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Weapons of the Weak: Technological Change, Guerrilla Firepower, and Counterinsurgency Outcomes

Costantino Pischedda[1], Mauro Gilli[2], and Andrea Gilli[3]

Abstract

What explains counterinsurgency outcomes? Existing scholarship points to characteristics and strategies of incumbents and insurgents but neglects the role of insurgents' weapons. Some studies discuss the effects of the firepower of insurgents relative to incumbents. Focusing on relative firepower, however, is problematic given the asymmetric nature of guerrilla warfare, with insurgents eschewing decisive engagements where incumbents would bring to bear their material superiority. We turn the spotlight, instead, on guerrilla firepower, i.e., insurgents' absolute ability to inflict casualties on incumbents using small arms in hit-and-run attacks. We argue that technological innovations dating to the mid-19th century sowed the seeds for cumulative increases in lethality of insurgents' small arms – the standard tools of guerrilla warfare – over the following 150 years, enhancing tactical effectiveness of hit-and-run attacks and thus insurgents' prospects of strategic success. Statistical analysis of novel data on guerrilla firepower in counterinsurgency campaigns from 1800 to 2005 corroborates our argument.

[1]Political Science, University of Miami, Coral Gables, FL, USA
[2]Center for Security Studies, ETH-Zurich, Zurich, Switzerland
[3]School of International Relations, University of St Andrews, St Andrews, UK

Corresponding Author:
Costantino Pischedda, Political Science, University of Miami, 1300 Campo Sano, Coral Gables, FL 33124-6914, USA.
Email: costantino.pischedda@gmail.com

Data Availability Statement included at the end of the article

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What explains the outcomes of counterinsurgency (COIN) campaigns? Why do some incumbents defeat their guerrilla challengers while others don't? Research highlights incumbents' choices and characteristics, such as strategy (Arreguín-Toft 2001; Biddle et al. 2012; Downes 2007; Krepinevich 1986; Mir 2018), resolve (MacDonald 2013; Mack 1975), regime type (Merom 2003), and force structure (Friedman 2011; Lyall and Wilson, 2009). Other studies focus on guerrillas' attributes and resources, including external support (Byman et al., 2001; Record 2007; Salehyan 2009; Weinstein 2006), cohesion (Akcinaroglu 2012; Krause 2014; Long 2014; Pischedda 2020; Sinno 2008; Staniland 2014), strength (Cunningham et al. 2009), and use of terrorism (Fortna 2015).

The literature, however, has paid limited attention to the impact of insurgents' weapons on war outcomes. This is surprising, given that both theorists and practitioners of guerrilla and counterinsurgency note that insurgents must inflict mounting casualties on COIN forces to achieve a favorable outcome. As Mao (1961, 54) put it, with their hit-and-run tactics, guerrillas act like "innumerable gnats, which, by biting a giant both in front and in rear, ultimately exhaust him." Intuitively, variations in weapon types should influence insurgents' ability to harass the incumbent and, ultimately, the war's outcome.

Some works do discuss the effects of guerrillas' weapons on war outcomes. However, they emphasize insurgents' firepower relative to counterinsurgents. This focus on relative firepower is problematic, as guerrillas typically eschew decisive engagements to hold ground, where incumbents would bring to bear their superiority in arms and numbers, instead relying primarily on hit-and-run attacks.

Building on longstanding insights about guerrilla warfare and recent research about armed groups' technology and military methods (Biddle 2021; Kalyvas and Balcells 2010), we advance the literature with an argument about the effects on COIN outcomes of guerrilla firepower, that is, insurgents' *absolute* ability to inflict casualties on incumbents using small arms in hit-and-run attacks.

As weapons meant to be carried by individual soldiers or transported on light vehicles, small arms, such as rifles, machine guns, rocket-propelled grenades, and explosives, facilitate guerrillas' quintessential tasks of avoiding detection before an attack as well as dispersing and hiding afterwards, thus limiting exposure to the incumbent's superior firepower and numbers. Yet, small arms display significant heterogeneity in their lethality, i.e., the potential for inflicting casualties. For example, Napoleonic-era muskets could fire just one round per minute (Headrick 1981, 85), whereas an automatic rifle like the Kalashnikov has a practical rate of fire of one hundred rounds per minute – a difference with obvious implications for lethality.

We argue that from the mid-nineteenth century technological innovations created the conditions for the cumulative growth in guerrilla firepower over the following hundred

and 50 years. In particular, manufacturing innovations yielded a radical increase in the range, precision, volume of fire, and thus lethality of small arms. The introduction of automatic rifles, giving individual fighters "the firepower of a … nineteenth-century infantry company" (Carr 2008, 19), represented the culmination of this long-term trend towards the improvement of weapons ideally suited for guerrilla warfare. The corresponding enhancement of guerrillas' ability to inflict casualties on incumbents through hit-and-run attacks, in turn, improved the prospects for insurgents' strategic success, that is, favorable war outcomes.

Although technological change is a systemic phenomenon, guerrillas' adoption of small arms did not proceed uniformly, due to variable political, geographical, and technical obstacles. For example, in the early 1980s, Nigeria's Maitatsine rebels relied on cold weapons such as hatchets, while the opposition to Siad Barre's government in Somalia used automatic rifles, machine guns, mortars, antiarmor weapons, and explosives. However, the absence of systematic data has prevented scholars from leveraging this cross-sectional variation for statistical analysis, likely contributing to the literature's neglect of insurgents' weapons as determinants of COIN outcomes.

We fill this gap with novel data on insurgents' small arms in COIN campaigns in the period 1800–2005, the Weapons of the Weak dataset, which relies on a broad range of sources, including case-specific studies as well as participants' memoirs. Our statistical analysis of the dataset shows that variation in guerrilla firepower is an important driver of COIN outcomes, contributing to explaining both the secular decline in counterinsurgents' victory and disparate outcomes across otherwise similar cases.

Besides revealing the effects of insurgents' small arms, our dataset allows a reassessment of existing findings on the effects of factors that follow a similar secular trend, which may have been biased by the failure to control for the long-run growth of guerrilla firepower. In fact, once insurgents' small arms are considered, we find no support for Lyall and Wilson (2009) influential argument that increased mechanization of security forces undermines COIN performance.

Although the era of troop-intensive, US-led counterinsurgency campaigns may be over, understanding the drivers of COIN outcomes remains a key policy concern. In fact, over the past decade the global prevalence of civil wars has reached unprecedented levels (Davies et al. 2022) and rebel groups continue to frequently adopt guerrilla warfare (Balcells and Kalyvas 2024). Furthermore, as discussions about Ukraine's options in the face of Russian aggression suggest, guerrilla warfare is likely to remain relevant in an age in which wars of foreign occupation and countervailing international efforts to prop up local resistance are concrete possibilities (Economist 2022).

The Literature on Insurgents' Firepower

An emerging stream of research has advanced our understanding of armed groups' behavior by showing how the weapon technology at their disposal influences their choice of military methods (Biddle 2021; Kalyvas and Balcells 2010). Yet, these studies do not specifically examine the impact of the firepower of insurgents on COIN

outcomes.[1] On its part, the broader literature on guerrilla warfare and counterinsurgency has paid scant attention to the topic. While policy and academic writings recognize arms as essential to insurgency (Metz and Millen 2004, 7; US Army/Marine 2007, 18), the types of weapons used by rebels are rarely considered in explaining COIN outcome variations.

