in East Mosul, Table 6 shows that our covariates are well balanced across East and West with no other statistically significant differences, and all covariates are jointly insignificant at all but the 10% level.[38] Especially notable is

[36]The Appendix includes photographs of West and East Mosul street views taken during our field research. Table A6 and Section J show that East Mosul had a higher density of population and residential units.

[37]By the time the battle moved to West Mosul, IS's posture was much more defensive and desperate. After losing East Mosul, IS entrenched itself in the dense Old City of West Mosul, using civilians as human shields in the process. Sarah El Deeb, "Tense Standoff Spells Endgame for IS Militants in Syria," *Associated Press* (Feb. 18, 2019), https://apnews.com/article/350baf7eab724e40944a68ebac672052.

[38]In Appendix Section D Table A6, we show balance through a simple difference-in-means. Table A6 also shows individual *and* neighborhood level variables (e.g., urban layout and residential density), revealing that West Mosul is substantially more dense than East Mosul. As discussed in Section 3, shifts in military tactics and strategy were driven partially by the density of West Mosul, which hindered the kind of close-quarters urban warfare that characterized the fighting in East Mosul and necessitated the use of less precise and more destructive munitions. We have no reason to believe that urban density is correlated with civilian attitudes except through the treatment or through other observables for which we control. Similar to the exclusion restriction in a formal instrumental variables design, we cannot test this assumption directly. However, in Appendix F Table A10 and Table A11, we show results from regressing our outcome variables on building

that respondents in East and West Mosul report nearly identical levels of grievances with the Iraqi government prior to IS occupation in 2014; this suggests that differences in respondents' present attitudes toward Iraqi and Coalition armed forces are not merely reflecting pre-existing attitudes toward the Iraqi government that are unrelated to the battle for Mosul itself.[39] Overall, the balance in observables across East and West Mosul gives us confidence that our estimates are unlikely to be biased by unobservable or omitted variables and lends credibility to our identifying assumption (Altonji, Elder and Taber, 2005).

Table 6: Balance on Covariates

	Dependent variable:
	Treated (West Mosul)
Education	−0.010
	(0.015)
Age	0.001
	(0.001)
Pre-IS HH Income	−0.039***
	(0.014)
Identity	−0.009
	(0.013)
Vote	0.018
	(0.036)
Sharia	0.026
	(0.024)
Friday Prayer	−0.004
	(0.012)
IS Rule: Any Harm?	−0.078
	(0.069)
Iraq Gov: Any Grievances?	0.007
	(0.024)
IS Rule: Any IS Blame?	0.110
	(0.067)
IS Service Provisions	0.005
	(0.016)
Constant	0.582***
	(0.125)
Observations	932
Adjusted R^2	0.008
F Statistic	1.663* (df = 11; 920)
Note:	*p<0.1; **p<0.05; ***p<0.01

density. The absence of a significant relationship in either side of the city lends further credibility to our assumption that urban density does not affect civilian attitudes except through the treatment.

[39] Any differences in pre-existing attitudes toward the Iraqi government could also cast doubt on the exogeneity of the bundled treatment since military planners may have considered the likelihood of civilian support or opposition. However, we find no statistically significant differences in pre-existing grievances (as measured by questions about government corruption and negative experiences with police and other institutions), which increases our confidence in the exogeneity of the bundled treatment.

7 Discussion

Our mixed methods approach yields strong evidence that the Coalition's shift in strategy from "annihilation" to "attrition"—including changes in force composition, tactics and weaponry, and rules of engagement—was associated with lower levels of perceived military legitimacy of counter-insurgent forces in West versus East Mosul. We find that this effect persists even after conditioning on personal exposure to harm, suggesting that civilians' attitudes towards combatants are driven not just by the physical and material harms caused by war, but also by their perceptions of *how* armed forces conduct themselves, including the extent to which they exercise due care in their efforts to minimize civilian harm, and *why* armed forces fight (that is, whether military objectives are just or unjust). In this section, We discuss how our study extends the literature on military legitimacy and civilian support for armed actors. We suggest potential areas for future research, and discuss implications for law and policy.

Our findings suggest that the process through which civilians form perceptions of military legitimacy is more complicated than previous literature suggests. Many accounts of civil war and counterinsurgency characterize civilian support for warring parties as fundamentally rivalrous (Boot, 2013; Horowitz, 1985; Berman, Shapiro and Felter, 2011). We challenge this zero-sum thinking. While fundamentally contextual and affected by the actions of insurgents, counterinsurgents' military legitimacy ultimately depends on the legal and moral status of their own conduct. Concretely, that civilians perceive a counterinsurgent force as legitimate does not imply that they perceive the insurgent force as illegitimate, and *vice versa*. In other words, counterinsurgency is not simply a zero-sum game between combatants engaged in a tug-of-war for the hearts and minds of civilians whose only choice is to support one side or the other. This aligns with a growing literature on civilians' agency and their diverse repertoires of "survival strategies" that do not necessitate choosing one side over another, including "fence-sitting" (Lyall and Wilson, 2009), migration (Schon, 2020), and hedging against uncertainty about the eventual outcome by "double-dealing" (Kalyvas, 2006: 228).

In addition to highlighting the importance of civilian agency, our findings demonstrate that civilians account for context and differentiate between just and unjust harms. Prior research has shown that not all collateral damage is equally wrong or blameworthy in the eyes of civilians. Dill (2019), for example, finds that Afghan civilians blamed the Coalition more for causing harms that they believed were "avoidable" than for harms that were "necessary."

Our quantitative results are consistent with this dynamic, and our qualitative interviews further suggest that many Moslawis viewed collateral damage in East Mosul as more justified than damage in West Mosul.[40] As one interviewee put it, "there is no such thing as a harmless war,"[41] but not all harm is created equal. In particular, several interviewees believed that much of the harm in West Mosul could have been avoided if Coalition had allowed IS to retreat into the desert rather than trapping them in the Old City, and that the defeat of IS "was not worth" the destruction it caused.[42] These findings are consistent with a nascent literature showing a resonance between international legal theory—including the foundational concepts of just cause and just conduct—and the experiences and attitudes of civilians (Dill and Schubiger, 2021).

While our paper is not intended to be prescriptive, our findings suggest some patterns and behaviors that tend to promote or undermine military legitimacy. Our interviewees, in addition to highlighting what they perceived as excessive airstrikes and other wide-impact-area munitions in West Mosul, also observed significant differences in the conduct, professionalism, and attitudes of different armed forces. Several singled out the CTS as displaying particular bravery, compassion, and respect in their efforts to protect civilians.[43] Echoing the literature showing that community-oriented policing can improve police legitimacy in domestic law enforcement (e.g., Peyton, Sierra-Arévalo and Rand, 2019), interview subjects specifically cited the Golden Division's ethnic diversity and positive relationship with the community.[44]

Finally, our research also has important implications for laws and policies that seek to regulate warfare and protect civilians. Despite the Coalition's claim that the battle for Mosul was "the most precise campaign in the history of warfare,"[45] the operation had

[40]Excerpts from Interviews A.1.3, A.1.4, A.1.7, A.1.8 in the Appendix support these distinctions between avoidable and unavoidable harm.

[41]Interview with resident of West Mosul in August 2023 (52-year-old male).

[42]Interviews A.1.4, A.1.7, and A.1.8. One Iraqi military commander expressed the same regret in 2018: "Looking back ... we should have let ISIS escape." Wilson Fache, "How eliminating the 'kill box' turned Mosul into a meat-grinder, *The National* (Jul. 10, 2018), https://www.thenationalnews.com/world/mena/how-eliminating-the-kill-box-turned-mosul-into-a-meat-grinder-1.748590.

[43]E.g., interviews A.1.3, A.1.4, A.1.6, and A.1.7.

[44]Interviewee A.1.3 observed, "The Golden Brigade was better [than the Federal Police because they] were very mixed in terms of ethnicity." Interviewee A.1.6 expressed high trust in the CTS because "They knew how we were living, they knew this was our land and they knew our people."

