This paper examines why decision makers often struggle to evaluate strategic progress, especially in armed conflict. Conventional wisdom (including prominent literatures on optimal stopping, bandit problems, and the bargaining model of war) holds that the longer decision makers go without achieving their objectives, the more pessimistic they should become about their ability to do so, and the more likely they should be to change course. This paper challenges those ideas and explains why we should often expect the very opposite. Theoretical crux of the argument is that standard models of learning and adaptation revolve around the assumption that decision makers are observing repeated processes with dynamics similar to slot machines and roulette wheels – but in war and other contexts, decision makers confront cumulative processes that have a very different logic for how rational actors should form and revise their expectations. Understanding this logic can shed light on theoretical frameworks, ongoing policy debates, and salient historical experience. The core empirical component of this paper evaluates U.S. military strategy during the American Indian Wars, where it is possible to examine commanders’ expectations against a relatively large body of objective empirical evidence, including original, event-level data spanning more than one hundred Native American tribes. The paper closes by discussing implications for understanding and combating strategic inertia in national security and decision making more generally.

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HOW CUMULATIVE DYNAMICS AFFECT MILITARY DECISION MAKING

When Barack Obama began withdrawing soldiers from Afghanistan in 2011, he was harshly criticized by those who believed he was removing crucial forces on the cusp of success. He was also challenged – and just as harshly – by critics making the exact opposite argument, saying that the war was a lost cause and so the troops should come home even sooner. Ten years into the longest war in U.S. history, officials, experts, and the general public were still not remotely close to consensus when it came to estimating how much longer it might take and how much more it might cost to defeat (or otherwise contain) the Taliban.

This kind of strategic inertia, in which public debates do not converge and public policies do not change, is one of the most common themes in scholarship on international security. Why did Germany take so much time to moderate its demands in World War I? Why did Japan not admit defeat earlier in World War II? Why did the Bush administration struggle to recognize the challenges it faced in Iraq, and why did the Johnson administration struggle to recognize the challenges it faced in Vietnam? The notion that leaders make mistakes is not necessarily surprising – much more concerning, perhaps, is how they often seem to find it so difficult to realize and correct those mistakes, and that they often stick to unsuccessful strategies for so long.

Political scientists and historians typically assume that this behavior represents organizational behavior,¹ domestic politics,² or psychology³ leading policymakers to act against the national interest. This paper does not challenge the notion that these are important issues, but it does

explain why strategic assessment involves genuine analytic challenges that scholars often overlook. The prevailing theoretical wisdom holds that the longer rational decision makers go without achieving their objectives, the more pessimistic they should become about their ability to do so and the more likely they should be to change course. This paper challenges those ideas, and explains why we should often expect the very opposite.

The theoretical crux of this argument is that many existing models of learning and adaptation revolve around the assumption that decision makers are observing repeated processes with dynamics similar to slot machines or roulette wheels – but in war and other contexts, decision makers often confront cumulative processes that have a very different logic for how people should form and revise their expectations. Section 1 draws this distinction and then Section 2 shows how relatively simple premises about the cumulative dynamics of armed conflict generate surprising predictions, explaining why rational decision makers might actually become more optimistic about their ability to achieve their goals, even as they continually fail to do so. Section 3 shows how this theoretical framework sheds new light on salient experience by examining U.S. military strategy in the American Indian Wars, a context chosen because it provides a rare opportunity to evaluate decision makers’ expectations against a relatively large body of objective empirical evidence. Section 4 concludes by discussing broader implications for understanding and combating strategic inertia in national security and decision making more generally.

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Section 1. Conceptual Foundations
Repeated Processes, Cumulative Processes, and Military Decision Making

The standard theoretical framework that political scientists use to model the way that decision makers form and revise their expectations in armed conflict comes from the literature on informational asymmetries and the “bargaining model of war.” This framework assumes that combatants enter conflict with uncertainty about their opponents’ capabilities and resolve. These factors determine a combatant’s overall “type,” which dictates the chances that they will be defeated in each “round of fighting.”\(^5\) Strong types are less likely to be defeated than weak types.

A common and important assumption, displayed in the top panel of Figure 1, is that the probability of defeating an opponent remains the same in each round of fighting, either in individual battles,\(^6\) or in the war as a whole.\(^7\)

This framework produces an important result, which is that war provides information that helps to reveal a combatant’s type. After each round of fighting concludes without inducing defeat, rational decision makers should become more likely to think that they are facing a strong opponent.\(^8\) This leads to the kind of gradual, monotonic learning process represented in the bottom panel of Figure 1. And this learning process is theoretically significant: it indicates that as combatants fight without achieving their objectives they should become more pessimistic about their ability to do so, and thus they should also become more amenable to compromise. As Alastair Smith and Allan Stam explain, “The act of waging war reveals information about the relative strengths of each side. As a war progresses, each side’s beliefs about the likely outcome

\(^5\) The term “round of fighting” is more conceptually precise than talking about a war’s “duration” since many armed conflicts contain protracted periods where fighting does not occur.


\(^8\) Slantchev 2003: 627 observes that almost all formal models of coercive bargaining with asymmetric information exhibit the “screening property” discussed here.
Figure 1. Armed Conflict as a Repeated Process

Figure 1 represents the standard framework for modeling the way that decision makers form and revise expectations in war. The top panel represents the assumption that an opponent’s “type” dictates their probability of being defeated in each round of fighting. Because those probabilities are different and repeated, each round of fighting provides “type-separating information” leading to the gradual learning process shown below. Decision makers begin with some prior probability about the likelihood that they are facing a strong type, and every time a round of fighting concludes unsuccessfully, a rational decision maker can use Bayes’ rule to revise that probability upward.
of continuing the war converge. Once the warring parties’ beliefs have converged sufficiently, they can find a bargained solution to the conflict.”

This is one of the best-known and most widely-taught insights to emerge from contemporary formal theory on international security.

The way that combatants resolve uncertainty in the bargaining model of war resembles learning in broader fields such as optimal stopping, bandit problems, sequential analysis, and statistical decision theory. These literatures capture the way that decision makers learn about repeated processes which produce outcomes that are independent and identically distributed. Both contain many applications to gambling. The name “bandit problems,” for instance, comes from the example of a gambler playing a slot machine (colloquially known as a “one-armed bandit”), who is attempting to determine the machine’s payoff function by playing the game and observing its results. Because a slot machine’s payoff probabilities are fixed and repeated, players should be able to form increasingly accurate expectations over time about what those probabilities are. A rational gambler would presumably not begin playing a slot machine unless she believed that it offered an acceptable rate of return – but as she continues to play without winning, she will be more likely to infer that the machine has a low probability of paying off. At some point she may decide that this machine is not as good a bet as she initially thought, and she would stop playing it.

This is a reasonable analogy for conventional models of rational learning in war, and thus it is worth pointing out how scholars who initially developed theories of learning about repeated

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9 Smith and Stam 2004: 783. Cf. Reiter 2003: 31, “Combat can reduce uncertainty by providing information about the actual balance of power…. The outcome of combat is observed by both sides and should cause their expectations to converge regarding the likely outcomes of future combat. This increases the likelihood of reaching an agreement that both sides prefer over continued fighting.” Or Filson and Werner 2002: 820, “War itself provides the information necessary for disputants to reach a settlement to end the war.”
processes stressed that they had limited practical relevance. For instance, Lester Dubins and Jimmie Savage based their seminal book around the example of a gambler who arrives at a casino aiming to make a certain amount of money, and must determine which bets are optimal for this purpose.\(^\text{10}\) On the first page, they explained that “The fantasy with which we have introduced the general problem of optimal gambling systems has no immediate practical importance.” They instead motivated their assumptions based on precedent (“the probabilist’s tendency to invoke gambling imagery”) and theoretical interest (“the problem, once proposed, cries out for attention as pure mathematics”).\(^\text{11}\)

One could justify the value of existing formal theory on learning and adaptation in war on similar grounds, but it is hard to claim that military decision makers do (or should) view wars as repeated processes like games in a casino. Take, for example, U.S. officials during the war in Vietnam. Even among those officials who were optimistic about U.S. strategy, few believed there was a significant chance of succeeding in the short run. When the Johnson administration approved the Rolling Thunder bombing campaign in 1965, Secretary of Defense Robert McNamara explained that among senior decision makers, “none of them expects the [Viet Cong] to capitulate or to come to a position acceptable to us, in less than six months.”\(^\text{12}\)

\(^\text{10}\) These dynamics are quite similar to models of the bargaining model of war in which a combatant must win a certain number of battles (or capture a certain number of “objectives”) in order to defeat its opponent strategically.

