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Reconciling strategic studies…with itself: a common framework for choosing among strategies

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Reconciling strategic studies … with itself: a common framework for choosing among strategies

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Three distinct, and seemingly irreconcilable, schools of thought are identified within the strategic studies literature. One which searches for "universal principles of war," a second, "context-dependent," approach that seeks to embed each instance of warfare within its concurrent social, political, technological milieu and, finally a "paradoxical logic" school, which equates strategy with the generation of uncertainty. The author offers some intuitive concepts from non-cooperative game theory to develop a "dominate-mix" approach to strategy choice. In doing so, he helps to reconcile these disparate approaches and provides a simple framework to assist researchers in framing military decisions as well as to assist planners in choosing among strategies.

Keywords: strategic studies; principles of war; game theory; Clausewitz; Jomini; Luttwak; uncertainty

Introduction

The field of strategic studies has produced a number of seemingly irreconcilable approaches to the study of military conflict: What is the nature of strategy? Is it a series of enduring "principles of war," a list of "context-dependent" environments to be considered in planning, or does it exist in a special realm of "paradoxical logic," utterly apart from other fields of study? These questions stem from related foundational debates with the field: To what degree is war knowable versus uncertain? To what degree is strategy an "art"? How does one utilize the unexpected in planning? What is required is a reconciliation of the competing approaches to the study of strategy within the field of strategic studies. If such a goal could be accomplished, then two benefits would result: a deeper understanding of military decision-making within the field of strategic studies, as well as a more transparent method for choosing among strategies.

In this article, a step is taken toward these ends through a modest contribution, which has been termed the "dominate-mix" approach. This is done by presenting the concepts of "strategy dominance" and "mixed strategies" from game theory to help in resolving the tensions within strategic studies. "Strategy domination" allows a player to compare the potential payoffs of their various available strategies against all possible strategies available to their opponent(s), while "mixed strategies" deals with randomization over strategies to achieve surprise. In their strictly formal and rigorously mathematical presentation, these tools may be too alien and constricting to fit with the temperament and needs of the strategic studies community. As simple concepts,

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however, they constitute an accessible tool for improving choice among strategies. They allow for recognized principles of war to be employed alongside the "paradoxical logic" of strategic surprise across various historic eras of conflict – thereby resolving a central tension in the field. Furthermore, the "dominate-mix" approach accords with existing US strategic planning that emphasizes ways-ends-means, thereby facilitating its ready comprehension and utility.

This article, does not offer a theory of strategy, but simply an articulation of strategic choice that can encompass important aspects of the existing debate within the strategic studies literature. Its goal is to reconcile seemingly disparate strands of this literature by creating a common framework to analyze strategic interaction; further, it offers a prescriptive apparatus that may also help practitioners to improve their decision-making in the field.

First, the current treatment of uncertainty within strategic studies is discussed and a conceptual refinement that is necessary to fruitfully tackle the phenomenon is proposed. Second, three prevalent approaches to the study of military strategy are laid out. These are termed: the "universal principles of war," "context-dependent," and "paradoxical logic" schools. A brief evaluation of each is provided. Third, the concepts of "strategy dominance" and "mixed strategies" from game theory are given to show how these help to reconcile the three approaches in a simple "dominate-mix" application. Finally, conclusions are offered, along with suggestions of ways forward for this line of inquiry.

Sources of uncertainty in war

War is often argued to contain both extreme complexity and stark simplicity. Harrison summarizes this contradiction powerfully:

> The imperatives of war appear to simplify everything down to a few basic requirements, but to attain them in the "resistant medium" constituted by danger, shock, surprise, excitement, fear, hunger, exhaustion, wounds, bereavement, boredom, isolation, ignorance, deception, self-interest and indiscipline turns out to be a process of endless complexity.[1]

Further, Handel argues, in his analysis of Clausewitz, that this contradiction essentially precludes the ability of observers to predict (and hence to model) war:

> The reader's attention must be directed to the *tension* or *seeming contradiction* between Clausewitz's ... emphasis on understanding the nature of the war one is about to embark on ... and, on the other hand ... *friction*, *chance*, *uncertainty*, *luck* and the *poor quality of intelligence* which reveals the near impossibility of reliably predicting the course of a war ... this is only one of the many "internal contradictions," 'tensions," and "paradoxical" problems that can be identified ... *The problem lies in the contradictory nature of war itself* (emphases in original).[2]

One is wrong to despair, however, when confronted with such a problem. War is a complex, strategic, and uncertain environment but this does not make it unique, "contradictory," or preclude its analysis. The struggle for strategic theorists has always been to distinguish the knowable from the inherently random and do their best to comprehend the former. The first step to profitably dealing with the seeming chaos of war is to distinguish between two distinct sources of uncertainty: stochastic and strategic. Once this is done, the ground is laid for choosing the appropriate tools to deal with each in turn, thereby allowing the most useful (if not perfect) models of war and warfare.