[45]Lt. Gen. Stephen J. Townsend, "Remarks by General Townsend in a media availability in Baghdad, Iraq," *U.S. Department of Defense* (Jul. 11, 2017), https://www.defense.gov/News/Transcripts/Transcript/Article/1244058/

devastating consequences for civilians, who had already suffered enormously from more than three years of IS's brutal rule. While many aspects of the battle for Mosul were driven by operational realities and conditions on the ground—including depleted troops and spatial and architectural features of West Mosul that did not lend themselves to the use of precise weapons—the heavier use of airstrikes in West Mosul also reflects a longer-term shift in U.S. military strategy away from "boots on the ground," motivated in part by backlash against American casualties during the wars in Afghanistan and Iraq. Of course U.S. political and military leaders should seek to minimize casualties in war, but there are concerns that combatant casualty aversion can undermine civilian protection when these two objectives conflict (Kempf, 2018: 48). Our finding that the shift from "attrition" to "annihiliation" was associated with a dramatic increase in civilian harm and more negative attitudes toward U.S. and Iraqi forces suggests that there are strong humanitarian, strategic, and international law reasons to redistribute some of the cost of air wars away from civilians, even though this will necessarily increase the costs to combatants.

8 Conclusion

This research generates more questions than it answers, and we hope that other scholars will take up our invitation to study the microfoundations of military legitimacy in contexts beyond Iraq and across different types of insurgencies and conventional wars. The Battle of Mosul is already having a profound effect on military doctrine, education, and training, as evidenced by numerous "lessons learned" documents and course materials (Arnold and Fiore, 2019) with implications for the complex urban warfare that is unfolding in Gaza[46] and Ukraine[47] at the time of writing. An important next step in this research agenda is to bridge insights from micro-level case studies with macro-level patterns to build generalizable

remarks-by-general-townsend-in-a-media-availability-in-baghdad-iraq/.

[46]Spencer, John. "These Are the Challenges Awaiting Israeli Ground Forces in Gaza," *Modern War Institute*, (Oct. 11, 2023), https://mwi.westpoint.edu/these-are-the-challenges-awaiting-israeli-ground-forces-in-gaza/.; David E. Sanger and Peter Baker "Biden Faces Risks in Wartime Visit to Israel, " *New York Times* (Oct. 16, 2023), https://www.nytimes.com/2023/10/16/us/politics/biden-israel-trip.html (noting that the U.S. military is sharing lessons from the Battle of Mosul with their Israeli counterparts).

[47]Todd South, "Urban combat veterans share lessons for Ukraine fight," *Military Times* (Mar. 11, 2022), https://www.militarytimes.com/flashpoints/ukraine/2022/03/11/urban-combat-veterans-share-lessons-for-ukraine-fight/ ("The battle of Mosul essentially annihilated the city. Many fear such a future for Ukraine's cities."

knowledge (Balcells and Justino, 2014). Although our research design does not allow us to disaggregate the components of our bundled treatment, future research should explore the individual causal effects of these and other shifts in personnel, tactics, and technology on civilian attitudes and behaviors. Survey experiments are one possible tool for doing so.

However, we also insist on the importance of studying critically important cases like the Battle of Mosul that are worthy of "mere description" in and of themselves (Gerring, 2012), regardless of our ability to precisely identify causal effects. The human and social consequences of the battle of Mosul are of undeniable importance and speak to an emerging literature on the "reverberating effects" (Waxman et al., 2000) and "cumulative harm" (Lubell and Cohen, 2020) caused by war—referring to the indirect "knock-on" effects on the surrounding economy, environment, and other essential services.

Our findings demonstrate the limitations of narrow measures of harm (e.g., fatalities) and of behavioral indicators that are commonly used as indirect proxies for civilian attitudes (e.g., calls to anonymous tip lines or insurgent violence) in the absence of direct evidence from interviews, surveys, oral histories, or other primary source data. The challenge of understanding the complex effects of civilian harm calls for rigorous and ethical research designs that go beyond existing event-based conflict datasets to triangulate between multiple sources of qualitative and quantitative data including interviews, representative surveys, and satellite imagery as we have tried to do in this study. While direct attitudinal data presents numerous ethical, security, and logistical challenges, these concerns can be mitigated with careful and conscientious field research. Our mixed-methods research design is motivated by our view that scholars who study questions with life-or-death consequences for civilians—such as the effects of collateral damage on perceptions of military legitimacy—owe it to civilians to give them an opportunity to answer those questions in their own words (Dill, 2019).

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Appendix [For Online Publication Only]

Table of Contents

A Interviews and Field Research in Mosul

This study began with in-depth interviews with residents of Mosul conducted over the course of more than two years of field research starting in 2016. Anonymous University's Institutional Review Board (IRB) approved these interviews on June 24, 2015 (Portocol #Anonymous). One of the authors conducted all interviews in standard Arabic with occasional help from local research assistants in interpreting the Iraqi dialect. Table A1 summarizes key demographic attributes of a subset of 30 interviews with residents of Mosul that informed the design of the survey questionnaire and our analysis of the quantitative data. All interviewees are identified by a number to protect their anonymity. As an additional precaution to ensure anonymity, we specify the month and year but not the day on which the interview was conducted. Interviews were conducted in Mosul as well as in other towns, cities, and IDP camps to which Moslawis fled during the battle.

The research team returned to Mosul in August 2023 to conduct follow-up interviews and observations of street and building density in seven of the same neighborhoods included in the 2018 survey: four randomly selected neighborhoods from the list of previously surveyed neighborhoods on the west side of the river (Farouk, Shiah, Amil, and Hay Al Mansur) and three on the east (Jazara, Mazari, Karamah), resulting in eight interviews. These interviews were approved by Anonymous University's Institutional Review Board (IRB) on July 22, 2023 (Portocol #Anonymous). Figure A1 shows the approximate areas the team visited and Table A2 details the demographics of interviewees.

Table A1: Pre-Survey Interviews with Residents of Mosul: 2017

#	Approximate Age	Gender	Occupation	Interview Date	Interview Location
1	40s	Male	School administrator	4/2017	Mosul
2	40s	Female	School administrator	4/2017	Mosul
3	40s	Male	School administrator	4/2017	Mosul
4	50s	Male	Teacher	4/2017	Mosul
5	20s	Male	Teacher	4/2017	Mosul
6	30s	Male	Teacher	4/2017	Mosul
7	40s	Female	Teacher	4/2017	Mosul
8	30s	Female	Teacher	4/2017	Mosul
9	40s	Female	Housewife	4/2017	Mosul
10	60s	Male	Butcher	4/2017	Mosul
11	30s	Male	Factory worker	4/2017	Mosul
12	20s	Female	Student	4/2017	Mosul
13	30s	Male	Municipal worker	4/2017	Mosul
14	60s	Male	Doctor	4/2017	Mosul
15	30s	Male	Hospital administrator	4/2017	Mosul
16	30s	Male	Accountant	4/2017	Mosul
17	40s	Male	Journalist	4/2017	Mosul
18	20s	Female	Store clerk	4/2017	Mosul
19	40s	Male	Butcher	4/2017	Mosul
20	50s	Male	Tailor	4/2017	Mosul
21	30s	Male	Car dealer	4/2017	Mosul
22	30s	Male	Store clerk	4/2017	Mosul
23	30s	Male	Store clerk	4/2017	Mosul
24	30s	Male	Food services	4/2017	Mosul
25	20s	Male	Food services	4/2017	Mosul
26	30s	Male	Truck driver	4/2017	Mosul
27	50s	Female	Housewife	12/2017	IDP camp, Makhmour
28	30s	Female	Housewife	12/2017	IDP camp, Makhmour
29	30s	Female	Housewife	12/2017	IDP camp, Makhmour
30	40s	Male	Retired military	12/2017	IDP camp, Makhmour

Table A2: Interviews with Residents of Mosul: August 2023

#	Approximate Age	Gender	Occupation	Interview Date	Interview Location
1	60s	Female	Shop Owner	8/2023	West Mosul
2	50s	Male	Shop Owner	8/2023	West Mosul
3	60s	Male	Shop Owner	8/2023	West Mosul
4	30s	Male	Shop Owner	8/2023	West Mosul
5	60s	Male	Retired Military	8/2023	West Mosul
6	30s	Male	Shop Owner	8/2023	West Mosul
7	60s	Male	Shop Owner	8/2023	East Mosul
8	50s	Male	Retired Military	8/2023	East Mosul

Figure A1: Approximate Neighborhood Locations of Follow-Up Field Research: August 2023

A.1 Abridged Quotes from Qualitative Interviews

This section provides abridged excerpts from our final round of interviews conducted in August 2023 to provide more context for the brief quotations included in the article. We do not provide full transcripts because of the risk that we might unintentionally disclose identifying information, among other ethical and security concerns noted in the Final Report of the Working Group on Qualitative Transparency Deliberations (Jacobs et al., 2021: 179).