\(^\text{11}\) Dubins and Savage 1965/76: 1, vii. Similarly, when discussing models of learning in statistical decision theory (which also generally revolve around the notion that observations are independent and identically distributed), von Winterfeldt and Edwards write that “We know of no real-world nonscientific contexts in which inferences must be made that fit any one of these… assumptions” (1986: 172). This is an overstatement, as models of optimal stopping are regularly used to model options pricing, job searches, and home-selling; but the point remains that one should be skeptical of the notion that the dynamics of decision making can be accurately represented with repeated processes.

Secretary of State William Bundy estimated that “we may have to hang on quite a long time before we can hope to see an improving situation in South Viet-Nam.”\(^{13}\) When the Joint Chiefs of Staff recommended a bombing escalation in 1968, they warned that “it is not anticipated that this impact will be immediately apparent.”\(^{14}\) When national intelligence estimates predicted the impact of ground force commitments, they typically stated that these escalations would not cause the communists to buckle immediately. “The real test,” according to one estimate, “would be that of combat,” and it was only if “the tide of battle runs against the Viet Cong for a substantial period” that the communists might possibly resort to negotiations.\(^{15}\)

U.S. officials in Vietnam did not believe that the war they were fighting was a repeated process; they did not assume that the probability of defeating their opponent was the same in one round of fighting as it was in the next. Instead, they saw the war as a *cumulative* process, in which they were attempting to push their opponents progressively closer to a point where they could no longer continue to resist. In discussing the ground war with the Viet Cong, U.S. officials often spoke of reaching a “crossover point” where insurgents would start to incur more losses than they could replace. In discussing the bombing of North Vietnam, officials often discussed pushing Hanoi past its “breaking point.” Similar language recurs widely in debates about military strategy and national security. In 2005, Secretary of Defense Donald Rumsfeld characterized the “key question” in Iraq as “when there will be a clearly discernible ‘tipping

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point’” where the local population would side with the central government. Secretary of State Henry Kissinger wrote in his memoirs that “In every crisis, tension builds steadily, sometimes nearly unbearably, until some decisive turning point.” Cumulative dynamics play a key role in Carl von Clausewitz’s seminal study of Napoleonic warfare, in which a central idea is that every offensive campaign builds towards a “culminating point” and thus one of the key characteristics of a successful general is the ability to “detect the culminating point with discriminative judgment.” And when Lord Simon (Britain’s Chancellor of the Exchequer in the late 1930s) described the arms race with Germany, he compared Britain to a “runner in a race who wants to reserve his spurt for the right time, but does not know where the finishing tape is.” This metaphor nicely captures the central challenge of assessing cumulative processes, in that even when decision makers believe that it is possible to achieve a desired objective, and even when they believe that are making progress toward doing so, they may not necessarily know how long it might take or how much it might cost to get there: the location of the “finishing tape,” however that goal is defined, can be hard to predict.

There are also theoretical reasons to question the idea that war is a repeated process. Scholars generally see the basic purpose of military strategy as being to alter an opponent’s cost-benefit analysis. Clausewitz wrote that “if the enemy is to be coerced you must put him in a situation that is even more unpleasant than the sacrifice you call on him to make.” Thomas Schelling wrote that “coercion requires finding a bargain, arranging for [an opponent] to be better off doing

16 Rumsfeld, “Progress in Iraq,” Memorandum to the President, 29 Nov 2005.
17 Kissinger 1979: 1193.
18 Book VII, Chapter 5. Clausewitz’s On War is full of references to cumulative dynamics. For instance, in Book IV, Chapter 7, he writes that “Losing an engagement [is] like the gradual sinking of a scale…. Every engagement is a whole, made up of subsidiary engagements that add up to the overall result.” And in Book IV, Chapter 9: “The course of battle [is] a slow process of mutual attrition that will reveal which side will first exhaust its opponent.”
19 The quote is from Cabinet minutes cited in Walt 1992.
what we want.” Robert Pape states that “The problem in coercion is to persuade the target state that acceding to the coancer’s demands will be better than resisting them.” The bargaining model of war is itself based on a similar logic: as Branislav Slantchev writes, the most important function of fighting is “to convince the opponent to accept a settlement. This happens after opponents learn enough about their prospects in war to decide that continuation is unprofitable.”

Yet before a combatant decides that continuing the war is unprofitable, there is no reason to expect them to concede. One would expect a rational opponent to continue resisting until and unless their expected net present value of continuing the war became negative, relative to other options. U.S. decision makers in Vietnam discussed the situation in similar terms. U.S. Ambassador to Vietnam Maxwell Taylor, for instance, explained that the goal of bombing the North was to “convey signals [to Hanoi] which, in combination, should present to DRV leaders a vision of inevitable, ultimate destruction if they do not change their ways.”

As the quotes above explain, however, this by no means implied that there was a significant probability of success in the early rounds of fighting: it might take a substantial period of time in order to cause the communists to revise their perceptions enough to induce concessions.

Figure 2 thus presents an alternative way of conceptualizing a combatant’s “type” that is more consistent with the cumulative dynamics of armed conflict. As shown in Figure 2, stronger opponents can withstand combat longer, but even “weak types” should be able to conduct some

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20 Clausewitz 1832: 75; Schelling 1966: 8; Pape 1996: 15; Slantchev 2003: 621.
21 In principle, combatants might be able to learn about their opponents from the way they revise their demands; but Fearon 2007 explains why there is no reason to assume this, especially given combatants’ incentives to avoid revealing their types at the bargaining table.
Figure 2. Armed Conflict as a Cumulative Process

Figure 2 shows how seeing war as a cumulative process suggests a very different logic for how decision makers should form and revise their expectations. Rather than viewing the odds of defeating an opponent as being fixed and repeated across rounds of fighting, the top panel shows how both “strong” and “weak” opponents should both be able to resist defeat in the conflict’s early stages. Thus up until round $W$, in which a weak opponent will be defeated, fighting does not provide type-separating information. The bottom panel shows how this produces a learning process that starkly differs from the conventional wisdom: up until round $W$, decision makers cannot revise their prior assumptions about the likelihood that they are facing a strong opponent.
amount of fighting without being defeated. This is also a stylized way to think about the issue – but it is no more stylized than existing models, and this section has offered both inductive and deductive reasons why this assumption may be more viable than the underpinnings of standard, alternative frameworks.

Figure 2 also shows how the new framework produces a learning process that is very different than the one proposed in the standard literature. Because both strong and weak types can withstand some initial rounds of fighting, those rounds do not provide type-separating information. The updating process in this model is therefore discontinuous – there is a point at which decision makers will be able to rule out the notion that they are facing a weak type, but otherwise they should not have the ability to revise their prior assumptions. This demonstrates how seeing war as a cumulative process provides a clear point of departure from existing theory on learning and adaptation in war. The next section fleshes out this framework, showing how it can lead to potentially surprising predictions that differ starkly from conventional wisdom.

Section 2. Theoretical Argument
Forming and Revising Expectations

A model with only two kinds of opponents is overly simplistic, of course, and this section expands the discussion to cover more general conditions. While military decision makers almost never discuss their expectations using the kind of explicit logic developed below, this articulation serves two key purposes. The first is to make clear exactly why it is that basic premises about the cumulative nature of armed conflict can lead to potentially counterintuitive conclusions about learning and adaptation. The second is to explain just how broadly these conclusions might hold. We will see that there are a wide range of conditions under which decision makers might
rationally become more optimistic about their ability to achieve their goals, even as they continually fail to do so. In fact, this section explains why scholars must impose special theoretical or empirical assumptions in order to obtain any other result.