Systems can be thought of as deterministic or stochastic. A deterministic system is one in which outcomes are driven solely by systematic factors – in other words, if all the contributing causes can be specified in a model, then variation on the dependent variable will be accounted

for entirely. A stochastic system, however, allows for some random component that cannot be modeled.[3] It is generally agreed that any social system (such as war) is, by its very nature, stochastic to some degree. Simply using this conceptual starting point would help account for the "chance," "friction," and "luck" to which Handel refers: a weapon misfires in battle; an unexpected change in weather inhibits maneuver; or troops are debilitated by an outbreak of an unforeseen illness.[4] By simply thinking in such terms, it allows the analyst to sort out conceptually those factors he or she argues exert a systematic effect on some dependent variable from pure randomness.

For example, imagine a pool of transport trucks which are necessary to supply an army on the march. Analysis of data shows that, at any given time, 10% of the vehicles are malfunctioning and in need of repair. For any given vehicle, it is impossible to know precisely when or where it will break down (perhaps at some critical point in a crucial battle), as there is only a probabilistic model of vehicle failure across the fleet of trucks. However, it can be reasonably expected that if the budget for vehicle maintenance is increased, this failure rate will decrease (and if it is reduced, vehicle failure will increase). Therefore, a systematic input (budget) can be modeled as one factor that will affect the dependent variable (vehicle failure rates) – even within a system which contains a stochastic component.

If random chances were known to be the only source of uncertainty in war, strategic choice could become a simple optimization-under-constraint problem: systematic factors would be modeled and choices could be weighed through expected utility equations. The resulting attempt to forecast war outcomes might come to resemble something akin to meteorology. Strategic theorists would counter, however, that simply recognizing the presence of random chance on the battlefield is not sufficient to understand war – there is another distinct source of uncertainty on the battlefield: the enemy. This represents a fundamentally different concern, which is labeled "strategic uncertainty."

"Strategic uncertainty" occurs when outcomes are jointly determined by the choices made by multiple, self-interested actors. In this case, decision theory (simply optimizing among risky choices) is no longer appropriate, because strategic opponents are not mindless probability generators (like the rolling of dice).[5] One simple way to show these distinctions is through comparing three games: playing a slot machine is simple probability (randomness of the outcomes generated by the machine); tic-tac-toe is a game of strategic uncertainty (outcomes are solely determined by the choices of the two self-interested players); and poker combines both (the element of randomness is provided by the shuffled deck of cards, while the strategic uncertainty is provided by the choices of the self-interested players to bet, raise, hold, or fold).

Gray points out how often this distinction between random chance and strategic uncertainty can be overlooked, even within the strategic studies community: "People unfamiliar with the arcane world of defence analysis might be surprised to learn just how common it is for imaginative, energetic, and determined strategic thinkers . . . to forget that the enemy too has preferences and choices."[6] Even in the realm of strategic uncertainty, systematic analysis is still possible – as long as the tools being applied have been developed with such a choice environment in mind (as has game theory, to which the author will later return). It is a crucial first step, however, simply to distinguish between these two types of uncertainty: stochastic and strategic.

Three existing approaches to military strategy

Three approaches to military strategy in the existing strategic studies literature are identified here: "principles of war," "context-dependent," and "paradoxical logic." This does not claim to be an exhaustive list, nor do many authors fit neatly into only one of these categories; Clausewitz, in his brilliant – yet internally incoherent work – exemplifies all three at various points.[7] Yet it is useful

to provide crude labels and discuss each approach independently to explain strengths and shortcomings. Only after these three schools of thought are outlined is it possible to show how the concepts of "strategy domination" and "mixed-strategies" can assist in the fruitful integration among these distinct approaches to strategic study.