The few works that do discuss the effects of the firepower of insurgents on COIN outcomes reach inconsistent conclusions based on different cases. MacDonald (2013, 260–261; 2014, 33–37 and 225) argues that insurgents' firepower is an unlikely explanation for the secular decline in the odds of counterinsurgency victory, as in the nineteenth century cases he examines the weapons of victorious colonial armies were not necessarily of superior quality than those of the insurgents. Marsh (2020, 69) advances the opposite claim, observing that while "US infantry could rely upon a great qualitative advantage in firepower" during the Philippine-American war of 1899–1902, decades later "US infantry faced Vietnamese foes armed with infantry weapons of similar firepower." The closing of the firepower gap between insurgents' and counterinsurgents' small arms, he suggests, helps explain the US defeat in Vietnam after the victory in the Philippines. Similarly, Young (1996) argues that insurgents' access to weapons comparable to those of counterinsurgents was crucial to rebel victories in recent African civil wars.

The common element to these perspectives is that they imply that one should focus on the firepower of insurgents relative to incumbents to explain variation in COIN outcomes. Given the asymmetric nature of guerrilla warfare, however, focusing on relative firepower is problematic. Whether the weapons of insurgents are comparable to those of the counterinsurgents is beside the point in a fight where guerrillas generally avoid direct tests of strength with their materially superior opponent, eschewing decisive engagements to hold ground and instead relying on hit-and-run attacks.[2] In this type of fight, guerrilla firepower – the *absolute* ability afforded insurgents by their small arms to inflict casualties on the incumbent while limiting exposure to COIN forces – is key.[3]

Furthermore, one could argue that counterinsurgents' firepower has outpaced the insurgents' over the past 150 years, considering the spread of modern artillery, armored vehicles, airpower, and eventually networks of advanced sensors, communication systems, and precision-guided munitions to state militaries (Cohen 2004; Hacker 2005; Mir 2018). A focus on relative firepower might then lead us to expect an increase in incumbents' rate of victory over this period, but the opposite occurred (Lyall and Wilson 2009).

Data limitations have confined the analysis of the effects of insurgents' weapons on COIN outcomes to case studies, precluding the identification of general patterns. To our knowledge, only the Non-State Actor dataset includes a variable related to insurgents' weapons: a measure of "the ability of rebels to procure arms, relative to the government" (Cunningham et al. 2009, 580).[4] This variable, however, has three characteristics that limit its utility for our purposes: it encompasses all weapon systems, not distinguishing between major conventional weapons and guerrillas' standard tools,

small arms; it measures rebel capabilities relative to the government, not considering the asymmetric nature of guerrilla warfare, much like the arguments discussed above; finally, its post-WWII scope prevents studying the long-term decline in incumbent victory.

This article advances the literature both theoretically and empirically, by combining insights on guerrilla warfare and on the relation between weapon technology and the military methods of nonstate actors into a new argument about guerrilla firepower's effects on war outcomes, and by addressing a major data lacuna with a novel dataset on insurgents' small arms for COIN campaigns in the years 1800–2005.

How Guerrilla Firepower Shapes COIN Outcomes

We posit that cumulative increases in the lethality of small arms from the second half of the nineteenth century depressed counterinsurgents' odds of victory and correspondingly improved insurgents' prospects of favorable war outcomes (i.e., strategic success). We proceed in two steps. First, we discuss the two main pathways to guerrilla strategic success and the role of small arms as fundamental instruments for insurgent tactics along both pathways. Second, we present an overview of the secular growth in small arms' lethality due to technological change.

Small Arms and Guerrilla Warfare

Guerrilla warfare involves political and military activities meant to help a weak rebel organization survive, grow, and eventually overpower the incumbent. Guerrillas combine persuasion and coercion to mobilize the population, on which they rely for supplies, shelter, intelligence, and recruits. The military hallmarks of guerrilla warfare are hit-and-run attacks on "the enemy's rear, flanks, and other vulnerable spots," which limit insurgents' exposure to the superior firepower and numbers of the security forces (Mao 1961, 46). As Taber (1965, 53) put it, "the guerrilla fights the war of the flea. The flea bites, hops, and bites again, nimbly avoiding the foot that would crush him. He does not seek to kill his enemy at a blow, but to bleed him and feed on him, to plague and bedevil him, to keep him from resting and to destroy his nerve and his morale."

There are two main paths to guerrilla strategic success. In the first, as casualties inflicted by the elusive flea accumulate, demoralization and desertions weaken the government forces, while the insurgents grow stronger as they capture weapons, acquire military experience, and gain confidence. In this process towards equalization of strength between the opposing sides, a point may be reached in which the insurgents are strong enough to switch to conventional warfare and thus either achieve a decisive battlefield victory or compel significant concessions from the incumbent (Mao 1954, 1961).

The second path, especially relevant to resistance against foreign incumbents (e.g., colonial powers and occupiers), envisions guerrillas succeeding by eroding their

opponents' political will, without ever reaching the strength necessary to engage in conventional warfare. As the anticipated "human, economic, and political costs" of indefinitely fighting a foe that cannot be brought to a decisive battle come to exceed the expected benefits, the incumbent may choose withdrawal (Mack 1975, 181). In other words, insurgents win by not losing.[5]

Until a potential shift to conventional combat on the first path to guerrilla strategic success, the two paths entail the same tactical repertoire – raids against fixed military installations, ambushes on enemy forces and government officials, and sabotage of economic and civilian infrastructure by small, highly mobile, and lightly armed units in areas under nominal incumbent control (Guevara 1998, 18–25; Jones 2017, 59–67). Insurgents typically concentrate their forces to obtain local numerical superiority for short bursts of kinetic activity and then disperse and hide, hence the moniker hit-and-run attacks. Stealth and tactical surprise are critical for these attacks to achieve their immediate objective of inflicting casualties on the incumbent while keeping insurgents' casualties at sustainably low levels.

The standard tools of guerrilla warfare are small arms – weapons carried out by individual soldiers or transported on light vehicles (e.g., rifles, light machine guns, grenades, bazookas, and mortars) – given the relative ease of moving and concealing them.[6] Unless insurgents become strong enough to switch to conventional warfare, major conventional weapons (e.g., tanks and artillery) often represent a liability. Their size and weight increase the risk that insurgents would be detected before an attack or fail to extricate themselves from clashes with security forces, thus exposing guerrillas to the incumbent's superior firepower and numbers.

Higher levels of guerrilla firepower deriving from more lethal small arms increase the odds of tactically effective hit-and-run attacks and, thus, of eventual strategic success through either one of the paths discussed above: equalization of the two sides' strength and attrition of the incumbent's political will. Guerrilla firepower shapes insurgents' tactical effectiveness in various ways.