The linear case

To begin with a simple case, consider what happens if decision makers enter conflict with a “flat prior” about how long it might take or how much it might cost to achieve their goals: in armed conflict, this is to say that decision makers believe it is equally likely that their opponents will be able to resist defeat for one round of fighting, for two rounds of fighting, or any other number out to some theoretical maximum, \(x_{max}\). (It is important to define a theoretical maximum here or else the expected duration of the war would be infinite; as shown below, it is not necessary to specify maxima for other distributions.) In this case, we can define the Expected Total Cost (ETC) of fighting as the number of rounds that the average opponent could withstand. We can express this quantity as \(ETC = \frac{x_{max}}{2}\). Figure 3 demonstrates that this is simply the midpoint of the range of possible opponent types.

Now consider what happens after combatants have already conducted a certain number of rounds of fighting, denoted \(x'\). Decision makers can now rule out the notion that they are facing an opponent who is weak enough to be defeated already – but since all remaining types would have held out thus far, it is not possible to distinguish among them. Conditional on having fought for \(x'\) rounds, a rational decision maker could thus re-estimate Expected Total Cost as \(ETC(x') = \frac{x_{max} + x'}{2}\). Expressed visually in Figure 3, this corresponds to the midpoint of the remaining range of opponent types.
Figure 3 represents the way that decision makers should form and revise their expectations about the expected total and remaining costs of defeating their opponents, in cases where these decision makers begin with a “flat prior” where they believe it is equally likely that their opponents can hold out for one round of fighting, two rounds of fighting, or any other number of rounds out to some theoretical maximum. The key takeaway is that Expected Remaining Cost will continually decline – this is exactly the opposite of the conventional wisdom.

This is not the quantity of interest, however. Keep in mind that Expected Total Cost represents the total amount of fighting that the opponent can be expected to withstand. By this point, however, combatants have conducted a portion of that fighting already. Since those costs are sunk, the quantity of interest is the Expected Remaining Cost (ERC) of fighting, which we can express as $ETC(x') - x' = \frac{x_{\text{max}} - x'}{2}$. The key takeaway is that Expected Remaining Cost is strictly decreasing. Thus the longer combatants fight without achieving their objectives, the more optimistic they should become about their prospects moving forward.

A flat prior is obviously a highly stylized way to represent decision makers’ assumptions, but it also theoretically significant, as it reflects a state of total uncertainty about an opponent’s capabilities and resolve. This discussion thus demonstrates that absent specific assumptions about which types of opponents are more common than others, the prediction for how rational
decision makers should update their views as a result of observing battlefield outcomes is exactly
the opposite of the conventional wisdom.

The general case

To extend the framework more generally, we can say that a decision maker’s subjective
probability that an opponent will be defeated in the $x^{th}$ round of fighting is $p(x)$.\textsuperscript{23} The decision
maker’s initial expectation of how many rounds of fighting it will take to achieve their strategic
objectives will then be $ETC = \int_0^\infty p(t) \cdot dt$. After fighting for $x'$ rounds, the new Expected
Total Cost will be $ETC(x') = \frac{\int_x^{\infty} p(t) \cdot dt}{\int_0^{\infty} p(t) \cdot dt}$. (The numerator in this expression truncates the prior
distribution, ruling out the possibility that the decision maker is facing an opponent that is weak
enough to have been defeated already. The denominator reweights the remaining probabilities
such that they sum to 1.) Backing out sunk costs, Expected Remaining Cost is thus $ERC(x') =
\frac{\int_x^{\infty} p(t) \cdot dt}{\int_0^{\infty} p(t) \cdot dt} - x'$.

\textsuperscript{23} It is worth repeating that military decision makers almost never make these sorts of
expectations explicit, it is nevertheless often possible to describe such views qualitatively. Before
the 2003 invasion of Iraq, for instance, Secretary of Defense Donald Rumsfeld wrote a
memorandum outlining “potential problems to be considered and addressed” in relation to the
coming war. One of the concerns he raised was that “Rather than having the post-Saddam effort
require 2 to 4 years, it could take 8 to 10 years, thereby absorbing U.S. leadership, military, and
financial resources” (“Iraq: An Illustrative List of Potential Problems to be Considered and
Addressed,” 15 October 2002). This is a rough way of stating a prior assumption about how long
it might take and how much it might cost in order to achieve U.S. objectives in Iraq. The memo
indicates Rumsfeld’s belief that the most likely scenario was that the post-invasion occupation
would not last long (two to four years) but that there was a chance of the mission dragging on
much longer than that (eight to ten years). It is also well-known that several administration
officials held out hope that U.S. forces would be “greeted as liberators” and so there would be
little need for a protracted occupation at all. It is thus possible to gain at least a rough sense of
decision makers’ degrees of belief in different possible outcomes. The purpose of this section is
to demonstrate how these beliefs matter when it comes to learning and adaptation in war.
This expression is useful, because we can take its derivative with respect to $x'$, and thereby determine the range of cases where a rational decision maker would become more optimistic or more pessimistic while attempting to achieve a desired goal. It turns out that the range of cases where decision makers become more optimistic is fairly broad.

For example, the normal distribution is probably the most common tool that scholars use to define prior expectations. Yet when decision makers have normally-distributed priors about their opponent’s potential type, then Expected Remaining Cost will always decline. Figure 4 shows
this graphically. The prior assumption about the distribution of potential opponent types is represented by the shaded density function. The x-axis represents rounds of fighting; as those rounds of fighting proceed, the solid and dashed lines in Figure 4 show the way that a rational decision maker will form new estimates of Expected Total Cost and Expected Remaining Cost. The key takeaway from this figure is that Expected Remaining Cost continuously falls. This will be the case for all normal distributions, regardless of their parameters.\textsuperscript{24}

It is worth considering several other ways to model the distribution of opponents’ potential types. Figure 5 presents the logistic, Laplace, gamma, and exponential distributions. These distributions have different shapes and they are used for different purposes, yet each produces a similar result: Expected Remaining Cost never increases, giving rational decision makers no reason to become more pessimistic about their policies based on how much they have already invested in trying to achieve their intended goals.

The exponential distribution is an important case: as shown in Figure 5, Expected Remaining Cost would be the same in every round of fighting if decision makers believed opponents’ potential types were distributed exponentially.\textsuperscript{25} This gives a more general result, which is that Expected Remaining Cost can only rise when a decision maker expects that the distribution of opponent types has “fatter tails” than the exponential. In probability theory, this is the definition

\textsuperscript{24} Expected Total Cost under normally distributed expectations can be expressed as the first moment of a truncated normal, which is the sum of a constant $\mu$ and the Inverse Mills Ratio. Thus, $ERC(x')$ can be expressed as $\mu + \lambda(x') - x'$, where $\lambda(x')$ is the Inverse Mills Ratio evaluated at $x'$. A known property of the Inverse Mills Ratio is that $\lambda(x')$ is always between 0 and 1. Thus $dERC/dx'$ is always between -1 and 0.

\textsuperscript{25} The exponential’s probability density function is $f(x) = \lambda e^{-\lambda x}$ and its cumulative distribution function is $F(x) = 1 - e^{-\lambda x}$. This means that $ERC(x') = \frac{\int_{0}^{x'} f(t) \, dt}{1 - F(x')} - x' = \frac{\frac{1}{\lambda} - e^{-\lambda x'} \left( -e^{-\lambda x'} - 1 \right)}{e^{-\lambda x'}} - x' = \frac{1}{\lambda} \left[ 1 + \lambda x' \right] - x' = \frac{1}{\lambda}$. Since this is a constant, it follows that $dERC(x')/dx' = 0$. Probability theorists refer to this property of the exponential distribution as “memorylessness.”
Figure 5. Expected Total/Remaining Cost Across Additional Distributions

Figure 5 shows how decision makers’ prior expectations about the distribution of opponent types (shown here by the gray areas representing the chances that an opponent will be defeated in each round of fighting) affect the way that they should revise their expectations about Total and Remaining Costs as fighting proceeds. Expected Remaining Cost can only increase if the decision maker’s prior expectations fall into the class of “heavy-tailed distributions.”
of a “heavy-tailed distribution.” Some examples include the Weibull distribution and the lognormal distribution – these are shown in at the bottom of Figure 5, and in these graphs, Expected Remaining Cost does indeed increase at certain points. Yet the bottom of Figure 5 shows that with a heavy-tailed distribution like the lognormal, it may take a significant period of time before Expected Remaining Cost begins to rise, and longer still before it rises enough to exceed its original value. Even here, rational combatants might conduct a substantial amount of fighting before they became more pessimistic about the prospect of achieving their goals relative to their expectations when the war started. Until this happens, there is no reason to expect that they would wish to alter or abandon their chosen strategies.