A.1.1 Interview 1

> "This area [West Mosul] was IS's last stronghold because it has narrow alleys and the houses are close together and there were basements where they could hide from the airplanes, and the tanks could not enter. That's why there was so much destruction here, because it was so confusing to the army. They didn't know who was IS or civilians and that's why they were bombing everywhere ...

”

A.1.2 Interview 2

“They were randomly bombing, there were no IS fighters here... We did not expect the bombings because there were no IS headquarters or fighters near our house. I kept thinking: Why was our house bombed if they [the Coalition] had informants on the ground? ... There were no IS fighters nearby. ... They claimed they were professionals, they had drones, they said they knew where the [IS] headquarters were, where the fighters were, where the civilians were. But they didn’t know anything.”

A.1.3 Interview 3

“The Federal Police were the ones who were harming us and bombing us. But the Golden Division were the ones who were helping us ... My husband has Parkinsons disease and he fell while we were trying to flee. A Golden Division soldier picked us up with his own car and took us all the way to the hospital ... The Golden Division was much better [than the Federal Police] ... they [the CTS] very mixed in terms of ethnicity. The Federal Police were mostly Shia Muslims. The Federal Police were looting and stealing a lot from civilians and they were watching other people stealing and doing nothing ... They [the Coalition] were capable of minimizing the damage but they did not. They destroyed the whole minaret [referring to a historic mosque] for just a few IS fighters.”

A.1.4 Interview 4

“They [the CTS] ... caused very little damage because they used snipers and ... some of the same techniques as IS, moving through holes between houses, which allowed them to liberate neighborhoods from the ground not using airstrikes ... There was no looting in this neighborhood because the Golden Division was here, but I did hear about looting in other neighborhoods ... The streets were wider

in the east side, so IS could not easily fight back and resist. It was easier for the Iraqi forces to liberate the east first because it was so open. But in West Mosul, the narrow streets and alleys are not wide enough for tanks and Humvees to enter ... The Army made a big mistake by leading them to their own rather then leading them toward the desert. They led them to Old City [in West Mosul] and everyone complains about this. They could have led them to the desert with much less damage."

A.1.5 Interview 5

"The east was open, which made it easy to liberate because the roads were wide enough for tanks and Humvees. In the west, the streets were very narrow and even if they [the Iraqi forces and vehicles] could enter through streets, IS was throwing grenades from the rooftops so it was not easy for them to move."

A.1.6 Interview 6

"I believe the targeting was random. They didn't know who was IS and who was a civilian because IS was hiding among civilians ... The Golden Division was better trained and more effective. Both forces were professional [Golden Division and Federal Police] but there are always bad apples in every force, and there were more bad apples in the Federal Police ... Because the Iraqi forces were from Iraq, they were more careful with civilians than the U.S. If I were called up to fight to liberate Syria or Jordan, I would be less passionate and less careful with civilians than if I were fighting to defend my own people in my own country [Iraq]. The Federal Police were mostly Shia from the south of Iraq. The people of Mosul did not know them and did not trust them. The Golden Division, on the other hand, knew how we were living, they knew that this was our land, and they knew our people."

A.1.7 Interview 7

"They were getting information from informants on the ground so they could track targets that were moving, but I don't understand why they destroyed hospitals ... The Golden Division were very good...The Old City [in West Mosul] is like Old Italy with very narrow streets. It would have been very difficult to start the battle in the west because all of the houses are connected to each other from the Old City all the way to the stadium and hospital. The streets are very tight and there would have been many causalities. That's why they started in the east, because they had better visuals and wider streets and could more effectively start the fight ... No it wasn't worth it [the defeat of IS was not worth the collateral damage it caused]. They destroyed the infrastructure, the schools, the hospitals, government institutions, and services just to kill a few thousand IS fighters ... It was not worth all of this damage. Most importantly, you cannot replace a human soul. There were way too many causalities and many more in the west than in the east. Too many houses collapsed on civilians, and there are still bones in the rubble."

A.1.8 Interview 8

"I served in the military [previously, before 2003] and I think the airstrikes were too much ... It was kind of wild, frankly. IS fighters were concentrated on that side of the city [West Mosul]. The American air strikes were too wild. They said they wanted to save the civilians, but they caused too many causalities. All that force was not needed ... they used too much force, of which only 10 percent was needed to defeat IS and the remainder was all excessive ... Of course it would have been better to let IS escape into the desert."

A.2 Pictures of Select Neighborhoods

Figure A2: Pictures of West Mosul Neighborhood: Farouk

Figure A3: Pictures of West Mosul Neighborhood: Shiah

Figure A4: Pictures of West Mosul Neighborhood: Amil

Figure A5: Pictures of West Mosul Neighborhood: Hay Al Mansur

Figure A6: Pictures of East Mosul Neighborhood: Hay Al Mansur

Figure A7: Pictures of East Mosul Neighborhood: Mazari

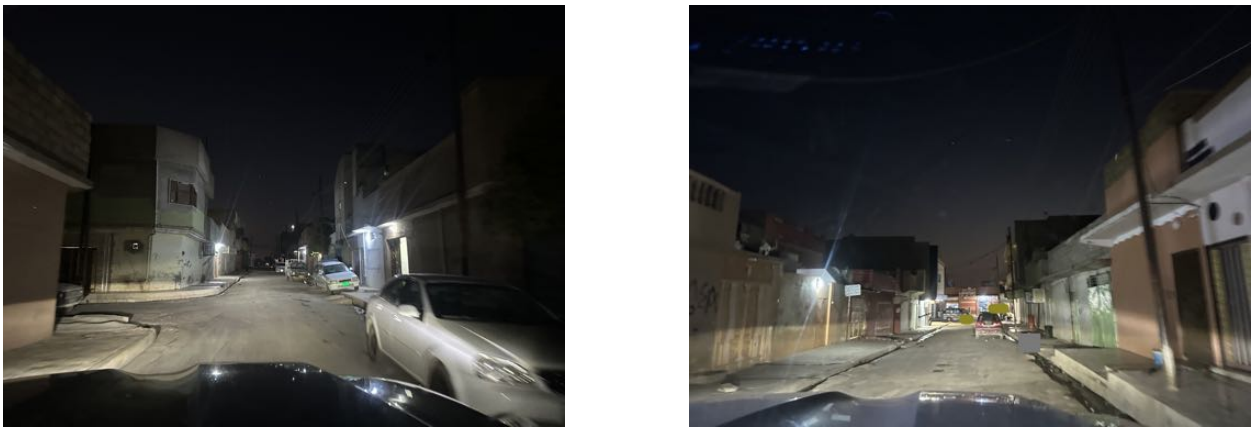


Figure A8: Pictures of East Mosul Neighborhood: Karamah

B Household Survey Methodology & Implementation

B.1 Random Sampling Procedure

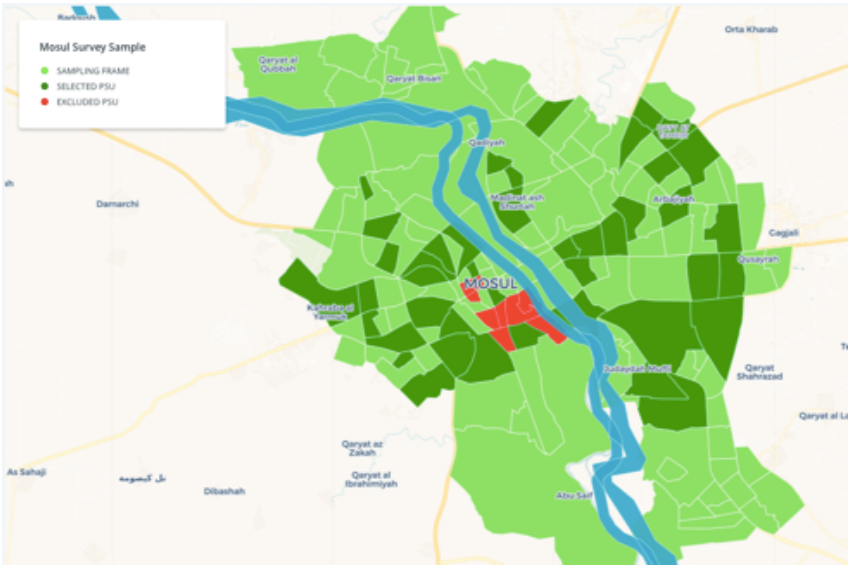
The random sample was drawn from 47 primary sampling units (PSUs) based on census blocks that were randomly selected from a list of all 209 census blocks in Mosul. These blocks have names corresponding to different neighborhoods. Enumerators conducted 30 interviews within each PSU.[48] Within each PSU, the sampling team randomly selected streets, within which enumerators selected households using a random-walk procedure. Enumerators counted the number of houses on each street and divided by seven to determine the interval of houses skipped between interviews. The tablets were programmed with a Kish grid (Kish, 1949) that randomly selected a respondent from the pool of adult household members.