"Universal principles of war" approach

In its simplest depiction, the "principles" approach is characterized by three attributes: a framework of causal laws, which generates testable hypotheses and is applicable across the entire scope of warfare. In short, this approach constitutes a search to uncover a causal system that would explain significant aspects of war, warfare, and strategy in a manner analogous to physical science. Though the most conceptually straightforward, it is has fallen out of favor over the last century, due to its unfulfilled claims of crisp predictive success. This approach is the most intellectually ambitious of the three outlined here, as it purports to analyze war in a manner analogous to the physical sciences: the ultimate goal would therefore consist of a system of deductively connected hypotheses that are actively subjected to possible empirical refutation through repeated testing.[8] Raimondo Montecuccoli (1609–1680) was one of the first to conceptualize such a "science of war," which, he argued, would "reduce experience to universal and fundamental rules" thereby encompassing the "whole of world history" such that "no remarkable military deed . . . cannot be reduced to these instructions."[9] Such work on a set of universal principles of war became increasingly popular through the French Enlightenment and culminated most famously in the work of Antoine Jomini.[10] Even relatively modern thinkers, such as J.F.C. Fuller sought to lay out a complete causal system by "do[ing] for war what Copernicus did for astronomy, Newton did for physics, and Darwin for natural history . . . to apply the method of science to the study of war."[11]

An important aspect of such an endeavor is rigorous testing of the empirical implications of the theoretical construct. Jomini, for example, attempted to test his general argument by using qualitative evidence:

> We will apply this great principle . . . and then show, by the history of twenty celebrated campaigns, that, with few exceptions, the most brilliant successes and the greatest reverses resulted from an adherence to this principle in the one case, and from a neglect of it in the other.[12]

It is worth reiterating, that for an argument to purport to be a "theory" of war in an accepted scientific sense, it must present crisp empirical hypotheses that can be falsified by testing. The "principles" approach is alone among the three schools presented here to adhere to that requirement.

It is also important to recognize that this approach depends upon more than the assumption that law-like relationships exist within war; it also often assumes that instances of war and warfare throughout history are drawn from a homogeneous population of cases. Jomini states this explicitly when he argues that:

> The fundamental principles upon which rest all good combinations of war have always existed . . . These principles are unchangeable; they are independent of the nature of the arms employed, of times, of places . . . For thirty centuries there have lived generals who have been more or less happy in their application . . . the battles of Wagram, Pharsalia and Cannae were gained from the same original cause.

Furthermore, Jomini argues that the systematic impact of enduring principles overrides any impact of "art," "genius," or "creativity": "Genius . . . presides over the application of recognized rules, and seizes, as it were, all the subtle shades of which their application is susceptible. But in any case, the man of genius does not act contrary to the rules."[13] This is an important

point, as it precludes the capacity for human agency to override the laws of the fixed causal system.

The "principles of war" approach may, therefore, be considered the most attractive in a strictly scientific sense. The problem is that the lofty ambition of this approach seems to crash to the ground as each proposed system is soon found to be severely limited in general predictive success. In recent decades, the quest for a unified and testable "science" of war has largely been abandoned in favor of a much less-stringent search for "suitable, acceptable, and feasible" approaches to strategy.[14] These lowered expectations are perfectly defensible – as long as they maintain conceptual coherence. This is addressed in the following section, titled the "context-dependent" approach to strategy – laying out the defining distinctions between the approaches and arguing that the two approaches can be reconciled by using trivial necessary conditions to theoretically delimit sub-populations of observations.

The context-dependent approach

The aspiration of the "context-dependent" approach to strategic studies seems at face value to be vastly different from the "principles" school. In this second approach, appropriate strategy is pursued in the context of the unique environment within which each war occurs. This section, reconsiders this vein of strategic studies, distinguishing it from the enduring principles approach, and showing how the two can fruitfully be integrated into a common conceptual framework by relying on trivial necessary conditions to constitute sub-populations of war.

Consider the work of Gray.[15] On the one hand, he contends that strategy is universal and presents a set of immutable dimensions of strategy that must be taken into account for success in war, and by doing so he purports to "captur[e] the whole nature of strategy for all periods [of history]."[16] This may be true, in some broad sense of the word "capture," yet it is not a theory of strategy in a strictly scientific sense. This is the case because there are no hypothesized relationships derived for the 22 or so dimensions that would be amenable to empirical testing. Gray defends this choice thus: "The precise relationships among the dimensions must always be in some sense uncertain ... A general theory of strategy ... which explains the nature of the subject and ... how the subject 'works', cannot itself explain particular strategic experience."[17] Rather than provide testable hypotheses, then, the work seeks to help "historians make better sense of their research while enabling strategic theorists to relate the historically unique to more general patterns in strategic experience."

How can these two approaches (universalist principles and context-dependence) be reconciled? Clausewitz points the way when he writes: "every age had its own kind of warfare, its own limiting conditions and its own peculiar preconceptions. Each period, therefore, would have held to its own theory of war, even if the urge had always and universally existed to work things out on scientific principles."[18] The important point here is that his position does not preclude the proposing and testing of causal laws, but simply warns against over-generalizing beyond certain contexts. To approach this challenge fruitfully, one must think hard about the notion of theoretically defined sub-populations of war.