Applications to actual data

Discussing theoretical probability distributions helps to establish basic conceptual properties of learning and adapting to cumulative processes, but how does this framework relate to actual empirical patterns? Figure 6 addresses this question by demonstrating how the expected total duration and the expected remaining duration of wars evolve over time given commonly-used data on four different kinds of armed conflict.26

In each of the four panels of Figure 6, shaded bars represent the percentage of wars that terminate in a given year of fighting. The solid lines capture how many years a randomly-selected war in each category would be expected to last, conditional on already being active for a certain period of time. The dashed lines then present the conditional expectation of how much

26 Data from Correlates of War (Sarkees and Wayman 2012). “Extra-state wars” occur between a recognized state and a nonstate entity outside its borders. “Non-state wars” occur when no combatant is recognized as being a state entity. All four data sets span 1816-2007.
Figure 6. Expected Total/Remaining Duration Across Empirical Distributions of Conflict

Inter-State Wars

Intra-State Wars
Figure 6 (continued). Expected Total/Remaining Duration Across Empirical Distributions of Conflict

**Extra-State Wars**

![Graph showing expected total and remaining duration for Extra-State Wars](image)

**Non-State Wars**

![Graph showing expected total and remaining duration for Non-State Wars](image)
time remains in a randomly-chosen conflict. Since we are dealing with observed data in these figures, the patterns are neither smooth nor monotonic; moreover, duration is obviously a rough measure of just how much fighting or expense a war entails. But consistent with the argument laid out in this section – and contrary to existing theoretical frameworks – these graphs indicate that the expected amount of fighting that remains in a conflict does not strictly increase in expectation as these conflicts unfold. For inter-state wars, expected remaining duration is in fact almost strictly declining. For the other forms of violence the pattern is mixed, but it certainly does not support the widely-held belief that the longer a war has lasted already, the longer we should expect it to continue moving forward.

*Summary of the theoretical contribution*

To summarize the argument up to this point, this paper described the standard theoretical framework for capturing the way that rational decision makers form and revise their expectations in armed conflict; showed how this framework relied on the assumption that war is a repeated process; replaced that assumption with an alternative way of conceptualizing opponent types that is more consistent with the notion that war is a cumulative process; and showed how this change resulted in theoretical predictions that are in some cases the very opposite of what conventional wisdom expects. In particular, the framework developed here challenges the common idea that rational decision makers should become more pessimistic about their policies as they fail to achieve their intended goals. There are in fact a wide range of conditions under which we should expect the very opposite. Those conditions include some of the most common theoretical assumptions that scholars use to model uncertainty, as well as assumptions shaped by the actual empirical distributions of inter-, intra-, extra-, and non-state armed conflicts.
Another important point is that the way decision makers should revise their expectations when observing cumulative processes is contingent on their prior assumptions. Here again, the framework developed in this paper departs from conventional wisdom. By assuming that war is a repeated process in which every round of fighting is independent and identically distributed, existing scholarship essentially assumes that trial-and-error will cause rational decision makers to converge on common beliefs. When viewing war as a cumulative process, this is not the case: decision makers’ initial expectations will fundamentally shape the way they will perceive their prospects, even after many rounds of fighting have transpired.

Rethinking theoretical conceptions of how decision makers should learn and adapt sheds light on prominent puzzles in current scholarship. For example, one of the most significant gaps in the literature on uncertainty and coercive bargaining is that it cannot explain protracted conflict. Iraq, Afghanistan, Vietnam, Korea, the World Wars: all of these cases involved extended periods of strategic inertia that constitute what Robert Powell calls an “analytic blind spot” for rationalist theories of learning.27 This paper has sought to make clear, however, that this gap largely results from the conventional assumption that war is a repeated process. This assumption is difficult to defend, and once it is relaxed, then our baseline conceptions of how rational actors should learn and adapt in armed conflict become very different.

Theoretical lenses similarly shape the way that scholars evaluate salient cases. For example, a prominent book by H. E. Goemans examines military decision making in World War I, asking why Germany fought for so long, even increasing its strategic demands as the conflict dragged

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27 Powell 2006: 175. There are other rationalist explanations for protracted conflicts (especially commitment problems that prevent combatants from agreeing to a deal that they would otherwise prefer); but since these models do not involve uncertainty, they fall outside the scope of this paper (and also outside the models of learning and adaptation to which Powell refers in this quote).
on. Goemans explains that traditional models of rational strategic assessment cannot account for this behavior, and so he argues that we should instead look to how institutional features of Germany’s politics could have led its leaders to behave so strangely. Broadly speaking, however, this section has shown why we do not need to invoke theories of organizational structure, domestic politics, or psychology in order to explain why military leaders often find it so difficult to realize and correct their strategic mistakes. We may often be able to explain this behavior simply by taking a careful look at the cumulative dynamics of armed conflict and understanding how they differ from other phenomena. The next section will go on to provide a more extensive demonstration of how this idea can serve to challenge conventional assessments of salient cases by examining U.S. military behavior in the American Indian Wars.

Section 3. Empirical Application: Persistent Misperception in the American Indian Wars

From the founding of Jamestown in 1607 to the Battle of Wounded Knee in 1890, British colonists and U.S. citizens were in continual conflict with native tribes. Today the American Indian Wars receive relatively little attention from political scientists, but they occupied the U.S. and British Armies for centuries while shaping the “American way of war.” These conflicts also provide an especially useful body of experience with which to study strategic assessment, because it is possible to take commanders’ stated expectations and evaluate them against a relatively large body of objective empirical evidence.

28 “Over time, combatants must come to agree on their relative strength and resolve because the mechanisms that prevent such agreement before war cannot sustain prolonged fighting.” Goemans 2000: 30.
29 Following scholarly convention, this paper will refer to the period as the “American Indian Wars” and otherwise use the terms “American Indian” and “Native American” interchangeably.
Overview

Throughout the American Indian Wars, U.S. and British commanders generally articulated their strategies in terms of coercive punishment: they believed that if they could inflict enough costs upon the tribes, then their opponents would conclude that it was not in their interest to continue resisting. These commanders often struggled, however, to estimate how long it might take or how much it might cost to achieve their objectives. When the U.S. Army went out to fight the Sioux and Cheyennes in 1876, for example, Lieutenant General Philip Sheridan (commanding the Division of the Missouri) discussed “the impossibility of any large number of Indians keeping together as a hostile body for more than one week.” Alfred Terry (commanding the Department of Dakota) wrote “I have no doubt of the ability of my column to whip all the Sioux whom we can find.” George Crook (commanding the Department of the Platte) expected to “strike a blow at once which will demoralize the savages from the start.” Of course, this campaign transpired very differently. In June, the Seventh Cavalry under George Custer attacked Sitting Bull’s main force at Little Bighorn and the result was one of the U.S. Army’s most historic defeats: Custer was killed and five of his companies were wiped out entirely.

31 For example, celebrated frontier commander George Crook famously stated that, sometimes, “there was nothing else to do but go out and kill them until they changed their minds.” Chapter 4 of the author’s dissertation shows how U.S. and British officers held similar views in a wide range of cases. Schelling 1966 uses the American Indian Wars as an archetypal example of coercive punishment in his famous book on that subject.