[48]It was not feasible to implement truly random sampling using probability proportional to size due to conflict-related changes in demography that make accurate estimates of the true populations of the PSUs impossible. For this reason, we assigned a consistent number of interviews to each PSU.

B.2 Map of the Sampling Frame

Figure 1 shows the sampling frame of 209 Primary Sampling Units (PSUs) in light green and the 47 randomly selected PSUs in dark green. Eight PSUs in West Mosul were excluded from the sampling frame (marked in red) because these areas experienced severe collateral damage during the recent military operation and were largely uninhabited.

Figure A9: Map of the Sampling Frame



B.3 Enumerator Training and Gender Protocol

We worked with a respected Iraqi survey firm, the Independent Institute for Administration and Civil Society Studies (IIACSS), to train a team of 10 Iraqi enumerators from Mosul who then conducted the door-to-door survey with tablets. Revkin conducted the training in Arabic and supervised translation of the questionnaire and eventual data in both directions (English to Arabic and Arabic to English). Given that many Iraqis have religious and cultural preferences for gender segregation, the team included male and female enumerators in order to accommodate any respondents who requested to be interviewed by someone of the same gender. Enumerators walked door-to-door individually, if a female or male

respondent requested to be interviewed by an enumerator of the same gender, the opposite-gender enumerator called a colleague to conduct the interview.

B.4 Response Rate and Quality Control

As noted in the article, Mosul's current population is almost entirely Sunni Arab due to massive out-migration by other religious and ethnic groups who were persecuted by IS. Through the filter questions that were designed to limit the sample to Sunni Arab Iraqis who were living in Mosul in June 2014, only 4 people were excluded for not being Iraqi, 4 were excluded for not being Sunni Arab, and 9 were excluded because they were not living in Mosul in June 2014. The refusal rate was 15%. After piloting the survey, the research team agreed that the survey should take at least 25 minutes to complete, to ensure that all questions were read thoroughly and slowly. Six surveys were dropped from the final dataset because they were completed in less than 25 minutes.

C Main Results: Full Tables

Table A3: OLS Regression Results: Opinions of An Actors Tolerance for Civilian Harm

	Dependent variable:				
	US: Kill Civilians?	CTS: Kill Civilians?	Iraq Army: Kill Civilians?	Iraq Police: Kill Civilians?	PMF: Kill Civilians?
	(1)	(2)	(3)	(4)	(5)
Treated (West Mosul)	0.147	0.138***	0.195***	0.214***	0.124**
	(0.094)	(0.052)	(0.053)	(0.064)	(0.049)
Education	0.051*	0.023	0.037**	0.066***	0.038**
	(0.028)	(0.016)	(0.017)	(0.019)	(0.019)
Age	0.004	0.004***	0.002	0.002	0.002
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Pre-IS HH Income	−0.096**	−0.084***	−0.068***	−0.079***	−0.107***
	(0.043)	(0.021)	(0.023)	(0.026)	(0.026)
Identity	−0.035	0.010	0.017	0.027	0.026
	(0.030)	(0.016)	(0.019)	(0.020)	(0.019)
Vote	−0.127	0.008	−0.001	−0.082	−0.098
	(0.092)	(0.042)	(0.051)	(0.061)	(0.068)
Sharia	0.076	−0.056	−0.042	−0.017	0.014
	(0.057)	(0.041)	(0.043)	(0.042)	(0.042)
Friday Prayer	−0.124***	−0.043***	−0.045***	−0.054***	−0.049***
	(0.032)	(0.014)	(0.015)	(0.014)	(0.016)
IS Rule: Any Harm?	0.423***	0.035	0.086	0.190*	0.056
	(0.152)	(0.089)	(0.084)	(0.099)	(0.112)
Iraq Gov: Any Grievances?	0.141**	0.043	0.091***	0.139***	0.121***
	(0.059)	(0.028)	(0.026)	(0.036)	(0.033)
IS Rule: Any IS Blame?	−0.686***	−0.036	−0.014	−0.165	−0.045
	(0.159)	(0.103)	(0.097)	(0.106)	(0.125)
IS Service Provisions	0.051	0.009	−0.026	−0.033*	0.005
	(0.034)	(0.017)	(0.017)	(0.019)	(0.024)
Population Density	−17.574	−9.102	−9.154	−8.232	−3.662
	(13.066)	(7.637)	(8.175)	(8.098)	(7.268)
Road Density	−11.113	−0.571	4.461	0.189	−0.944
	(10.743)	(6.844)	(6.823)	(7.502)	(5.530)
Residential Unit Density	153.389*	54.605	52.834	66.209	4.599
	(83.951)	(52.321)	(58.766)	(57.114)	(49.521)
Constant	3.388***	1.446***	1.272***	1.346***	1.576***
	(0.417)	(0.180)	(0.184)	(0.192)	(0.204)
Uncoditional Mean	2.995	1.326	1.357	1.42	1.44
Individual Controls	Yes	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes	Yes
Observations	917	923	921	923	920
Adjusted R^2	0.078	0.048	0.058	0.081	0.050
F Statistic	6.170*** (df = 15; 901)	4.128*** (df = 15; 907)	4.799*** (df = 15; 905)	6.409*** (df = 15; 907)	4.233*** (df = 15; 904)

Note: *p<0.1; **p<0.05; ***p<0.01
HC1 robust, neighboorhood-clustered standard errors

Table A4: OLS Regression Results: Perceptions of Iraqi Army's Likelihood of Killing Civilians (Controlling for Harm)

	Dependent variable:			
	Army: Kill Civilians?	Army: Kill Civilians?	Army: Kill Civilians?	Army: Kill Civilians?
	(1)	(2)	(3)	(4)
Treated (West Mosul)	0.198***	0.195***	0.169***	0.172***
	(0.053)	(0.052)	(0.049)	(0.049)
Reported: House Damage	−0.021			−0.032
	(0.048)			(0.048)
Reported: HH Death or Injury		0.007		−0.003
		(0.049)		(0.048)
Detected: House Damage (10m)			0.161**	0.166**
			(0.066)	(0.069)
Education	0.037**	0.037**	0.039**	0.039**
	(0.017)	(0.017)	(0.017)	(0.017)
Age	0.002	0.002	0.002*	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)
Pre-IS HH Income	−0.068***	−0.068***	−0.069***	−0.068***
	(0.022)	(0.023)	(0.023)	(0.023)
Identity	0.017	0.017	0.016	0.015
	(0.019)	(0.019)	(0.019)	(0.020)
Vote	−0.0002	−0.0005	0.002	0.002
	(0.051)	(0.051)	(0.049)	(0.049)
Sharia	−0.042	−0.042	−0.039	−0.039
	(0.043)	(0.043)	(0.043)	(0.043)
Friday Prayer	−0.045***	−0.045***	−0.046***	−0.045***
	(0.015)	(0.015)	(0.015)	(0.015)
IS Rule: Any Harm?	0.088	0.086	0.087	0.090
	(0.083)	(0.084)	(0.085)	(0.084)
Iraq Gov: Any Grievances?	0.090***	0.091***	0.095***	0.094***
	(0.027)	(0.026)	(0.026)	(0.027)
IS Rule: Any IS Blame?	−0.012	−0.014	−0.012	−0.009
	(0.097)	(0.096)	(0.097)	(0.097)
IS Service Provisions	−0.027	−0.026	−0.025	−0.026
	(0.018)	(0.017)	(0.017)	(0.018)
Population Density	−9.102	−9.137	−8.867	−8.788
	(8.185)	(8.172)	(8.203)	(8.209)
Road Density	4.552	4.439	2.973	3.080
	(6.773)	(6.804)	(6.350)	(6.296)
Residential Unit Density	52.595	52.585	48.668	48.314
	(58.669)	(58.787)	(58.221)	(58.053)
Constant	1.284***	1.272***	1.292***	1.310***
	(0.193)	(0.184)	(0.178)	(0.184)
Uncoditional Mean	1.357	1.357	1.357	1.357
Individual Controls	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes
Observations	921	921	921	921
Adjusted R^2	0.057	0.057	0.063	0.062
F Statistic	4.505*** (df = 16; 904)	4.495*** (df = 16; 904)	4.877*** (df = 16; 904)	4.350*** (df = 18; 902)