First, with more lethal small arms, guerrillas can inflict greater casualties on the incumbent through ambushes, raids, and acts of sabotage, while suffering fewer casualties themselves, thus boosting the processes of equalization of the two sides' strength and/or attrition of the incumbent's political will. Second, with more lethal small arms, insurgents can better disrupt the counterinsurgent's strategy by harassing COIN forces engaged in policing tasks and cutting off their supply lines, sabotaging development projects, and undermining governance activities such as running a census and regulating the economy. Since some COIN tasks (e.g., searching insurgent hideouts, patrolling areas being secured, and gathering human intelligence) require soldiers to dismount their vehicles, the vulnerability of security forces to the small arms of modern guerrillas cannot be fully eliminated. Third, the higher guerrilla firepower, the less likely that COIN forces will venture deep into areas under insurgent control lest they become targets of hit-and-run attacks, thus reducing the chances of finding and destroying bases guerrillas use for training, planning, and organization. Though incumbents can counter these advantages accruing to insurgents from high levels of

firepower by saturating the area with troops, significant financial costs make high troop densities hard to sustain for prolonged periods (Biddle et al. 2012).

Secular Growth of Small Arms Lethality and Technological Change

The middle of the nineteenth century saw the emergence of a series of technological innovations, such as the shift from artisan manufacturing to interchangeable parts, progress in product design and testing methods, the development of more efficient and reliable casting methods delivering cheaper, lighter, and more resistant metals, and chemistry advances in propellants and explosives. Besides promoting tremendous social and economic changes, this technological transformation sowed the seeds for progressive improvements in small arms. We argue that these improvements, in turn, led to the cumulative growth of guerrilla firepower and thus the reversal of fortune for counterinsurgents over the following hundred and 50 years.

New manufacturing techniques using interchangeable parts, requiring unprecedented consistency and precision, led to a radical increase in the lethality of long guns, i.e., muskets and rifles (Rosenberg 1963; Headrick 1981, 115–127). In the early nineteenth century, the best armed guerrillas used muzzleloading smoothbore flintlock muskets. Short-ranged, highly inaccurate, and misfiring 70% of the time, these weapons were virtually useless in rain and damp weather. Furthermore, muskets' complex reloading procedure limited the rate of fire to one shot per minute, and shooters could execute it only while standing, thus exposing themselves to enemy fire cued by a cloud of smoke (Brodie and Brodie 1973, 81; Headrick 1981, 85). By contrast, Arab insurgents during WWI used breechloading repeating rifles, which offered higher range, accuracy, and reliability even in adverse weather. Their ten-round magazine could be expended in seconds and reloaded lying down or crouching, while their smokeless powder helped conceal shooters' location. As Headrick (1981, 84) observed, "[i]n terms of effective firepower the disparity between the rifle of World War One and the Napoleonic musket was greater than between the musket and the bow and arrow."

After WWII, the spread of automatic rifles, with firing rates much higher than WWI-era magazine-loading rifles (Biddle 2021, 56–58), marked a significant leap in guerrilla firepower. Automatic fire emerged in the 1880s with the first machine gun, the Maxim gun. Over time, machine guns became less bulky and more reliable, leading to widespread adoption among guerrillas by the middle of the twentieth century. This process also led to the introduction of the submachine gun towards the end of WWI, which offered automatic fire in an extremely compact design, though with the serious downside of much reduced range and stopping power, due to its small pistol cartridges. Thus, the submachine gun's popularity among guerrillas declined with the spread of automatic rifles, as they offered automatic fire with plenty of stopping power and range with their medium-sized cartridges (Ellis 1975; Gander 1990, 89–97; Chivers 2010).[7]

Innovations in explosive technology also boosted guerrilla firepower. Until the early twentieth century, limited access to essential materials restricted the use of improvised

explosive devices by insurgents (Meyers and Shanley 1990). The Haber-Bosch method for synthesizing ammonia eased this constraint, as ammonium nitrate, the key chemical compound of inorganic fertilizers, can be used to create explosions (Smil 2001). With the diffusion of industrial production of synthetic fertilizers around the world in the second half of the twentieth century, a crucial ingredient for relatively safe-to-handle improvised explosive devices became easily accessible to insurgents. Over the past century, insurgents have also gained better access to explosive devices from industrial lines of production, including landmines, grenades, and demolition explosives, through battlefield capture, theft, foreign assistance, and illicit markets.

In addition to automatic weapons and explosives, light-to-medium mortars and portable antiarmor weapons are important items in modern insurgent arsenals. Mortars provide an easy-to-use, portable indirect fire option, while antiarmor weapons like bazookas, rocket-propelled grenades, and recoilless rifles amp up the insurgents' punch against increasingly mechanized COIN forces (Gander 1990, 113–118 and 123–129).

The secular upward trend in guerrilla firepower does not mean that all insurgent organizations in a given period had similar weapons. In fact, there is considerable variation in small arms use across contemporaneous conflicts. For example, while Spanish guerrillas fought Napoleon's forces with muskets, a few years later the Pindaris resisted British encroachment in India with spears and swords. Similarly, after WWII, Malagasy nationalists relied on machetes and spears, whereas Mao's guerrillas used repeating rifles and automatic weapons.

Based on these considerations, we expect that, all else equal, the higher the level of guerrilla firepower in a war, the higher the probability of insurgents' strategic success, i.e., war outcomes favorable to insurgents. Evidence of a positive association between guerrilla firepower and the odds of insurgent strategic success would support our thesis, while no association or a negative association would falsify it.

What Explains Variation in Guerrilla Firepower within a Technological Era?

A systematic analysis of the determinants of guerrilla firepower within a specific historical era is beyond this article's scope. However, before presenting the empirical analysis, we briefly identify determinants that may also influence COIN outcomes and thus should be controlled for to alleviate omitted variable bias concerns.

As noted, technological advances over time made small arms increasingly lethal. Yet, insurgents' ability to acquire the most advanced small arms of the day varied based on specific technical and geopolitical factors as well as local conditions. Breechloading repeaters and machine guns required a much more advanced production system than earlier weapons, including hard-to-obtain specialized machine tools and durable metals. Thus, by the late nineteenth century, producing state-of-the-art weapons was beyond most guerrilla organizations' capabilities, making other forms of international and domestic acquisition more important.

International acquisition depends on third parties' willingness to facilitate or hinder weapon flows, which varies over time and across contexts. The 1890 Brussels Conference Act limited African rebels' access to modern weapons, but similar agreements proved elusive in other regions, much to the benefit of international arms dealers. Direct third-party transfers of weapons to insurgents increased in periods of intense great power competition, especially during the Cold War, and with the post-WWII consolidation of norms of national self-determination (Grauer and Tierney 2018). On its part, the scale of domestic acquisition through leakages from the incumbent's stockpiles, theft, or capture in battle by insurgents varies based on the counterinsurgent's state capacity and the strength of both security forces and rebels.

Empirical Approach

We test our argument about the effects of guerrilla firepower on COIN outcomes using the novel Weapons of the Weak (WOW) dataset, which provides information on guerrillas' small arms over the past two centuries. The following subsections introduce the guerrilla firepower indicator and the dependent variable. Table A1 in the appendix reports summary statistics for all variables.