32 Sheridan to Terry, 16 May 1876; Terry to Sheridan, 16 May 1876; Crook interview with Denver Rocky Mountain News, 23 Feb 1876. See Gray 1976: 45, 90 and the documents appended to the Secretary of War’s 1876 report to Congress: these include Sheridan’s Report of Lieut. Gen. P. H. Sheridan (Headquarters, Military Division of the Missouri, 25 Nov 1876), where he recollects that Terry believed a “quick movement… might be decisive”; and Crook’s recollection, even after the fact (Report of General Crook, Headquarters, Department of the Platte, 25 Sep 1876) that “I did not ask for reinforcements because I felt that we were abundantly able to take care of ourselves.”
If commanders entered warfare against the tribes with these sorts of misperceptions, they often exhibited remarkable difficulty in adapting to unexpected events. The Second Seminole War is perhaps the clearest example. From the start of the war in 1835, more than 90 percent of Seminoles in Florida were either killed, captured, or forcibly relocated and yet the remainder continued to fight until President Tyler ordered a unilateral ceasefire in 1842. The conflict was politically embarrassing and financially draining, it killed more U.S. servicemen than the first decade of the War in Afghanistan, and militant Seminoles literally lived to fight another day – thirteen years later the U.S. Army would be summoned to fight a Third Seminole War.

Yet despite the fact that the Seminoles proved to be one of the most resilient insurgencies in history, U.S. commanders were consistently optimistic about their prospects for terminating the conflict in short order. In December 1835, Secretary of War Lewis Cass reported that while some of the Seminoles were preparing to resist relocation, “They will, probably, when the time for operations arrives, quietly follow their countrymen.” When hostilities did in fact break out, the War Department expected a quick fight, relying on militia who were only mobilized for a three-month term of service. Winfield Scott took command of forces in Florida with a plan for using three columns to surround his opponents such that they would be “hemmed in and captured,” estimating that he would need just twelve days to do this.

33 1,535 members of the U.S. Army and Navy were killed in the Second Seminole War (out of a total of 10,169 who served in Florida, for an attrition rate of 15 percent). In addition, 55 militia members were killed in action, and far more volunteers presumably died from wounds or sickness. Mahon 1961: 325. By comparison, 1,446 U.S. soldiers died in Afghanistan between 2001-2010, out of roughly one million who served in that country.
35 This is how Scott described his strategy, even after the fact, in his 1864 memoirs; cf. Sprague 1848: 115.
36 Cohen 1836: 230.
Over the next six years the Seminoles continually frustrated this kind of “column and detachment” strategy, but the U.S. Army rarely attempted to alter its playbook.\(^{37}\) Richard Call succeeded Scott as commander of the Army of the South. His columns and detachments failed, too, but the prevailing view was that this was because Call was “insufficiently vigorous” in directing them – so Call was replaced by Thomas Jesup, who received the standard instructions, along with the expectation that “should you succeed in bringing the Indians to a general engagement, and in defeating them therein, the ready submission of the tribe may probably be expected.”\(^{38}\) In spring 1837, Jesup reported that he had the Seminoles located and surrounded, that he had induced their leaders to capitulate, that “the war is no doubt ended,” and that “there is no danger of a renewal of hostilities.”\(^{39}\) The War Department issued orders for withdrawing the majority of Army forces from Florida. But by June, the war was back in full swing. In total, the conflict would drag on through seven commanding generals, five secretaries of war, and three presidents, most of whom repeated this pattern of unfulfilled optimism.\(^{40}\)

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\(^{37}\) Scott argued that his strategy was sound, and that he had only failed as a result of starting the campaign too late in the fighting season, together with poor coordination and supply. A court of inquiry agreed with Scott’s assessment, saying that the “plan of campaign was well devised.” See the relevant documents in Sprague 1848: 114-157.

\(^{38}\) Butler to Jesup, 4 Nov 1836 (\textit{ASP} VI §716, VII §760). The specific charge against Call was that after locating a large body of Seminoles at Withlacoochee, he refused to pursue them across a stream that appeared too deep to ford, but later proved passable.

\(^{39}\) Jesup to War Department, 7 Feb 1837, 6 Mar 1837, 26 Mar 1837, and 5 May 1937 (\textit{ASP} VII §760).

\(^{40}\) As frontier historian Francis Prucha describes it: “One commander after another tried his hand at bringing the embarrassing affair to a successful conclusion, yet the war dragged on, despite optimistic announcements from the commanding generals and the War Department, which periodically proclaimed that the war had finally been brought to an end”(1969: 268).
Case selection and methodology

Why did these commanders have so much difficulty forming and revising their expectations? Attempting to explain this behavior with a theory that characterizes rational decision making is a tough test for establishing the utility of the conceptual framework advanced in this paper. This is especially true since the experience is typically seen as being relatively easy for alternative, nonrational theories to explain. Custer, for instance, had a legendary flair for risk-taking, which many scholars have attributed to hubris, insubordination, or desire for public acclaim. Scott was a prominent proponent of Napoleonic warfare, which historians have argued may have shaped his insistence on conventional strategy in the Florida War. Developing a plausible explanation for how U.S. Army commanders in these conflicts may have had a much more rational basis for their actions and expectations than is commonly believed thus runs against the weight of conventional wisdom. The notion that many written records of the period might also be biased in favor of optimism (especially by commanders seeking to maintain troops’ morale or to boast of their own abilities) makes it even harder to think that these statements might be plausibly consistent with rational beliefs.

The most important methodological justification for focusing on the American Indian Wars, however, is that these conflicts offer a relatively large cross-section of experience with a relatively high degree of unit homogeneity. In total, U.S. and British forces fought against more than one hundred different Native American tribes. Most tribes fought in reasonably similar ways. These tribes fought against either of two opponents (the U.S. or the British Armies). In

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41 McGinnis 2012 explains the importance of viewing the American Indian Wars against the backdrop of centuries of intertribal warfare. This experience developed strong cultural constraints on the way that the tribes organized themselves for fighting and the tactics they used to do so. McGinnis 2011 contains an extensive review of relevant literature.
almost all cases, the stakes were the same, with the U.S. and British attempting to stop the tribes from raiding and to eject them from contested territory. In every instance, the U.S. and British ultimately succeeded in achieving those objectives – by the end of the nineteenth century, even the most resilient tribes had been coerced into reservation life.\textsuperscript{42}

Of course, this is not to say that the American Indian Wars were literally identical – the point is that, relatively speaking, these units of analysis are much more comparable than those in most existing data sets on interstate wars, civil wars, insurgencies, or other kinds of political violence.\textsuperscript{43} To be specific, this analysis draws on original data that aim to capture a reasonably comprehensive sample of armed encounters between the United States (or, prior to independence, the British) and each tribe, including anything from scattered raids to major battles.\textsuperscript{44} In all, these data incorporate 4,794 event reports comprising 2,958 separate

\textsuperscript{42} Consistent strategic outcomes greatly facilitate data analysis. If the U.S. Army had won some conflicts and lost others, then we would need to stratify the sample in order to interpret variables like loss rates: being able to hold out for a longer period of time in a losing campaign generally indicates capability and resolve, but when a combatant \textit{wins} a war, then shorter and less costly conflicts indicate military power.

\textsuperscript{43} For instance, the Correlates of War data are the most widely used cross-section of interstate conflicts: they involve multiparty wars of the most destructive magnitude (e.g., World War II) along with limited conflicts in vastly different contexts (e.g., the Ecuadorian-Colombian War of 1863). The most widely-used data set on insurgencies (Lyall and Wilson 2009) involves one case (the Chinese Civil War) in which million-man armies employed advanced weaponry throughout a huge East Asian country, along with another case (the Costa Rican Revolution of 1948) in which a few thousand rebels toppled a Latin American regime in less than two months. In relation to these bodies of evidence, the American Indian Wars offer a much more comparable cross-section of cases, which facilitates identifying meaningful empirical patterns.

\textsuperscript{44} The sources for data collection comprise several anthologies of individual military engagements. The most comprehensive is Webb (1939) which lists 1,177 engagements between 1790 and 1890. Webb’s book is itself a compilation of two official records: the U.S. Army Adjutant General’s \textit{Chronological List of Actions, &c., with Indians} and the U.S. Army War College Historical Section’s \textit{Compilation of Indian Engagements}. These records certainly suffer omissions and inaccuracies, but they are generally well-regarded. Additional data come from Axelrod 1993, Ratjar 1999, Michno 2003, Nunnally 2007, and Michno and Michno 2008. Each includes transparent sourcing; consistent information on the date, location, casualties, and
engagements.\textsuperscript{45} Across these engagements, the United States inflicted 33,207 recorded casualties\textsuperscript{46} and sustained 18,044 recorded casualties in fighting 114 different tribes.\textsuperscript{47} These data provide an opportunity to take the expectations of commanders like George Custer and Winfield Scott and compare them to a relatively large body of objective, empirical evidence. Rarely do data on armed conflict make it possible to assess predictions in this manner.