Note: *p<0.1; **p<0.05; ***p<0.01
HC1 robust, neighboorhood-clustered standard errors

Table A5: OLS Regression Results: Attribution of Blame for Harm

	Dependent variable:				
	IS Blame: House Damage	IS Blame:HH Injured	IS Blame:HH Killed	IS Blame:HH Injury or Killed	IS Blame:Any Harm
	(1)	(2)	(3)	(4)	(5)
Treated (West Mosul)	−0.069*	−0.157***	−0.106	−0.111**	−0.039
	(0.038)	(0.053)	(0.083)	(0.047)	(0.031)
Education	0.005	0.021	0.006	0.013	0.002
	(0.012)	(0.013)	(0.023)	(0.012)	(0.011)
Age	−0.002	−0.003	0.0003	−0.002	−0.002*
	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
Pre-IS HH Income	−0.007	0.011	0.015	0.007	0.010
	(0.016)	(0.026)	(0.035)	(0.024)	(0.016)
Identity	−0.022*	−0.001	−0.007	0.014	−0.010
	(0.012)	(0.015)	(0.015)	(0.012)	(0.011)
Vote	−0.013	0.066	0.116	0.054	0.002
	(0.039)	(0.069)	(0.078)	(0.060)	(0.038)
Sharia	0.027	0.080	0.062	0.084*	0.051**
	(0.028)	(0.051)	(0.057)	(0.046)	(0.024)
Friday Prayer	0.010	0.006	0.032	0.015	0.014
	(0.010)	(0.017)	(0.020)	(0.011)	(0.009)
IS Rule: Any Harm?	−0.297***	−0.066	−0.178	−0.195	−0.251***
	(0.094)	(0.132)	(0.196)	(0.128)	(0.085)
Iraq Gov: Any Grievances?	−0.050*	−0.059*	−0.045**	−0.043*	−0.020
	(0.028)	(0.036)	(0.022)	(0.023)	(0.022)
IS Rule: Any IS Blame?	0.431***	0.120	0.425***	0.308***	0.378***
	(0.087)	(0.137)	(0.161)	(0.114)	(0.080)
IS Service Provisions	0.012	−0.004	−0.008	−0.028*	−0.002
	(0.012)	(0.017)	(0.013)	(0.016)	(0.011)
Population Density	−2.254	13.778**	−1.923	8.021	−1.070
	(5.125)	(5.585)	(6.469)	(5.021)	(4.945)
Road Density	4.474	−4.859	−6.394	−6.809	5.586
	(4.207)	(4.031)	(8.215)	(4.663)	(3.532)
Residential Unit Density	−9.285	−66.158	31.962	−30.148	−5.334
	(31.962)	(40.834)	(54.959)	(35.913)	(28.124)
Constant	0.809***	0.785***	0.667**	0.811***	0.696***
	(0.105)	(0.219)	(0.259)	(0.188)	(0.090)
Uncoditional Mean	0.789	0.817	0.833	0.844	0.837
Individual Controls	Yes	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes	Yes
Observations	672	235	138	282	719
Adjusted R^2	0.097	0.073	0.114	0.088	0.086
F Statistic	5.788*** (df = 15; 656)	2.230*** (df = 15; 219)	2.177** (df = 15; 122)	2.811*** (df = 15; 266)	5.487*** (df = 15; 703)

Note: *p<0.1; **p<0.05; ***p<0.01
HC1 robust, neighboorhood-clustered standard errors

D Balance: Difference-in-Means

Table A6: Balance on Covariates

Variable	West Mosul (642)	East Mosul (591)	Difference-In-Means
Education: None	0.174	0.153	0.021
	(0.38)	(0.361)	
Education: Elementary	0.421	0.396	0.025
	(0.494)	(0.49)	
Education: Primary	0.121	0.162	-0.041.
	(0.326)	(0.369)	
Education: Secondary	0.155	0.146	0.009
	(0.362)	(0.354)	
Education: Mid-level Diploma	0.05	0.047	0.003
	(0.218)	(0.213)	
Education: Bachelors	0.077	0.092	-0.016
	(0.266)	(0.29)	
Education: Masters	0.002	0.002	0
	(0.044)	(0.047)	
Age	37.87	36.371	1.499
	(14.387)	(13.985)	
Income: Significant Difficulties	0.38	0.259	0.121***
	(0.486)	(0.439)	
Income: Some Difficulties	0.19	0.194	-0.004
	(0.393)	(0.396)	
Income: No Difficulties	0.228	0.338	-0.109***
	(0.42)	(0.474)	
Income: Can Save	0.202	0.209	-0.008
	(0.402)	(0.407)	
Identity: Iraqi	0.494	0.479	0.016
	(0.5)	(0.5)	
Identity: Muslim	0.398	0.398	0.001
	(0.49)	(0.49)	
Voted	0.708	0.693	0.015
	(0.455)	(0.462)	
Sharia Law Preference	1.505	1.457	0.048
	(0.582)	(0.61)	
Friday Prayer (per month)	2.484	2.601	-0.118
	(1.661)	(1.66)	
Harms during IS Rule: House Damage	0.29	0.261	0.029
	(0.454)	(0.439)	
Harms during IS Rule: House Confiscated	0.116	0.137	-0.021
	(0.32)	(0.344)	
Harms during IS Rule: Household Injured	0.108	0.121	-0.014
	(0.31)	(0.327)	
Harms during IS Rule: Household Killed	0.108	0.063	0.045*
	(0.31)	(0.243)	
Harms during IS Rule: IS Blame?	0.271	0.21	0.061*
	(0.445)	(0.408)	
IS Services: Electricity Fees	0.413	0.354	0.06.
	(0.493)	(0.479)	
IS Services: Water Fees	0.448	0.424	0.024
	(0.498)	(0.495)	
IS Services: Zakat	0.326	0.349	-0.024
	(0.469)	(0.477)	
Insulted by Iraqi Police	0.269	0.235	0.034
	(0.444)	(0.424)	
Arrested	0.052	0.067	-0.016
	(0.222)	(0.251)	
Sunni Discrimination	0.125	0.124	0.001
	(0.33)	(0.33)	
Protest Participation	0.019	0.036	-0.017
	(0.137)	(0.186)	
Population Density	0.018	0.014	0.004***
	(0.008)	(0.01)	
Road Density	0.024	0.024	0
	(0.004)	(0.005)	
Residential Unit Density	0.002	0.001	0.001***
	(0.001)	(0.001)	

E First Stage Validation: Comparing Battle Experience between East and West Mosul

Table A7: OLS Regression Results: Self-Reported and Satellite-Detected Experiences of Harm During Battle for Mosul