Measuring Guerrilla Firepower

WoW codes guerrilla firepower levels for the COIN campaigns in Lyall and Wilson (2009) list. This list has the broadest time coverage (1800–2005) among datasets of conflicts in which rebels resorted primarily to guerrilla warfare, defined by Lyall and Wilson (2009, 70) "as a strategy of armed resistance that (1) uses small, mobile groups to inflict punishment on the incumbent through hit-and-run strikes while avoiding direct battle when possible and (2) seeks to win the allegiance of at least some portion of the noncombatant population."[8] Our dataset consists of a cross-section of 275 cases with onset and termination between 1800 and 2005.[9]

The types of small arms used by insurgents in a given war can vary over time as rebels gain new sources of weapons or lose existing ones. Although a time-varying measure of guerrilla firepower would be ideal, coding it for nearly 2000 war-years is impractical, especially given the sparse historical record for many nineteenth century conflicts. Thus, in line with a common practice for coding independent variables in cross-sectional datasets on violent and nonviolent campaigns, we pragmatically coded the peak level of guerrilla firepower.[10] In other words, our variable measures the highest level of firepower at the disposal of the rebels at any point during the guerrilla phase of their struggle. The alternative approach of measuring firepower at the onset of insurgency has the major drawback of drastically reducing variation, as guerrillas often start their fight with little in the way of weaponry.[11]

Relying on a broad array of sources, ranging from intelligence reports, newspapers, academic literature on specific wars, and memoirs of guerrillas and counterinsurgents to conflict encyclopedias and think tank studies, WoW includes information on the

following categories of small arms typically used by guerrillas: long guns (i.e., muskets and rifles); machine guns; submachine guns; mortars; explosives; and portable antiarmor weapons.[12]

For long guns, we created an ordinal variable, Long Guns, ranging from 0 to 5, corresponding to cases where most guerrilla fighters use:

- Cold weapons, e.g., bow and arrows, sword, clubs, machetes, and spears – Long Guns = 0.
- Muskets, i.e., smoothbore (primarily) or rifled muzzleloading long guns – Long Guns = 1.
- Single-shot breechloading rifles, offering a higher rate of fire, range, and precision than muskets – Long Guns = 2.
- Repeating (or magazine loading) rifles, providing a higher rate of fire than single-shot breechloaders by obviating the need to manually load rounds after each shot; from the 1890s, with the use of smokeless powder, repeating rifles also offered superior range and stopping power, in addition to drastically reducing the extent to which firing them gave away the shooter's location – Long Guns = 3.
- Semiautomatic rifles, providing a higher rate of fire than repeating rifles, as they fire one cartridge per trigger pull without requiring manual action to eject spent cartridges and feed new rounds into the chamber – Long Guns = 4.
- Automatic (or assault) rifles, achieving yet a higher rate by firing continuously until the trigger is released (though they can also be used in semiautomatic mode) – Long Guns = 5.

Since we aim to capture the weapons used by the typical fighter in the phase of the war when guerrilla firepower peaked, Long Guns indicates the most advanced long gun used by the *majority* of insurgents at any point during the war.[13] For example, although some Zulus in the 1906 war against the British used breechloading rifles, most were armed only with traditional spears and clubs, warranting a coding of 0.[14]

While long guns are basic infantry weapons that one would expect most members of a well-armed modern guerrilla force to possess, the other small arms we consider – machine guns, submachine guns, mortars, portable antiarmor weapons (shoulder-fired missile and rocket launchers as well as recoilless rifles), and explosives (grenades, landmines, and improvised explosive devices) – are support weapons that only a small fraction of an infantry unit would be armed with.[15] For each of these other small arms, therefore, we coded dichotomous variables indicating whether insurgent organizations used them at any point during the war.[16]

We create the guerrilla firepower indicator, Firepower, by summing Long Guns scores with the values of the five dummy variables corresponding to the other small arms. Firepower ranges from 0, when insurgents mainly use cold weapons and no support weapons (e.g., the Navajo in the 1860s) to 10, when insurgents use automatic rifles and all categories of support weapons (e.g., the Afghan Mujahideen in the 1980s). Intermediate values of 4–6 typically correspond to cases in the late nineteenth and early

twentieth centuries, where insurgents used repeating rifles and some support weapons, in particular machine guns and explosives of various kinds, such as anti-Soviet rebellions in the 1920s.[17] To ensure results are not driven by the specific way we created the indicator, we also ran our analysis using three alternative operationalizations of guerrilla firepower: Long Guns, which considers only long guns; Firepower2, which combines a simplified indicator for long guns with the dummies for support weapons;[18] and the first principal component from principal component analysis on all dummies corresponding to each type of long gun and support weapon. The effects of guerrilla firepower are robust to these alternative operationalizations (Table A3).

Figure 1 below plots Firepower across 275 wars over the period 1800–2005. Guerrilla firepower displays a clear upward trend, with most insurgent organizations scoring below 3 before 1946 and 10 afterward (Figures A1-A3 show a similar trend for the alternative indicators). The average value over the entire period is 5.1, with a standard deviation of 3.9.

Measuring COIN Outcomes

Our main dependent variable, the dummy Insurgent Success, captures the concept of strategic success (i.e., a favorable war outcome) for guerrillas. It equals 1 for cases Lyall and Wilson (2009) code as insurgent victory or draw, and zero for cases of insurgent loss/counterinsurgent victory. Insurgent victories occur when rebels achieve virtually all their demands, including cases where they defeat government forces on the battlefield; draws occur when incumbents concede to some, but not all, insurgents' demands, with neither side achieving its maximal goals. In insurgent losses/counterinsurgent victories the conflict ends without the insurgents obtaining

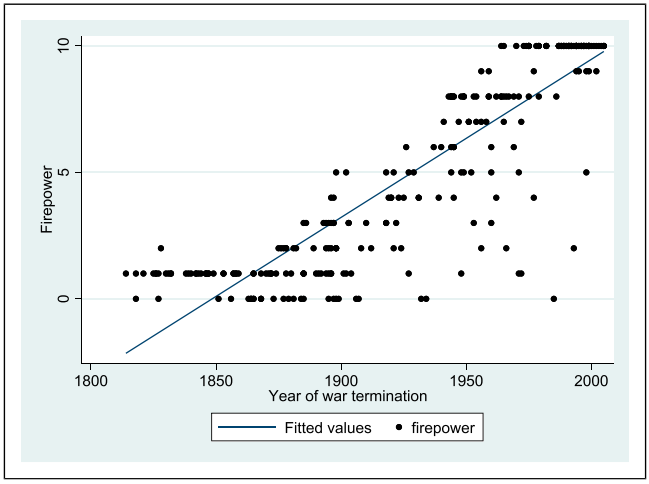

Figure 1. Secular trend in guerrilla firepower.

political concessions, including cases where rebel groups are destroyed. We opted for a dichotomized version of Lyall and Wilson's war outcome variable to employ ordinary least squares in our main analysis, which is necessary for some tests (decade-fixed effect analysis, due to the sparsity of the decade dummies, and sensitivity analysis). Results are robust to using multinomial and ordinal logits with a dependent variable distinguishing the three types of war outcome (Tables A4).[19]

We corrected the outcome of 21 cases in Lyall and Wilson's list, based on encyclopedic and case-specific sources as well as a cross-examination with Balcells and Kalyvas's (2014) outcome coding for post-WWII civil wars (see the appendix for details on each of these coding decisions). Our key results are robust to using Lyall and Wilson's original coding (Table A2).