\textit{Strategic assessment in the American Indian Wars}

For instance, it is obvious in hindsight that Custer, Sheridan and other U.S. commanders underestimated Sitting Bull’s forces in 1876. Ex ante, however, their belief that most tribes could not withstand significant fighting was supported by historical experience. Figure 7 shows this by presenting the 114 tribes in the data set, ordered from fewest to most recorded casualties

\textsuperscript{45} Friedman 2013b provides an article-length evaluation of these data’s comprehensiveness, estimating that they comprise roughly half of the casualties sustained by Native American forces and roughly ninety percent of casualties sustained by U.S. forces.

\textsuperscript{46} For a standard of comparison, these tribes had a combined total of roughly 400,000 people based on population estimates corresponding to the time when each tribe entered armed contact with the U.S./British; most treatments assume that roughly one-quarter to one-fifth of a tribe would have consisted of military-age males. Population estimates are from Sturtevant (1978-).

\textsuperscript{47} The event reports contain information on engagements involving Native American groups with 175 different names. Some tribes had multiple names (e.g., Atsinas/Gros Ventres); some reports refer to specific bands within a larger tribe (e.g., Chickamaugas are a subset of Cherokees); and some reports refer to warriors by the name of a town or landmark where they lived (e.g., “Hillabee” warriors presumably come from the Creek town of that name). After merging labels where appropriate, the data contain information on 114 groups, each of which was positively identified as a separate tribe. Coding decisions were based primarily on the Smithsonian Institution’s 20-volume \textit{Handbook of North American Indians} (Sturtevant 1978-), which is considered to be the authoritative survey of more than two hundred tribes and pays close attention to specifying subgroups and synonymies. When proper classification was unclear, the decision rule was to combine groups that were relatively nonviolent and to disaggregate groups that were relatively violent. This decision rule pushes against the central empirical claim of this paper that violence in the American Indian Wars was skewed.
These data place the Great Sioux War into a useful perspective. The right side of Figure 7 indicates that a few tribes (such as the Sioux, Seminoles, and Creeks) were indeed able to continue fighting despite withstanding relatively large numbers of casualties. But Figure 7 also demonstrates how these tribes are outliers. Sixty-nine tribes (61 percent) sustained fewer than 100 recorded combat casualties. The median tribe in these data lost only 54 members in battle. Thus when U.S. Army commanders such as Custer and Sheridan asserted that the tribes could not withstand large amounts of coercive punishment, they were, in expectation, correct.

The data offer further insight into the context of the Great Sioux War. For example, Custer is often criticized for dividing his forces in assaulting Sitting Bull’s camp, leaving his regiment unnecessarily vulnerable. But it was extremely rare for this sort of vulnerability to be sustained. These data place the Great Sioux War into a useful perspective.

In order to interpret these figures, note that the mean population of each tribe in the data set is roughly 3,000, with a standard deviation of roughly 4,000. Rescaling this figure with per capita casualties on the y-axis produces results that are substantively similar, but much less precise due to the difficulty of estimating tribal populations. Moreover, aggregate counts are more conceptually appropriate here. When commanders stated their expectations that these conflicts would be relatively brief and cheap, this is inherently a statement about the aggregate costs of fighting.

Exactly why tribes varied in their resilience is an important question in its own right. Some tribes were intensely averse to leaving ancestral lands; others knew that relocating would result in attacks and assimilation by their rivals; many warriors believed supernatural powers would protect them; some tribes actually did have the ability to stave off encroachment for a period of time. Tribal warfare was highly individualistic and demonstrations of personal bravery were often a primary means of social and political advancement. Many warriors thus sought combat despite (and even because of) its lethality, while many tribes had limited ability to restrain “spoilers” who believed, for whatever reason, that fighting was in their interest. There are thus a wide range of political, economic, social, and cultural reasons why some tribes would have been willing to fight for extended periods against a more powerful opponent, and this is in itself an important reason for selecting the American Indian Wars as a context for empirical analysis: because the tribes’ military behavior varied, decision makers had to grapple with uncertainty in assessing their opponents.

In addition, Friedman 2013c identifies an additional 53 tribes who are not recorded as having engaged in any organized fighting with U.S. or British forces. It is unclear how many of those tribes belong within the scope of the analysis here, but surely some of them were relocated through the use of military coercion, even if this did not ultimately result in the use of violence.
Figure 7. Recorded Casualties Sustained by 114 Tribes during the American Indian Wars


51-100 casualties: Caddo, Coquille, Fox, Gosiute, Jicarilla Apache, Modoc, Nisqually, Nomlacki, Palouse, Quapaw, Shasta, Umatilla, Waco, Yokut.


201-500 casualties: Blackfeet, Delaware, Kickapoo, Mescalero Apache, Mohave, Powhatan, Quechan, Shawnee, Takelma, Ute, Walapai, Wiyot, Yavapai.

501-1000 casualties: Apalachee, Bannock, Cherokee, Kiowa, Navajo, Ottawa, Pequot, Seminole, Wampanoag, other Apache bands.

1001-2000 casualties: Cheyenne, Chiricahua Apache, Narragansett, Paiute, Teton Sioux, Tuscarora, Western Apache.

2001-3000 casualties: Comanche, Creek, Santee Sioux.
exploited in the manner of Little Bighorn. Of the 2,958 engagements in the data set, only thirteen caused more U.S. or British battle deaths than Custer’s Last Stand. Only four of these engagements involved tribes who did not fight alongside European regulars; and of this subset, only one had occurred in the nineteenth century.\(^{51}\)

Custer, for his part, had participated in six previous engagements against the Sioux and Cheyennes. Across these engagements, he had lost a total of 27 men killed in action (an order of magnitude less than what Custer’s regiment lost in a single day at Little Bighorn). Custer’s previous experience included an attack on a Cheyenne village on the Washita in 1868, which many historians believe was the model for the assault at Little Bighorn. Custer had been criticized for taking too many risks in this attack, too, but it had still succeeded at a cost of only 21 U.S. combat deaths. Custer’s regiment, the Seventh U.S. Cavalry, had participated in 41 recorded engagements in the decade since it was formed. Most of these engagements involved Sioux or Cheyennes, and they had generated a total of just 43 U.S. combat deaths. So when Custer arrived at Little Bighorn, past experience overwhelmingly suggested that his opponents would not stand, fight, and exploit his vulnerabilities.

Figure 8 demonstrates this pattern more broadly, showing how the distribution of casualties inflicted by Native American tribes is similar to the distribution of casualties inflicted on Native American tribes: it is skewed and it has a few prominent outliers, but most tribes caused relatively little military damage. The mean tribe in the data set inflicted 131 recorded casualties on its opponents, and the median is just 23. Keep in mind, moreover, that these numbers describe the total casualties inflicted by each tribe across the entire data set, while Little Bighorn was a

\(^{51}\) This was the 1813 Fort Mims Massacre during the Creek War; and in this engagement, the majority of U.S. casualties were civilians.
Figure 8. Recorded Casualties Inflicted by 114 Tribes during the American Indian Wars


11-50 casualties: Apalachee, Arikara, Atsina, Blackfeet, Caddo, Cahuilla, Catawba, Cayuse, Coquille, Fox, Gosiute, Lipan Apache, Menominee, Modoc, Mohave, Navajo, Osage, Pequot, Quechan, Shasta, Taos, Waco, Yakima, Yankton Sioux, Yavapai, Yokut.

51-100 casualties: Arapaho, Cayuga, Jicarilla Apache, Mescalero Apache, Mingo, Pamunkey, Pocumtuck, Sauk, Wampanoag, Weanock, Western Apache, other Apache bands.


201-500 casualties: Cheyenne, Chiricahua Apache, Comanche, Delaware, Kickapoo, Mohawk, Nipmuc, Paiute, Powhatan, Santee Sioux, Tuscarora.