	Dependent variable:					
	Reported: House Damage	Reported: HH Injury	Reported: HH Killed	Reported: HH Injury or Killed	Reported: Any Harm	Detected: House Damage (10m)
	(1)	(2)	(3)	(4)	(5)	(6)
Treated (West Mosul)	0.131***	0.036	0.096***	0.072*	0.137***	0.171***
	(0.050)	(0.039)	(0.025)	(0.039)	(0.044)	(0.062)
Education	−0.014	−0.004	0.003	−0.001	−0.008	−0.013**
	(0.010)	(0.011)	(0.008)	(0.011)	(0.009)	(0.005)
Age	−0.001	0.0001	0.0002	0.0001	−0.001	−0.0004
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Pre-IS HH Income	0.015	0.016	0.017	0.018	0.015	0.001
	(0.011)	(0.011)	(0.012)	(0.013)	(0.011)	(0.010)
Identity	−0.011	0.018*	0.004	0.011	−0.011	0.010
	(0.011)	(0.010)	(0.010)	(0.011)	(0.010)	(0.010)
Vote	0.020	0.018	−0.023	−0.017	0.009	−0.018
	(0.036)	(0.034)	(0.024)	(0.030)	(0.025)	(0.043)
Sharia	−0.021	0.016	0.034	0.022	−0.017	−0.015
	(0.026)	(0.022)	(0.021)	(0.025)	(0.025)	(0.023)
Friday Prayer	0.015	−0.007	−0.003	−0.007	0.009	0.005
	(0.009)	(0.007)	(0.006)	(0.008)	(0.008)	(0.007)
IS Rule: Any Harm?	0.114**	−0.006	0.066	0.011	0.111**	−0.005
	(0.054)	(0.042)	(0.048)	(0.048)	(0.053)	(0.029)
Iraq Gov: Any Grievances?	−0.041*	0.023	0.011	0.029	−0.027	−0.021*
	(0.022)	(0.017)	(0.016)	(0.018)	(0.021)	(0.011)
IS Rule: Any IS Blame?	0.077	0.104**	0.006	0.139***	0.123**	−0.002
	(0.055)	(0.052)	(0.038)	(0.051)	(0.058)	(0.040)
IS Service Provisions	−0.023*	0.013	0.004	0.010	−0.018	−0.004
	(0.013)	(0.011)	(0.009)	(0.011)	(0.013)	(0.006)
Population Density	1.981	−2.015	−2.784	−2.776	2.987	−1.513
	(4.725)	(2.524)	(2.053)	(2.528)	(4.140)	(5.815)
Road Density	4.156	1.600	1.043	1.328	2.437	9.269
	(5.177)	(3.926)	(3.406)	(4.270)	(4.352)	(6.417)
Residential Unit Density	−12.275	34.751*	25.426*	38.870**	−14.253	21.596
	(35.503)	(19.352)	(14.542)	(18.159)	(31.602)	(39.667)
Constant	0.574***	0.022	−0.059	0.066	0.609***	−0.127
	(0.147)	(0.100)	(0.117)	(0.121)	(0.121)	(0.131)
Uncoditional Mean	0.73	0.255	0.15	0.303	0.771	0.135
Observations	932	932	931	932	932	932
Adjusted R^2	0.062	0.017	0.027	0.032	0.086	0.096
F Statistic	5.074*** (df = 15; 916)	2.070*** (df = 15; 916)	2.692*** (df = 15; 915)	3.077*** (df = 15; 916)	6.873*** (df = 15; 916)	7.598*** (df = 15; 916)

Note: *p<0.1; **p<0.05; ***p<0.01
HC1 robust, neighboorhood-clustered standard errors

Table A8: OLS Regression Results: Reported Looting During Battle

	Dependent variable:			
	CTS: Looting?	Iraqi Army: Looting?	Iraqi Police: Looting?	PMF: Looting?
	(1)	(2)	(3)	(4)
Treated (West Mosul)	0.054***	0.055***	0.103***	0.027
	(0.019)	(0.019)	(0.030)	(0.031)
Education	0.003	0.018***	0.025***	0.029***
	(0.005)	(0.006)	(0.008)	(0.009)
Age	0.0001	0.001	−0.0003	−0.00005
	(0.0004)	(0.001)	(0.001)	(0.001)
Pre-IS HH Income	−0.004	−0.009	−0.002	−0.025*
	(0.006)	(0.009)	(0.014)	(0.013)
Identity	−0.001	−0.001	0.012	0.019**
	(0.006)	(0.010)	(0.011)	(0.009)
Vote	−0.005	−0.010	−0.013	−0.014
	(0.018)	(0.018)	(0.030)	(0.033)
Sharia	−0.025**	−0.005	0.045**	0.045*
	(0.011)	(0.017)	(0.018)	(0.026)
Friday Prayer	−0.008**	−0.012**	0.003	0.002
	(0.004)	(0.005)	(0.007)	(0.009)
IS Rule: Any Harm?	0.014	0.075**	0.058	0.083**
	(0.023)	(0.036)	(0.038)	(0.042)
Iraq Gov: Any Grievances?	0.011	0.038***	0.064***	0.076***
	(0.008)	(0.012)	(0.021)	(0.021)
IS Rule: Any IS Blame?	−0.040	−0.141***	−0.149***	−0.227***
	(0.032)	(0.045)	(0.046)	(0.050)
IS Service Provisions	0.001	0.001	−0.019	0.015
	(0.006)	(0.009)	(0.012)	(0.012)
Population Density	1.293	1.186	−2.806	−0.098
	(1.831)	(2.419)	(4.251)	(3.928)
Road Density	1.808	4.425*	0.743	1.998
	(2.097)	(2.472)	(3.070)	(3.406)
Residential Unit Density	−4.615	−9.293	23.009	−14.566
	(9.339)	(17.900)	(29.414)	(23.199)
Constant	0.026	−0.062	0.024	0.066
	(0.036)	(0.058)	(0.089)	(0.103)
Uncoditional Mean	0.051	0.092	0.225	0.231
Observations	924	924	924	923
Adjusted R^2	0.015	0.037	0.054	0.065
F Statistic	1.949** (df = 15; 908)	3.337*** (df = 15; 908)	4.508*** (df = 15; 908)	5.256*** (df = 15; 907)

Note: *p<0.1; **p<0.05; ***p<0.01
HC1 robust, neighboorhood-clustered standard errors

Table A9: Balance of Harm and Looting

Variable	West Mosul (642)	East Mosul (591)	Difference-In-Means
Reported: House Damage	0.787	0.658	0.129***
	(0.41)	(0.475)	
Reported: HH Injury	0.287	0.22	0.067*
	(0.453)	(0.415)	
Reported: HH Killed	0.2	0.092	0.107***
	(0.4)	(0.29)	
Reported: HH Injury or Killed	0.352	0.245	0.108***
	(0.478)	(0.431)	
Reported: Any Harm	0.835	0.694	0.141***
	(0.371)	(0.461)	
Detected: House Damage (10m)	0.195	0.027	0.168***
	(0.396)	(0.162)	
CTS: Looting?	0.077	0.021	0.057***
	(0.267)	(0.143)	
Iraqi Army: Looting?	0.116	0.064	0.051**
	(0.32)	(0.246)	
Iraqi Police: Looting?	0.274	0.168	0.106***
	(0.447)	(0.374)	
PMF: Looting?	0.234	0.225	0.009
	(0.424)	(0.418)	

F Exclusion of Geography

Table A10: Regressing Outcomes on Neighborhood Density in West Mosul

	Dependent variable:				
	US: Kill Civilians?	CTS: Kill Civilians?	Iraq Army: Kill Civilians?	Iraq Police: Kill Civilians?	PMF: Kill Civilians?
	(1)	(2)	(3)	(4)	(5)
Population Density	5.791	−3.830	−0.092	2.466	−4.093
	(5.661)	(3.733)	(4.849)	(5.545)	(4.862)
Constant	2.993***	1.484***	1.469***	1.496***	1.578***
	(0.090)	(0.098)	(0.099)	(0.100)	(0.083)
Observations	519	521	520	520	520
Adjusted R^2	−0.0004	−0.0001	−0.002	−0.001	−0.0003
F Statistic	0.797 (df = 1; 517)	0.931 (df = 1; 519)	0.0005 (df = 1; 518)	0.275 (df = 1; 518)	0.861 (df = 1; 518)

	Dependent variable:				
	US: Kill Civilians?	CTS: Kill Civilians?	Iraq Army: Kill Civilians?	Iraq Police: Kill Civilians?	PMF: Kill Civilians?
	(1)	(2)	(3)	(4)	(5)
Residential Unit Density	51.472*	−0.245	24.771	42.312	−4.405
	(29.783)	(18.842)	(25.810)	(28.946)	(27.710)
Constant	2.974***	1.415***	1.408***	1.438***	1.514***
	(0.074)	(0.070)	(0.068)	(0.069)	(0.065)
Observations	519	521	520	520	520
Adjusted R^2	0.001	−0.002	−0.0002	0.002	−0.002
F Statistic	1.677 (df = 1; 517)	0.0001 (df = 1; 519)	0.890 (df = 1; 518)	2.145 (df = 1; 518)	0.026 (df = 1; 518)

	Dependent variable:				
	US: Kill Civilians?	CTS: Kill Civilians?	Iraq Army: Kill Civilians?	Iraq Police: Kill Civilians?	PMF: Kill Civilians?
	(1)	(2)	(3)	(4)	(5)
Road Density	3.914	5.558	12.192	10.151	3.640
	(10.864)	(7.300)	(8.370)	(11.730)	(6.397)
Constant	3.005***	1.282***	1.176***	1.298***	1.417***
	(0.241)	(0.179)	(0.194)	(0.265)	(0.145)
Observations	519	521	520	520	520
Adjusted R^2	−0.002	−0.001	0.003	0.001	−0.001
F Statistic	0.125 (df = 1; 517)	0.668 (df = 1; 519)	2.799* (df = 1; 518)	1.594 (df = 1; 518)	0.232 (df = 1; 518)