Empirical Analysis

Table 1 reports the main regression results on the effect of guerrilla firepower on insurgent strategic success. Model 1 includes Firepower as the sole explanatory variable, while Model 2 adds controls for factors that the literature has identified as affecting COIN outcomes and that may be correlated with guerrilla firepower.

We include a Cold War dummy for insurgencies ending between 1945 and 1990, as this period of intense great power competition affected global patterns of civil war termination, guerrilla strength, and access to small arms. The Cold War saw a prevalence of victories in civil wars, followed by a sharp decline (Howard and Stark 2017/18). Moreover, during the Cold War Marxist rebels, the main adopters of guerrilla warfare, reached the apex of their strength due to ideological prestige and support from communist governments (Balcells and Kalyvas, 2024). In this period also there were enormous flows of weapons to both governments and rebel groups as numerous states intervened in civil wars in support of their respective local allies, leading to unprecedented access to small arms for guerrillas (Chivers 2010).

We also directly control for external support with two dummies from Lyall and Wilson (2009): Aid, indicating whether insurgents receive outside economic and military aid, and Haven, indicating whether they have a sanctuary in a neighboring country. These controls are crucial due to strong evidence that external support increases the probability of insurgent strategic success (Hazen 2013; Jones 2017; Lyall and Wilson 2009; Record 2007; Salehyan 2009) and the fact that it is likely correlated with guerrilla firepower, as both display a secular upward trend, with some external support taking the form of transfers of small arms (Grauer and Tierney 2018, 268).

We control for incumbents' capabilities, which may influence both war outcomes and insurgents' access to weapons. Our two variables – per capita energy consumption, Energy, and the Composite Index of National Capabilities, Cinc (Correlates of War 2010a) – are logged and measured 1 year before war onset. While Cinc is a standard measure of the stock of material resources available to a country for military purposes, we use per capita energy consumption as proxy for the level of economic development, which existing studies suggest should capture the sophistication of a country's military

Table 1. Assessing the Effects of Guerrilla Firepower on COIN Outcomes (OLS).

	Model					
DV = Insurgent Succes	(1)	(2)	(3)	(4)	(5)	(6)
Firepower	0.070***	0.048***	0.048***	0.046***	0.046***	0.056***
	(9.67)	(4.36)	(4.30)	(3.17)	(2.91)	(4.61)
Aid		0.313***	0.300***	0.311***	0.292***	0.292***
		(3.95)	(4.07)	(4.03)	(3.46)	(3.50)
Haven		−0.066	−0.062	−0.048	−0.049	−0.089
		(−0.87)	(−0.82)	(−0.62)	(−0.51)	(−1.06)
Regime		0.007	0.007	0.007	0.011**	0.008
		(1.41)	(1.51)	(1.57)	(2.01)	(1.59)
CINC		−0.037*	−0.039**	−0.038*	−0.034	−0.040
		(−1.85)	(−2.04)	(−1.90)	(−1.29)	(−1.59)
Energy		−0.005	−0.006	−0.007	0.012	0.012
		(−0.72)	(−0.82)	(−0.87)	(0.55)	(0.73)
Distance		0.011	0.010	0.012	0.010	0.013
		(0.82)	(0.76)	(0.76)	(0.65)	(0.90)
Post-WWII norms		0.300***	0.310***	0.257**	0.230*	0.296***
		(2.75)	(2.94)	(2.41)	(1.87)	(2.76)
Cold war		−0.201***	−0.203***	−0.238**	−0.193**	−0.196**
		(−2.70)	(−2.77)	(−2.36)	(−2.24)	(−2.31)
Parallel war			0.061	0.052	0.024	−0.006
			(0.55)	(0.41)	(0.19)	(−0.05)
Mechanization					0.005	
					(0.13)	
Troop density						−0.554***
						(−5.30)
Constant	0.102**	0.072	0.080	0.012	0.135	0.087
	(2.36)	(0.69)	(0.78)	(0.10)	(0.92)	(0.68)
Decade fixed effects	No	No	No	Yes	No	No
N	275	274	274	274	159	163

Models 2–4 have one fewer observation than Model 1 due to a missing value for Energy.
Robust standard errors clustered on incumbent (T statistic). *< 10%; **< 5%; ***< 1%.

technology and the skill of its armed forces (Beckley 2010) as well as its level of state capacity (Fearon and Laitin 2003; Hendrix 2010).[20] Additionally, since military capabilities can decay over long distances (Buhaug et al. 2009), we control for the natural log of the distance (in kilometers) from the incumbent's capital to the conflict area, using data from Lyall and Wilson (2009).

Normative change likely had significant influence on COIN outcomes. In particular, the post-WWII strengthening of norms against colonialism and territorial conquest, along with the consolidation of nationalism as a legitimizing political principle, improved guerrillas' odds of strategic success in national liberation struggles (Betts 1985, 47–75;

Jackson 1993; Spruyt 2000; Fazal 2011). Thus, we include a dummy flagging post-WWII campaigns waged by colonial powers and foreign occupiers (PostWWII Norms), which should have a positive effect on the probability of insurgent strategic success.[21]

We also control for regime type, given that studies suggest it may affect counterinsurgency outcomes (Getmansky 2013; Lyall 2010; Merom 2003) and the global spread of democracy occurred in parallel with the secular increase in guerrilla firepower. We measure regime type with the Polity2 value for the year preceding war onset (Marshall and Jaggers 2006).

In both Models 1 and 2, Firepower displays the expected significant, positive effect on insurgent strategic success. The effect is substantially large: using the coefficient estimate from Model 2, a one-standard deviation shift (e.g., approximately the difference in firepower between Chechen insurgents in the 1940s and the Mujahedeen in the 1980s) is associated with an increase of about 19% in the probability of insurgent strategic success. The PostWWII Norms and Aid dummy variables have effects of a comparable magnitude, with a shift from 0 to 1 raising the odds of success by roughly 30%.[22]

Model 3 adds to Model 2's specification a dichotomous variable, Parallel War, indicating COIN campaigns during which the incumbent was also involved in an interstate war.[23] This control is important because the state(s) fighting against the counterinsurgent often provide aid, including weapons, to the insurgents, and the outcome of the interstate war can be decisive for insurgent strategic success (think of anti-German insurgencies during WWII). Model 4 adds to the previous specification decade-fixed effects to capture time-variant unobserved heterogeneity that may positively correlate with guerrilla firepower and increase the odds of insurgent strategic success. Firepower retains its significant, positive effect.[24]