501-1000 casualties: Cherokee, Creek, Ottawa, Seminole, Teton Sioux.

single battle. Thus if we instead examine the 2,958 individual *engagements* on file then the average frontier fight led to six U.S/British casualties, with the median engagement generating no recorded casualties at all. These measures help to place in proper perspective how the fight at Little Bighorn was truly a radical outlier.

In order to predict the extraordinary performance of Sitting Bull and Crazy Horse’s followers, U.S. commanders would thus have needed some way of predicting how extensively they differed from the average tribe. (And even from the way that the Sioux and Cheyenne had themselves fought in the past.)\(^{52}\) This would naturally have been quite difficult. At the time – and this was true in most of the American Indian Wars – U.S. Army commanders possessed little information on the specific tribes that they were fighting. In most cases, the central challenge was simply *finding* the tribe in question, to say nothing of assessing the complex military, social, and political dynamics underlying its resiliency and combat effectiveness. In 1876, these dynamics would have been especially difficult to pin down. The campaign took place at the same time that thousands of Sioux left their reservations for the annual hunting season. Determining just how many of these “Summer Roamers” intended to fight with Sitting Bull was severely challenging. Intelligence estimates of Sitting Bull’s force size varied widely, and according to one staff officer, they were “wildly conjectural.”\(^{53}\)

The data therefore suggest it may often have been perfectly reasonable for commanders like Custer or Scott to enter conflicts with the perception that it would not be particularly costly to

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\(^{52}\) Prior to the Battle of Little Bighorn, the data record Teton Sioux and Cheyenne forces inflicting an average of 3.7 combat deaths over 309 total engagements. Other than Little Bighorn there were just two engagements where these tribes inflicted more than 25 battle casualties on the U.S./British: the 1854 Grattan Fight (29 casualties) and the 1866 Fetterman Fight (79 casualties).

\(^{53}\) The quote is from Bourke 1891: 246. See Gray 1976 on the “Summer Roamers.”
achieve their objectives – though there were several instances in which those perceptions proved to be false, ex ante they were supported by substantial empirical evidence. And as the previous section demonstrated, if military decision makers enter conflicts with the belief that they can attain their objectives at reasonable expense, we should not necessarily expect them to become more any pessimistic about their prospects as those conflicts drag on.

This is another claim that we can directly evaluate in the context of the American Indian Wars, because with the empirical distribution of tribal “types” in hand, we can plug this information back into the theoretical framework developed in Section 2 in order to examine the way that commanders updated their expectations about the resilience of the opponents they were facing. This is the purpose of Figure 9. The shaded area in the figure represents the density function for how many recorded casualties a randomly-chosen tribe sustained. The lines in Figure 9 then explain how, conditional on already inflicting some number of casualties on a tribe, decision makers might have updated their expectations about how much more coercive punishment that tribe might withstand.

Similar to the data presented earlier on inter-, intra-, extra-, and non-state wars, the data in Figure 9 demonstrate that just because a strategy has not yet achieved its objectives does not necessarily imply that it is any less likely to succeed moving forward. In fact, across much of Figure 9, the number of casualties that a tribe could be expected to sustain at the margin either declines or stays relatively constant. This combination of theory and data shows why it might not be so surprising that these commanders did not become more pessimistic about their prospects as the war continued, even though conventional theoretical frameworks and historical assessments argue the very opposite.
This is not to say that nonrational explanations have no explanatory value here: commanders like Custer and Scott were human and fallible, and they operated under the direction of a War Department and a Congress whose decisions were influenced by nonmilitary considerations. These factors undoubtedly played important roles in the American Indian Wars, just as they...

Figure 9 combines the data introduced in this section with the theoretical framework from Section 2, showing how many casualties a randomly-chosen tribe could sustain, conditional on already conducting a certain amount of fighting. Consistent with the data shown above on inter-, intra-, extra-, and non-state wars (but in stark contrast to conventional theoretical frameworks), Figure 9 demonstrates how decision makers should not necessarily become more pessimistic about a strategy just because it has not yet achieved its objectives. In fact, across much of the distribution, the amount of fighting that a tribe could be expected to sustain at the margin either declines or stays relatively constant.
undoubtedly affect all conflicts. Yet to the extent that understanding cumulative dynamics helps to reframe these commanders’ expectations as being more reasonable than what is commonly believed, this runs against a century and a half of conventional wisdom, suggesting that other prominent cases might also benefit from re-examination given the theoretical framework developed here.

Section 4. Discussion

A popular adage states that “the definition of insanity is doing the same thing over and over again and expecting different results.” But in many cases, it would also be inappropriate to abandon a course of action just because it does not succeed immediately. Military strategy provides many examples. Political scientists and historians regularly ask why U.S. officials took so long to see their strategic failings in Vietnam, while critics have leveled similar judgments at the Bush administration’s handling of the war in Iraq and the Obama administration’s handling of the war in Afghanistan. In almost any field of study it is usually possible to ask why it is that decision makers seem to find it so difficult to realize their strategic mistakes, and it is frustrating when debates about controversial issues do not converge towards consensus.

Understanding how cumulative dynamics affect decision making has several implications for thinking about these problems. Several points have already been mentioned: (1) the prospect of

54 In fact, it becomes more likely that nonrational factors could have played decisive roles in these cases if it turns out that this apparently puzzling behavior is much closer to rationality than what is commonly believed. Just as “trembles” are more important in game theory when it is easier to divert players onto a nonequilibrium path, strategy should become more sensitive to nonrational factors when the analytic problems decision makers confront are genuinely hard. In this sense, it is best to see rational and nonrational explanations as complements and not substitutes – something that is not the case with conventional theoretical frameworks that see these mechanisms as pushing in opposite directions.
rational strategic inertia, which is all but oxymoronic according to the conventional wisdom on learning and adaptation; (2) the idea that protracted conflict and persistent misperception are therefore not as puzzling as the contemporary literature on uncertainty and armed conflict makes them appear; (3) the notion that rational learning is contingent on decision makers’ prior assumptions, whereas standard frameworks assume that divergent beliefs should converge as a result of trial-and-error; (4) the ability to use these insights in order to re-evaluate established views of salient cases; and (5) that these insights revolve around the straightforward observation that war is not a repeated process in which the odds of success are the same in one round of fighting as they are in the next.

It is worth drawing out three additional implications of the analysis. The first is that if understanding prior assumptions is central to evaluating strategic assessment, then it is important to assess these assumptions in light of the full array of relevant information. The data used in this paper to evaluate U.S. military decision making in the American Indian Wars were informative largely because they contained information on all of the American Indian Wars, regardless of their intensity. Looking back on this period, the wars that were the most violent are the ones that stand out most prominently: readers who examine the list of tribes in Figures 7 and 8, for instance, will presumably be familiar with almost all of the groups who fought protracted conflicts (such as the Creek, Seminole, and Sioux) but almost none of the tribes (such as the Atsina, Nisqually, and Umatilla) that did not. Yet these less violent tribes were far more common, constituting the bulk of the opponents that a U.S. commander in the frontier army
would have faced. Understanding this point is crucial for viewing U.S. Army decision making in proper context.\textsuperscript{55}

This point is not only relevant to the structure of prominent data sets, which typically “censor” out small conflicts that do not reach a specified size\textsuperscript{56} – in many ways the difficulty of analyzing extreme cases is built into the way that scholars prioritize their research. A vast amount of analysis in international relations concentrates on outliers, extreme events such as the World Wars or the U.S. experience in Vietnam. Because these experiences were so important in their own right, they deserve extensive study. But in conducting such studies, it is important to keep in mind that they are outside the norm and thus in some ways at odds with reasonable expectations. Rather than asking why decision makers did \textit{not} understand the nature of these challenges, a more relevant question may be to ask how they \textit{could} have understood them.\textsuperscript{57} This paper explains why that can be genuinely difficult.