Note: *p<0.1; **p<0.05; ***p<0.01
HC1 robust, neighboorhood-clustered standard errors

Table A11: Regressing Outcomes on Neighborhood Density in East Mosul

	Dependent variable:				
	US: Kill Civilians?	CTS: Kill Civilians?	Iraq Army: Kill Civilians?	Iraq Police: Kill Civilians?	PMF: Kill Civilians?
	(1)	(2)	(3)	(4)	(5)
pop_density	−8.789	1.092	0.011	−0.626	−0.894
	(8.612)	(3.430)	(3.353)	(3.757)	(2.998)
Constant	2.962***	1.212***	1.230***	1.289***	1.377***
	(0.171)	(0.069)	(0.067)	(0.070)	(0.050)
Observations	425	428	426	428	425
Adjusted R^2	0.002	−0.002	−0.002	−0.002	−0.002
F Statistic	1.939 (df = 1; 423)	0.128 (df = 1; 426)	0.00001 (df = 1; 424)	0.032 (df = 1; 426)	0.052 (df = 1; 423)

	Dependent variable:				
	US: Kill Civilians?	CTS: Kill Civilians?	Iraq Army: Kill Civilians?	Iraq Police: Kill Civilians?	PMF: Kill Civilians?
	(1)	(2)	(3)	(4)	(5)
Residential Unit Density	−13.448	14.324	6.346	5.853	−14.909
	(62.339)	(32.566)	(32.935)	(36.977)	(25.554)
Constant	2.860***	1.208***	1.222***	1.273***	1.384***
	(0.163)	(0.069)	(0.070)	(0.075)	(0.050)
Observations	425	428	426	428	425
Adjusted R^2	−0.002	−0.001	−0.002	−0.002	−0.002
F Statistic	0.085 (df = 1; 423)	0.418 (df = 1; 426)	0.084 (df = 1; 424)	0.053 (df = 1; 426)	0.276 (df = 1; 423)

	Dependent variable:				
	US: Kill Civilians?	CTS: Kill Civilians?	Iraq Army: Kill Civilians?	Iraq Police: Kill Civilians?	PMF: Kill Civilians?
	(1)	(2)	(3)	(4)	(5)
Road Density	−18.490	−5.065	−4.732	−5.436	−7.835
	(15.588)	(7.457)	(7.104)	(7.655)	(5.589)
Constant	3.282***	1.347***	1.343***	1.409***	1.551***
	(0.376)	(0.167)	(0.152)	(0.166)	(0.133)
Observations	425	428	426	428	425
Adjusted R^2	0.004	−0.0004	−0.001	−0.001	0.001
F Statistic	2.618 (df = 1; 423)	0.848 (df = 1; 426)	0.758 (df = 1; 424)	0.744 (df = 1; 426)	1.240 (df = 1; 423)

Note: *p<0.1; **p<0.05; ***p<0.01
HC1 robust, neighboorhood-clustered standard errors

G Perceptions of Other Forces' Likelihood of Killing Civilians (Controlling for Harm)

Table A12: OLS Regression Results: U.S. Likelihood of Killing Civilians (Controlling for Harm)

	Dependent variable:			
	US: Kill Civilians?	US: Kill Civilians?	US: Kill Civilians?	US: Kill Civilians?
	(1)	(2)	(3)	(4)
Treated (West Mosul)	0.155	0.153	0.113	0.122
	(0.096)	(0.096)	(0.091)	(0.094)
Reported: House Damage	−0.058			−0.057
	(0.082)			(0.086)
Reported: HH Death or Injury		−0.085		−0.097
		(0.098)		(0.099)
Detected: House Damage (10m)			0.206*	0.230**
			(0.109)	(0.112)
Constant	3.421***	3.394***	3.415***	3.457***
	(0.408)	(0.420)	(0.410)	(0.404)
Uncoditional Mean	2.995	2.995	2.995	2.995
Individual Controls	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes
Observations	917	917	917	917
Adjusted R^2	0.077	0.078	0.080	0.080
F Statistic	5.808*** (df = 16; 900)	5.849*** (df = 16; 900)	5.999*** (df = 16; 900)	5.443*** (df = 18; 898)

Note: *p<0.1; **p<0.05; ***p<0.01
HC1 robust, neighboorhood-clustered standard errors

Table A13: OLS Regression Results: Federal Police Likelihood of Killing Civilians (Controlling for Harm)

	Dependent variable:			
	Police: Kill Civilians?	Police: Kill Civilians?	Police: Kill Civilians?	Police: Kill Civilians?
	(1)	(2)	(3)	(4)
Treated (West Mosul)	0.216***	0.214***	0.171***	0.174***
	(0.065)	(0.062)	(0.055)	(0.057)
Reported: House Damage	−0.012			−0.029
	(0.068)			(0.066)
Reported: HH Death or Injury		0.008		−0.012
		(0.067)		(0.063)
Detected: House Damage (10m)			0.265***	0.271***
			(0.046)	(0.045)
Constant	1.353***	1.346***	1.378***	1.395***
	(0.194)	(0.191)	(0.176)	(0.176)
Uncoditional Mean				
Individual Controls	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes
Observations	923	923	923	923
Adjusted R^2	0.080	0.080	0.092	0.091
F Statistic	6.005*** (df = 16; 906)	6.004*** (df = 16; 906)	6.866*** (df = 16; 906)	6.111*** (df = 18; 904)

Note: *p<0.1; **p<0.05; ***p<0.01
HC1 robust, neighboorhood-clustered standard errors

Table A14: OLS Regression Results: CTS Likelihood of Killing Civilians (Controlling for Harm)

	Dependent variable:			
	CTS: Kill Civilians?	CTS: Kill Civilians?	CTS: Kill Civilians?	CTS: Kill Civilians?
	(1)	(2)	(3)	(4)
Treated (West Mosul)	0.144***	0.135***	0.121**	0.126**
	(0.053)	(0.051)	(0.051)	(0.051)
Reported: House Damage	−0.053			−0.066
	(0.054)			(0.053)
Reported: HH Death or Injury		0.031		0.032
		(0.041)		(0.041)
Detected: House Damage (10m)			0.101	0.103
			(0.069)	(0.071)
Constant	1.476***	1.445***	1.458***	1.494***
	(0.186)	(0.178)	(0.177)	(0.179)
Uncoditional Mean				
Individual Controls	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes
Observations	923	923	923	923
Adjusted R^2	0.049	0.048	0.050	0.050
F Statistic	3.942*** (df = 16; 906)	3.895*** (df = 16; 906)	4.027*** (df = 16; 906)	3.687*** (df = 18; 904)

Note: *p<0.1; **p<0.05; ***p<0.01
HC1 robust, neighboorhood-clustered standard errors

H Spillover Concerns: Size of Buffers

Table A15: OLS Regression Results: Iraqi Army Likelihood of Killing Civilians (Controlling for Harm: Various Buffers)

	Dependent variable:					
	Iraq Army: Kill Civilians?	Iraq Army: Kill Civilians?	Iraq Army: Kill Civilians?	Iraq Army: Kill Civilians?	Iraq Army: Kill Civilians?	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated (West Mosul)	0.169***	0.180***	0.171**	0.159***	0.184***	0.145***
	(0.038)	(0.053)	(0.083)	(0.047)	(0.031)	(0.031)
Detected Binary: House Damage (10m)	0.161					
Detected Continous: House Damage (10m)		0.091				
Detected Binary: House Damage (50m)			0.083			
Detected Continous: House Damage (50m)				0.010		
Detected Binary: House Damage (100m)					0.030	
Detected Continous: House Damage (100m)						0.003
Constant	1.292***	1.287***	1.262***	1.340***	1.257***	1.370***
	(0.105)	(0.219)	(0.259)	(0.188)	(0.090)	(0.090)
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	921	921	921	921	921	921
Adjusted R^2	0.063	0.060	0.060	0.064	0.058	0.068
F Statistic (df = 16; 904)	4.877***	4.660***	4.676***	4.924***	4.516***	5.165***
Note:						*p<0.1; **p<0.05; ***p<0.01
						HC1 robust, neighboorhood-clustered standard errors

Table A16: OLS Regression Results: U.S. Likelihood of Killing Civilians (Controlling for Harm: Various Buffers)