In each of the following models, we sequentially add to the baseline specification of Model 3 variables corresponding to plausible confounders for which data is available only for subperiods. Model 5 includes Mechanization, which measures the number of mechanized vehicles per soldier at the incumbent's disposal and is available for the post-1917 period, using data from Lyall and Wilson (2009). They document an upward trend in mechanization during the era of mechanized warfare and argue it explains the secular decline in counterinsurgents' victory, as highly mechanized armies struggle to gather intelligence from local civilians. Since Firepower also displays a secular upward trend ($\rho = 0.40$), controlling for Mechanization helps address concerns about the spuriousness of our results. The effect of guerrilla firepower remains robust. Although we replicated Lyall and Wilson's findings on the association between Mechanization and COIN outcomes using their coding of outcomes, model specifications, and estimation technique, once we control for Firepower, even with that setup, the coefficient of Mechanization shrinks and loses statistical significance (Tables A7-8). These results suggest that Lyall and Wilson's estimate of the effect of Mechanization on COIN outcomes may be capturing the impact of Firepower and may thus be affected by omitted variable bias.[25]

Model 6 adds Troop Density, the ratio of COIN forces to the population (measured as troops per 1000 local inhabitants), for which data is available from WWI (Friedman 2011). Existing studies indicate that troop density should reduce the probability of insurgent strategic success (Friedman 2011; Quinlivan 1995; US Army/Marine Corps 2007). On the other hand, a complex relationship may exist between boots on the ground and guerrilla firepower: high troop densities may hinder insurgents access to weapons, but counterinsurgents may also respond to (observed or expected) high levels of guerrilla firepower by deploying more troops. The effect of guerrilla firepower on insurgent strategic success remains significant and positive. Troop Density displays a significant, negative effect, albeit of a modest magnitude.[26]

Existing data do not allow us to control for other efforts by incumbents to reduce vulnerability to guerrilla firepower, such as technological and tactical innovations. This limitation, however, does not necessarily imply an upward bias in our findings. In fact, the opposite would be true if two plausible assumptions hold: (1) the more lethal insurgents' small arms, the more resources counterinsurgents invest in these efforts; and (2) some of these efforts succeed in mitigating the immediate, tactical effects of higher guerrilla firepower. Under these assumptions, our estimates capture both guerrilla firepower and counterinsurgents' efforts to blunt the impact of insurgents' small arms. Thus, if we could control for counterinsurgents' efforts, the estimated coefficient for Firepower would be larger.

Given that guerrillas often acquire weapons by capturing them from the incumbent on the battlefield, it may be that the better-armed insurgent organizations are those that, due to significant strength – particularly in cohesion and tactical proficiency – fare well in encounters with security forces. It may also be the case that the stronger a rebel organization, the higher its chances of favorable war outcomes, suggesting that without controlling for rebel strength we could be overestimating the effect of Firepower. Model 1 in Table 2 addresses this concern by including in the basic specification from Model 3 in Table 1 two ordinal variables proxying rebel strength from Cunningham et al.'s (2009) dataset: Rebel Strength, a measure of rebel strength relative to the government aggregating three components (ability to mobilize supporters, ability to procure arms, and fighting capacity) and Central Control, measuring the extent of control exercised by the rebel leadership. The model also includes a variable flagging whether the insurgents control any territory (Territory), as rebels with territorial control may be well positioned to both tap into illicit arms trading networks and extract local resources from the local population to pay for assets useful for waging guerrilla warfare, including weapons. While the number of observations is reduced substantially, due to Cunningham et al.'s data covering only the post-WWII period, Firepower continues to have a significant, positive effect on insurgent strategic success.[27]

In Model 2 (Table 2), we include a dummy for insurgents financing their activities with natural resources, as guerrillas could use revenues from the commercialization of natural resources to buy weapons and other useful assets for the anti-government struggle.[28] Regardless of the form of rebel financing, larger trade flows in and out of a country may improve insurgents' chances of purchasing weapons on the international

Table 2. Assessing the Effects of Guerrilla Firepower on COIN Outcomes (OLS).

	Model					
DV = Insurgent Succes	(1)	(2)	(3)	(4)	(5)	(6)
Firepower	0.068***	0.049**	0.061***	0.062***	0.051***	0.043***
	(2.97)	(2.01)	(3.66)	(3.36)	(2.84)	(3.83)
Aid	0.188*	0.245**	0.199**	0.226**	0.168	0.196***
	(1.72)	(2.25)	(2.07)	(2.26)	(1.49)	(2.83)
Haven	−0.040	−0.058	−0.058	−0.081	−0.022	−0.001
	(−0.35)	(−0.47)	(−0.56)	(−0.75)	(−0.18)	(−0.01)
Regime	0.017***	0.016**	0.015***	0.017***	0.014**	0.010**
	(2.80)	(2.55)	(2.73)	(3.13)	(2.49)	(2.38)
CINC	−0.064**	−0.067***	−0.068***	−0.066***	−0.070***	−0.071***
	(−2.59)	(−2.79)	(−2.92)	(−3.00)	(−3.35)	(−3.37)
Energy	−0.001	−0.004	0.000	−0.006	−0.004	−0.002
	(−0.05)	(−0.20)	(0.03)	(−0.34)	(−0.19)	(−0.22)
Distance	0.002	0.002	0.000	0.000	0.014	0.015
	(0.13)	(0.13)	(0.01)	(0.01)	(0.87)	(1.07)
Post-WWII norms	0.342**	0.216	0.383***	0.405***	0.351**	0.330***
	(2.60)	(1.29)	(3.25)	(3.29)	(2.40)	(3.11)
Cold war	−0.171*	−0.202*	−0.205**	−0.209**	−0.239**	−0.238***
	(−1.68)	(−1.91)	(−2.14)	(−2.04)	(−2.48)	(−3.34)
Parallel war	−0.063	0.010	−0.066	−0.015	0.026	−0.065
	(−0.25)	(0.05)	(−0.32)	(−0.08)	(0.12)	(−0.42)
Rebel strength	0.054					
	(0.88)					
Central control	−0.039					
	(−0.62)					
Territory	−0.061					
	(−0.69)					
Natural resources		0.115				
		(1.16)				
Trade			−0.020			
			(−0.54)			
Socialist				−0.003		
				(−0.03)		
Islamist				0.180		
				(1.39)		
Media					0.008	
					(0.08)	
Literacy						−0.000
						(−0.03)
Constant	−0.011	0.075	−0.049	−0.018	0.071	0.128
	(−0.05)	(0.30)	(−0.21)	(−0.10)	(0.42)	(1.05)
N	117	102	129	129	114	214

Robust standard errors clustered on incumbent (T statistic). *< 10%; **< 5%; ***< 1%.

market. Trade openness may also enhance guerrillas' prospects of strategic success through another channel. In the post-WWII environment of strengthening global human rights norms, governments engaged in counterinsurgency may face external pressure to avoid controversial but otherwise effective COIN practices (Byman 2016; Fazal 2015; Hazelton 2017). The more dependent a country is on international economic relations, the more vulnerable to such pressure it might be, making it less likely to defeat insurgents. Thus, Model 3 controls for Trade, the sum of export and import values as a share of GDP (logged and measured 1 year before war onset) for post-WWII COIN campaigns conducted by domestic incumbents (as opposed to colonial powers and foreign occupiers).[29] Since rebel groups with certain ideological outlooks may use domestic and transnational ideological networks to obtain weapons and other useful assets for guerrilla warfare, Model 4 includes binary indicators for guerrillas with Islamist and revolutionary socialist ideologies.[30] The statistical association between Firepower and COIN outcomes is robust to all of these additional controls.