A second set of implications from this analysis concerns how we should think about improving decision making in practice. Strategic inertia is costly, and the United States’ long wars in Iraq and Afghanistan have predictably brought demands for institutional change, especially for overhauling interagency relations within the U.S. government. These demands turn

\textsuperscript{55} It is also crucial for understanding the history of this period more generally. Scholarly attention to Native American tribes is heavily skewed towards those who fought protracted conflicts against the United States, even though the data clearly indicate that these tribes were not the norm. For this reason, too many tribes “remain nonparticipants in the epic of America” (Blackhawk 2006: 4). Friedman 2013c argues that large-n social science can play a role in redressing this problem by ensuring that each tribe is accorded equal analytic weight when investigating empirical patterns.

\textsuperscript{56} The standard threshold for inclusion in data sets on armed conflict is 1,000 battle deaths. A more expansive collection effort (Lacina and Gleditsch 2005) relaxed this threshold to 25 battle deaths. In these data, the \textit{median conflict} resulted in fewer than 1,000 casualties, and would thus have been excluded from conventional analyses.

\textsuperscript{57} Mueller 1980 analyzes the Vietnam War from this perspective.
on assumptions about the extent to which organizational inefficiencies hamper the United States’ ability to assess and mitigate military challenges. A counterfactual is necessary: if the government were better-designed, what would we expect its performance to look like? Bureaucratic problems have doubtlessly hampered recent war efforts, but this paper has sought to make clear that military strategy involves genuine analytic challenges which even ideal organizations would struggle to confront. In this way, defining standards of rational behavior plays a crucial role in how we diagnose the sources of policy failures, how we prescribe potential remedies for them, and how we estimate the impact that those treatments might have.  

By a similar logic, theoretical frameworks guide the way that people debate policies over which they disagree. From 2003 through 2006, for instance, critics of the occupation of Iraq continually emphasized the mounting costs, the increasing numbers of insurgent attacks, and the growing body count of a war that dragged on far longer than what the administration had anticipated. This stance reflected the conventional logic of learning about repeated processes, which is that if a policy has not worked yet, this also implies that it will not work soon. Critics would not have emphasized these facts if they did not expect them to move the debate. U.S. officials, however, justified their policies by arguing that they were making cumulative progress towards building an effective Iraqi state, that the government in Baghdad was meeting its benchmarks, and that violence should not be expected to fall until the country had achieved political consolidation. The point here is not to take sides on a contentious debate, but to point

58 Similarly, Charles Glaser motivates his rational theory of international politics by stating that “theories of suboptimal behavior, whether built on arguments about domestic politics or errors in individual decision making, rely at least implicitly on a rational theory” (2010: 2-3). This issue is especially prominent in the literature on intelligence studies, where some scholars argue that U.S. citizens and officials place too much faith in institutional reform because they do not adequately appreciate the inherent limits of analysis. See Betts 2007 in particular.
out that it is unsurprising how these camps were talking past each other and how their views of
the war did not converge. As this paper has shown, prior costs have ambiguous implications
when it comes to assessing cumulative processes, and debates about strategic progress should not
necessarily approach consensus over time in the manner that the conventional wisdom expects.

It is also instructive to examine why U.S. officials eventually changed strategy when they did.
According to standard accounts, this shift did not result from mounting frustrations with the time
or the cost of the war effort, but rather from decision makers realizing that they had
misunderstood the nature of the conflict. In the summer of 2006, Iraq entered a spiral of sectarian
violence that appeared to be driven by local security dilemmas far more than ideology, anti-
occupation sentiment, or national-level politics. A different diagnosis of the violence naturally
suggested a different prescription for how to deal with it, precipitating major shifts in U.S.
policy, emphasizing direct provision of population security instead of using U.S. forces in
training and advisory capacities, adopting a more aggressive posture in dealing with the Iraqi
government, and “surging” additional forces into the country.

In other words, what seems to have changed the administration’s Iraq policy was not four
years of trial-and-error – rather, it seems that the key factor breaking strategic inertia in Iraq was
the administration fundamentally re-evaluating its prior assumptions about the kind of conflict it

59 This argument is most clearly stated in the report of the Joint Strategic Assessment Team that
wrote the U.S. campaign plan for the surge. As Gordon and Trainor describe it, the “central
point” of the team’s report “was that the war had been grievously misunderstood: the entire
character of the conflict had changed, but U.S. military strategy had been unresponsive,
increasingly irrelevant, and, at times, counterproductive to boot.” The increasing sectarian
violence in Iraq had demonstrated that “The nation was in the middle of a ‘communal power
struggle’ among Shiite, Sunni, and Kurdish factions squabbling and killing each other… a
development the American command had misdiagnosed and inadvertently abetted”(2012: 356).
60 On the impact of the surge, see Biddle, Friedman, and Shapiro 2012. On the decision to
approve the surge, see Feaver 2011.
was waging. This paper has stressed throughout how the nature of these basic assumptions should play a central role in understanding how decision makers will adjust their expectations. The Iraq case appears to bear this out, while suggesting that debating such assumptions may be a more effective way to combat strategic inertia than emphasizing a policy’s prior failings, even though the latter often takes pride of place in public discourse, while also being the mechanism that drives learning and adaptation according to existing theoretical frameworks.61

In closing, it is important to emphasize how the ideas in this paper are not just intended to inform academic models of military decision making, but rather to speak to public debates about learning and adaptation more generally. Armed conflict provides many salient examples of decision makers struggling to evaluate cumulative processes, but the same could be said in a wide range of issue areas. For example, there is currently sharp disagreement about why development assistance has failed to lift certain countries out of poverty traps. Some argue that this shows how current aid policies are flawed (and that they should thus be reformed or scrapped), while others say the problem is that aid levels are too low (and that they should thus be expanded). Similar difficulties arise when evaluating expensive scientific projects that offer the uncertain promise of producing major breakthroughs. In some cases (as with hunting the Higgs boson) decades of effort and hundreds of millions of dollars eventually produce their intended objectives, and in other cases (as with attempts to develop vaccines for malaria and HIV) doubts remain about whether to continue investing in further progress or to shift resources towards other programs. In general, whenever people debate whether policies are not succeeding because of the concept or the execution – whether decision makers are doing the wrong thing or

61 See Chapter 5 of the author’s dissertation for an extended discussion of this point as it relates to U.S. decision making during the occupation of Iraq.
just not doing the right thing *enough* – they are dealing with the kinds of cumulative dynamics that make it difficult to decide whether it would be better to switch strategies or stay the course. Existing theoretical frameworks (and perhaps most people’s basic intuitions) may not be reliable guides for dealing with these situations.

A passage from *New York Times* columnist David Brooks helps to establish the connection between this paper’s analysis of military decision making and similar analytic problems that emerge on other issues. In describing the 2012 presidential campaign between Barack Obama and Mitt Romney, Brooks wrote that

Both campaigns fervently believe that more spending leads to more votes. They also believe that if they can carpet bomb swing voters with enough negative ads, then eventually the sheer weight of the barrage will produce movement in their direction. There’s little evidence that these prejudices are true. But the campaigns are like World War I generals. If something isn’t working, the answer must be to try more of it.

This passage is relevant both for its explicit analogy between the logic of strategic assessment in war and other areas, and also because it sardonically conveys the author’s belief in a logic that is not necessarily appropriate to the subjects at hand. If armed conflict and political campaigns transpired like rolling dice or playing slot machines, then the notion that decision makers are due for success if they double down on failing strategies would indeed be fallacious reasoning, an example of the gambler’s fallacy. But many situations are not like gambling: sometimes it does indeed take protracted effort in order to cause public opinion to shift, and indeed it often takes substantial fighting in order to cause combatants to concede. Few people would claim that these contexts actually represent repeated processes, in which the odds of success in one stage are the
same as they are in the next. Nevertheless, people often expect decision makers to behave as if those processes were repeated, perhaps because it is unclear just how strongly their expectations depend on premises that are highly limited in scope.

Ultimately, the notion that decision makers deal with cumulative dynamics is not new. The cumulative dynamics of war have been a central theme of writing on military strategy since Clausewitz, for instance, and most people find these dynamics intuitively obvious. What is much less obvious, however, is why those cumulative dynamics matter, how they influence learning and adaptation, how they affect decision making, and why the conventional wisdom does not account for key issues. Recognizing these limitations provides an opportunity to question prominent theoretical frameworks, to inform ongoing policy debates, and to re-evaluate salient historical experience.

References


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