	Dependent variable:					
	US: Kill Civilians?	US: Kill Civilians?	US: Kill Civilians?	US: Kill Civilians?	US: Kill Civilians?	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated (West Mosul)	0.113***	0.123**	0.126	0.101**	0.137***	0.097***
	(0.038)	(0.053)	(0.083)	(0.047)	(0.031)	(0.031)
Detected Binary: House Damage (10m)	0.206					
Detected Continous: House Damage (10m)		0.142				
Detected Binary: House Damage (50m)			0.073			
Detected Continous: House Damage (50m)				0.012		
Detected Binary: House Damage (100m)					0.027	
Detected Continous: House Damage (100m)						0.003
Constant	3.415***	3.412***	3.378***	3.474***	3.374***	3.486***
	(0.105)	(0.219)	(0.259)	(0.188)	(0.090)	(0.090)
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	917	917	917	917	917	917
Adjusted R^2	0.080	0.079	0.078	0.081	0.077	0.081
F Statistic (df = 16; 900)	5.999***	5.921***	5.829***	6.026***	5.784***	6.013***
Note:						*p<0.1; **p<0.05; ***p<0.01
						HC1 robust, neighboorhood-clustered standard errors

Table A17: OLS Regression Results: CTS Likelihood of Killing Civilians (Controlling for Harm: Various Buffers)

	Dependent variable:					
	CTS: Kill Civilians?	CTS: Kill Civilians?	CTS: Kill Civilians?	CTS: Kill Civilians?	CTS: Kill Civilians?	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated (West Mosul)	0.121***	0.132**	0.131	0.115**	0.143***	0.109***
	(0.038)	(0.053)	(0.083)	(0.047)	(0.031)	(0.031)
Detected Binary: House Damage (10m)	0.101					
Detected Continous: House Damage (10m)		0.035				
Detected Binary: House Damage (50m)			0.023			
Detected Continous: House Damage (50m)				0.006		
Detected Binary: House Damage (100m)					−0.016	
Detected Continous: House Damage (100m)						0.002
Constant	1.458***	1.452***	1.443***	1.488***	1.455***	1.503***
	(0.105)	(0.219)	(0.259)	(0.188)	(0.090)	(0.090)
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	923	923	923	923	923	923
Adjusted R^2	0.050	0.048	0.048	0.050	0.047	0.051
F Statistic (df = 16; 906)	4.027***	3.892***	3.881***	4.045***	3.872***	4.107***

Note: *p<0.1; **p<0.05; ***p<0.01
HC1 robust, neighboorhood-clustered standard errors

Table A18: OLS Regression Results: Federal Police Likelihood of Killing Civilians (Controlling for Harm: Various Buffers)

	Dependent variable:					
	Iraq Police: Kill Civilians?	Iraq Police: Kill Civilians?	Iraq Police: Kill Civilians?	Iraq Police: Kill Civilians?	Iraq Police: Kill Civilians?	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated (West Mosul)	0.171***	0.172***	0.190**	0.142***	0.218***	0.124***
	(0.038)	(0.053)	(0.083)	(0.047)	(0.031)	(0.031)
Detected Binary: House Damage (10m)	0.265					
Detected Continous: House Damage (10m)		0.246				
Detected Binary: House Damage (50m)			0.083			
Detected Continous: House Damage (50m)				0.019		
Detected Binary: House Damage (100m)					−0.010	
Detected Continous: House Damage (100m)						0.006
Constant	1.378***	1.386***	1.335***	1.478***	1.352***	1.521***
	(0.105)	(0.219)	(0.259)	(0.188)	(0.090)	(0.090)
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	923	923	923	923	923	923
Adjusted R^2	0.092	0.095	0.082	0.100	0.080	0.106
F Statistic (df = 16; 906)	6.866***	7.028***	6.155***	7.435***	6.004***	7.867***

Note: *p<0.1; **p<0.05; ***p<0.01
HC1 robust, neighboorhood-clustered standard errors

I Additional Survey Evidence on Variation of Harm and Tactics

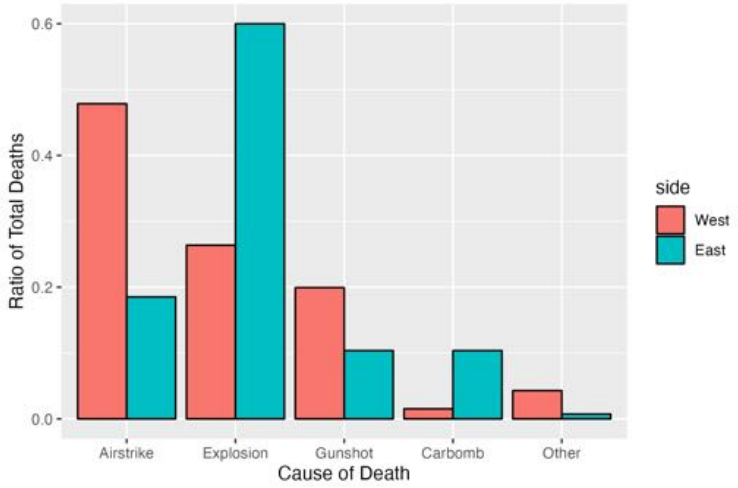
Table A19: Differences in Causes of Battle-Related Death and Injury

Variable	West Mosul (2637)	East Mosul (4781)	Difference-In-Means
Death from Conflict: Any	0.124	0.028	0.095***
	(0.329)	(0.166)	
Death from Conflict: Airstrike	0.059	0.005	0.054***
	(0.236)	(0.072)	
Death from Conflict: Explosion	0.033	0.017	0.016***
	(0.178)	(0.129)	
Death from Conflict: Gunshot	0.025	0.003	0.022***
	(0.155)	(0.054)	
Death from Conflict: Carbomb	0.002	0.003	-0.001
	(0.044)	(0.054)	
Death from Conflict: Other	0.005	0	0.005***
	(0.073)	(0.014)	
Injury from Conflict: Any	0.052	0.012	0.04***
	(0.222)	(0.107)	
Injury from Conflict: Shelling	0.026	0.006	0.02***
	(0.159)	(0.076)	
Injury from Conflict: Blast	0.021	0.004	0.017***
	(0.144)	(0.066)	
Injury from Conflict: Gunshot	0.004	0	0.003***
	(0.061)	(0.02)	
Injury from Conflict: Burns	0.001	0	0.001
	(0.028)	(0.014)	
Injury from Conflict: Torture	0	0.001	-0.001
	(0)	(0.025)	
Injury from Conflict: Other	0	0	0
	(0.019)	(0)	

Table A19 conducts a difference in means test of Lafta, Al-Nuaimi and Burnham (2018)'s household survey outcomes covering 7,559 residents of Mosul after the conclusion of the battle. Lafta, Al-Nuaimi and Burnham (2018) ask respondents if they experienced any death or injury in their household due to the conflict and the cause of the death or injury. Consistent with our analysis, West Mosul residents experiences a higher level of civilian harm in comparison to East Mosul. To explore, variation in the sources of harm, Figure **??** subsets the data to the households who reported death in the household (326 individuals died in West Mosul compared to 135 in East Mosul) and then plots the percentage of deaths attributed to a given source. Figure **??** shows that a larger proportion of deaths in West

Mosul (compared to East Mosul) were due airstrikes or gunshots, while a higher proportion of deaths in East Mosul were attribute to explosions.

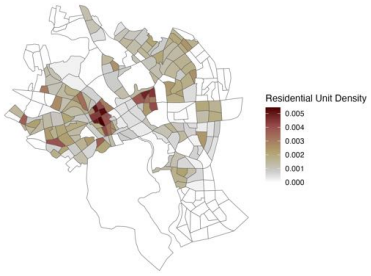
Figure A10: Death Causes



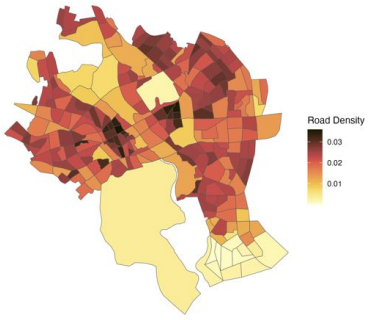
J Additional Figures

Figure A11: Visualizing Neighborhood Covariates

(a) Neighborhood Population normalized by area (m^2) Source: UN Habitat



(b) Neighborhood number of residential units normalize by area (m^2) Source: UN Habitat



(c) Neighborhood Road Density (length of roads/ area of neighborhood)