Models 5 adds a control for mass media accessibility (Media), calculated as the sum of radios, televisions, and daily newspaper circulation per capita in the country conducting counterinsurgency.[31] With high levels of mass media accessibility, the public may be informed about both atrocities committed by the country's military and the casualties it suffered, which could foster mass opposition to the COIN campaign. Conversely, mass media penetration may increase the population's exposure to political messages promoting loyalty to the state and national unity, which in turn could strengthen the commitment of both ordinary citizens and soldiers to COIN victory (Warren 2014). The effect of Firepower remains robust. By contrast, Media does not reach statistical significance, though the reduced sample size, due to data availability, suggests taking this null finding with a grain of salt.

Finally, Model 6 controls for literacy levels in the country engaged in counterinsurgency, which have experienced a secular growth globally similar to that of guerrilla firepower.[32] On the one hand, literacy can serve as a proxy for the cumulative return on a country's investment in mass education, which governments often promote to strengthen popular acceptance of their authority and attachment to the nation in the face of external and internal threats (Darden and Mylonas 2015; Paglayan 2022). Thus, countries with high literacy levels should be well positioned to defeat insurgents due to strong public support for the COIN effort. On the other hand, in ethnically diverse countries, high literacy rates may indicate the potential for competing national identities, which in turn may increase the odds of strategic success for ethno-national insurgencies (Darden n.d). Literacy has no impact on COIN outcomes, while the effect of Firepower persists.

In the absence of a reliable instrument, omitted variable concerns remain, no matter how extensive an observational study's battery of controls is. We can, nonetheless, further reduce these concerns with sensitivity analysis, which enables us to assess the minimum strength of association with Firepower and Insurgent Success that unobserved confounders would need to have to alter our key finding (Cinelli and Hazlett 2020). The sensitivity analysis in Table A9 indicates that unobserved confounders

would need to explain more than 14% of the residual variance of both Firepower and of Insurgent Success to cause our estimate of the effect of guerrilla firepower to lose statistical significance at the 95% level. Even a confounder as strong as Aid (a robust predictor of COIN outcomes highly correlated with Firepower, $\rho = 0.6$) would be insufficient to undermine our main finding.

Conclusions

Guerrilla firepower has not figured prominently in theoretical propositions and empirical investigations about the outcomes of COIN campaigns, despite the intuitive notion that the types of weapons used by insurgents matter. Moreover, existing datasets lack the necessary information for quantitative tests of the effects of guerrillas' arms. This article contributes to filling these gaps in the literature with new theory, data, and empirical analysis.

We argue that innovations deriving from the mid-nineteenth century technological transformation led to a long-run, cumulative increase in the lethality of small arms – the fundamental tools of insurgency. By the middle of the twentieth century a growing number of insurgent organizations could access automatic rifles, machine guns, portable antiarmor weapons, explosives, and mortars, giving guerrillas' hit-and-run attacks an historically exceptional ability to inflict casualties on incumbents while limiting exposure to their superior firepower and numbers. We posit that the increased tactical effectiveness resulting from higher levels of firepower improved insurgents' prospects of strategic success, regardless of whether their theory of victory envisioned attrition of the incumbent's political will or eventual equalization of the strength of the two sides and transition to conventional warfare.

We test this argument with a novel dataset containing information on various types of small arms available to rebels in all COIN wars from 1800 to 2005, which we use to create an index of guerrilla firepower. Our statistical analysis shows that guerrilla firepower has a significant and substantively large positive effect on the probability of insurgent strategic success.

Although concerns about omitted variable bias cannot be entirely eliminated, the remarkable robustness of our findings to a broad battery of controls and sensitivity analysis suggests that increasing levels of guerrilla firepower are an important driver of the twentieth century reversal of the nineteenth century pattern of COIN wars routinely ending in favor of incumbents. In contrast to Lyall and Wilson's (2009) findings, once insurgents' weapons are considered, mechanization of COIN forces does not display a statistically significant association with war outcomes, indicating that failure to control for guerrilla firepower risks biasing estimates of the effects of other factors with similar secular trends.

Previous findings about the effects of a different variable that the counterinsurgent can directly manipulate, troop densities, do hold. However, these effects are overshadowed by those of guerrilla firepower. For instance, a massive force increase from 6 to 20 troops per one thousand local inhabitants (that is, from pre-surge US troop levels

in Iraq to the US military's doctrinal standard, exceedingly difficult to meet in COIN operations in countries with even a medium-sized population like Iraq) would only reduce the probability of insurgent strategic success by less than 1%.[32] By contrast, a one-standard deviation decline in guerrilla firepower is associated with approximately a 19% reduction in the probability of insurgent strategic success.

Thus, a key policy implication of our findings for governments deciding whether to launch a COIN campaign or a military intervention that may trigger an insurgency is that they should carefully consider the likely levels of guerrilla firepower. Additionally, assessing insurgents' equipment and taking steps to either curtail or facilitate weapon flows – depending on whether policymakers aim to hinder or support rebel efforts – should be priorities for intelligence and other government agencies.

Besides contributing to the study of insurgency, counterinsurgency, and the relation between the technology of armed groups and their military methods, this article is relevant to ongoing debates about the implications of technological change for the future of international politics. Several observers have warned about an impending, radical alteration of international affairs as emerging technologies enable weak states and nonstate actors to close the technological gap with the leading powers (Hammes 2013; Office of Undersecretary of Defense for Acquisition, Technology and Logistics 1999). Yet, various studies show that only the most powerful states have the resources required to fully leverage increasingly complex military technology, a fact that has the potential of magnifying, rather than reducing, existing technological disparities (Beckley 2018; Brooks and Wohlforth 2016; Gilli and Gilli 2018). Our finding that the growth in small arms' lethality has enhanced insurgents' effectiveness suggests that, even if high-end weapons systems remain beyond the reach of all but a handful of states, the spread of simpler military innovations that dovetail with asymmetric strategies employed by weak actors could have far-reaching consequences. Future studies should therefore systematically assess the impact of the spread of such technologies as drones, 3D printing, cyber, and precision firepower on the effectiveness of guerrilla warfare.

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ORCID iD

Costantino Pischedda https://orcid.org/0000-0002-8784-8623

Data Availability Statement

Data used for the article, together with do-file and online appendix, can be accessed at https://doi.org/10.7910/DVN/EWIGR4 (Pischedda 2024).

Supplemental Material

Supplemental material for this article is available online.

Notes

1. See the online appendix for references to additional studies about the effects of armed groups' weapons on different outcomes and about acquisition methods.
2. In decisive engagements defenders remain in position under assault even after attackers get sufficiently close that defenders cannot avoid being overrun by withdrawing.
3. In this respect, the closest argument to our thesis has been developed by Biddle (2021), who posits that progressive increases in the lethality of their weapons have enabled nonstate actors – when their internal politics are properly aligned – to go toe to toe in conventional battle with state armies, despite the fact the latter often retain significant technological advantages. The key differences between the two studies are that our theory and empirical analysis are confined to instances of guerrilla warfare and we examine the effects on war outcomes of firepower, without making claims about its effects on rebels' choice of military methods; by contrast, Biddle focuses on the effects of weapons on nonstate actors' positioning along the spectrum from "pure" guerrilla ("Fabian," to use Biddle's terminology) to "pure" conventional ("Napoleonic") warfare and does not examine effects on war outcomes.
4. A RAND Corporation's dataset includes a measure of "insurgents'… ability to maintain their tangible support (recruits, weapons and materiel, funding, intelligence, sanctuary)" (Paul et al. 2013, 6). However, the fact that this variable treats weapon availability as part of a bundle of resources makes it unsuitable for testing propositions specifically about the effects of guerrilla firepower.
5. The winning-by-not-losing logic is relevant to instances in which hit-and-run attacks enable guerrillas to survive while imposing casualties on COIN forces, even if insurgent strategic success only occurs once a third party defeats the incumbent in inter-state war (e.g., anti-German insurgencies during WWII).
6. Some studies use the terms "small arms" and "light weapons" interchangeably, while others use them to refer to weapons that can be carried by individuals and that can be transported on

light vehicles, respectively. For simplicity, we refer to both types of weapons as "small arms".

7. The automatic rifle's advantage in terms of rate of fire is only marginally offset by the reduced range and stopping power of its smaller round compared to previous rifles, as its power is sufficient for all practical purposes within ranges at which virtually all combat takes place (Chivers 2010, 161–169 and 198–199).
8. Since the prevalent type of warfare may vary over time within a conflict, Lyall and Wilson (2009) include only cases in which guerrilla fighting lasted longer than conventional fighting. Table A2 show that our key results are robust to excluding conflicts where it is unclear if rebels primarily used guerrilla, rather than conventional, warfare (see the appendix for a discussion of our procedure for examining warfare type, exclusion and inclusion criteria, the list of relevant cases, and detailed information for some examples of exclusion and inclusion decisions). We agree with Biddle's (2021) observation that a binary distinction between guerrilla and conventional warfare overlooks a great deal of multi-dimensional variation in military methods and that most real-world combat represents an amalgam of elements generally associated with the conventional and guerrilla archetypes. Thus, creating a large-N dataset with fine-grained information on the military methods of nonstate actors represents an important direction for future research. Nonetheless, we believe that cases where rebels primarily engage in hit-and-run attacks and avoid direct battle have sufficient similarities with one another (and corresponding differences with cases where rebels tend to behave otherwise) to warrant our focus on guerrilla warfare as a useful, albeit rough, approximation.
9. We dropped seven cases from Lyall and Wilson (2009) dataset due to insufficient information to code guerrilla firepower and four cases as they are duplicates of other COIN campaigns (see the appendix).
10. Chenoweth and Stephan (2011) and Friedman (2011), respectively, use the peak size of the opposition movement and the maximum size of security forces as independent variables in analyses of the determinants of strategic success in nonviolent resistance and counterinsurgency. While in principle peak levels of guerrilla firepower could correspond to extremely brief phases of the war, the peaks we identified often characterize insurgencies for much of their duration. This is unsurprising, given that the sources we used for coding generally aim to capture typical aspects of the conflict, including insurgents' weapons. See the appendix for more details.
11. For example, the Tigray People's Liberation Front, which would wound up as one of the best armed guerrilla organizations of the 20th century, initially had only four outdated rifles (Berhe 2009).
12. For an overview of weapons in the guerrilla arsenals, see Gander 1990. See the appendix for details on the coding procedure, information on sources, and examples of coding decisions.
13. If a long gun, say automatic rifles, was available to insurgents in a conflict but not used by most of them due to ammunition scarcity, we coded the guerrillas as armed with the long gun actually used by the typical fighter, say repeating rifles.
14. In cases of ambiguous evidence about the prevalence of different long guns, we opted to err on the side of disadvantaging our argument, coding the highest plausible level of firepower

for cases of insurgent loss/COIN victory and the lowest one in cases of insurgent strategic success. For example, since it is unclear whether the defeated Huk rebels in the Philippines primarily used repeating or semiautomatic rifles, we coded long guns as semiautomatic (a score of 4 out of 5).

15. Though not technically support weapons, we treat submachine guns as such because their limited range and stopping power, combined with high rate of fire, made them complements rather than substitutes for nonautomatic rifles, until automatic rifles made submachine guns largely obsolete for guerrillas.
16. If evidence indicates that the number of specific support weapons used by guerrillas remained extremely low (<5) throughout the war, we coded the corresponding dummy variable as 0.
17. See the appendix for details on the creation of Firepower. This variable reflects a compromise between nuance and pragmatic considerations of feasibility in coding variables for ten weapon types for hundreds of wars over two centuries. Thus, while WoW offers the most fine-grained cross-sectional information about guerrilla firepower among existing datasets, it does not capture all variation, such as differences between simple antiarmor weapons (e.g., RPG-7) and guided ones (e.g., Javelin) or advances in improvised explosive devices in recent decades (e.g., shaped charges). Furthermore, given the common conception of COIN as a competition for control of the local population where boots on the ground are crucial for incumbent victory, we focused on small arms used against ground forces and so WoW does not include data on man-portable air-defense system.
18. The simplified indicator for long guns ranges from 0 – cold weapons and muzzleloaders to 2 – semi- and automatic rifles – with an intermediate value of 1 for single-shot and repeating breechloaders.
19. Brant tests indicating that the parallel regression assumption is violated, however, caution against using ordered logistic models.
20. Due to data availability, we follow Lyall and Wilson (2009) in using per capita energy consumption as a proxy for economic development, instead of GDP per capita.
21. See the appendix for details on coding campaigns waged by colonial powers and foreign occupiers.
22. Including measures of guerrilla firepower and external support in the same model may cause post-treatment attenuation bias for the latter, as increased access to weapons is one of the channels through which external support affects COIN outcomes. When Firepower is dropped, the size of the coefficient for Aid indeed grows substantially (Table A5).
23. This variable is based on data from Correlates of War 2000b.
24. Table A6 shows that the effect of guerrilla firepower is robust to world-region fixed effects, too.
25. A possible interpretation of our null mechanization finding is that mechanization is a double-edged sword for counterinsurgents: on the one hand, mechanized forces have the potential of making counterinsurgency more difficult by limiting intelligence flows from civilians, as argued by Lyall and Wilson (2009). On the other hand, the enhanced force protection enjoyed by mechanized units may help counterinsurgents by decreasing their vulnerability to

guerrilla attacks. Thus, the fact that Mechanization does not reach statistical significance may be due to these two effects offsetting each other.

26. Considering that Troop Density is measured as COIN forces per 1000 local inhabitants, a shift from 200,000 to 400,000 troops (a large force size in absolute terms) in a country of 40 million would be associated with a decrease of about 1/3 of a percentage point in the probability of insurgent strategic success.
27. Results are robust to replacing rebel Strength with its component indicator for rebel fighting capacity and Territory with an indicator of the degree of effective territorial control (not shown for reasons of space).
28. Data from Fortna et al. 2018; Rustad and Binningsbø 2012.
29. Data from Lyall and Wilson 2009.
30. Data from Balcells et al. 2022; Kalyvas and Balcells 2010.
31. Data from Banks and Wilson 2021.
32. Data from ibid.

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