"Populations" in social phenomena are often treated as given, and rarely problematized. This is often the case when a single term, such as "war" is given to a diverse set of occurrences that may or may not be instances of the same causal process. As Ragin argues:

> Sometimes populations contain subgroups that are so distinct that they should be treated as analytically separate populations ... Often, this mixing of different kinds of cases in the same population is missed by the investigator because the heterogeneity is mistaken for the play of random forces

> ... Thus, the researcher may relegate unrecognized heterogeneity to the error vector of probabilistic models when it should be conceived ... as multiple populations.[19]

Clausewitz's proposal that heterogeneity exists among the history of warfare is commonly asserted, but the author argues it is often done so in a less than useful manner. As an example, Jomini's theory of strategy and operations is commonly lauded as useful, but only within the "Napoleonic era" within which it was articulated. Other portions of military history are often labeled similarly as "Classical," "Medieval," "Early modern," etc. Ragin argues that a more useful way to classify sub-populations is by identifying the necessary conditions which define the causal logic which operates within said sub-population. A brief example can be seen in recent work by Arquilla, who recognizes a distinction between from "state-state" to "state-network" conflict and then proceeds to offer arguments and policy recommendations that are appropriate for this newly identified sub-population of armed conflicts.[20]

An advantage of identifying the trivial necessary conditions in this way is twofold: first, rather than using a historical label that carries no additional analytic information, using a necessary condition to delimit the scope of an argument forces one to explicitly articulate the theoretical mechanism by which they choose to characterize the sub-population; second, such a method does not force conflicts to be lumped together according to linear time ("the nineteenth century," "the post-Cold War era," etc.), but by theory. A vivid example is provided by the late nineteenth-century French Navy: as the development of steam-powered warships restored tactical movement to naval warfare, naval planners briefly engaged the idea of re-integrating rams on the prows of its vessels – by comparing steam-powered ships to the oar-powered triremes of the classical era.[21] This showed that by thinking in terms of the necessary condition of "rapid tactical maneuver," it was concluded that the steam-powered vessels of the late nineteenth century were, in some crucial ways, closer to the warships of the ancient Greeks than to their immediate predecessors of the mid-nineteenth century.

Summarizing, the "context-dependent" approach can be reconciled with the "principles" approach by explicitly addressing the notion of theoretically defined sub-populations. The advantage of the "context-dependent" approach is that it allows for the specifics of each shifting environment to be factored into some causal argument. Furthermore, it moves beyond military operations and combat and recognizes that war is embedded within a broader political, cultural, diplomatic, and economic milieu. It cannot only ask, "is this strategy militarily effective on the battlefield?" but also, "is it morally acceptable, institutionally feasible, diplomatically appropriate, politically expedient?"

By focusing on the concept of theoretically defined populations, this discussion has helped to reconcile the first two approaches to strategy: using the first approach to search for rigorous models of war; and using the second approach to make these models sensitive to the evolving social, technological, and physical environments in which wars take place. What unifies these two approaches to war is that they rely on some form of "rules" – either universal rules (first approach), or rules that apply to some delimited time and space (second approach). Next, is the third approach to war, one that is premised on the "breaking of rules" as the defining logic of strategy. After this third school of thought is introduced, the discussion turns to a simple framework for integrating all three approaches.

"Paradoxical logic" approach

The element of surprise has been a central concept for strategic theorists throughout history. Recently, however, Edward Luttwak has elevated surprise to the central pillar for military strategy: arguing that war operates in a unique realm of "paradoxical logic":

> Consider an ordinary tactical choice ... to move toward its objective, an advancing force can choose between two roads, one good and one bad, the first broad, direct, and well paved, the second narrow, circuitous, and unpaved. Only in the paradoxical realm of strategy would the choice arise at all, because it is only in war that a bad road can be good *precisely because it is bad* and may therefore be less strongly defended ... the bad option may deliberately be chosen in the hope that the unfolding action will not be expected by the enemy.[22]

Taken at face value, Luttwak argues that war is essentially a game of Rochambeau ("rock-paper-scissors"); the degree to which something follows the "rules" is predictable and can be countered. Luttwak argues that doing the unexpected, for the purpose of generating strategic uncertainty in the mind of the opponent, is the consummate activity for a strategist. This would seem to utterly negate the first (universal principles) and second (context-dependent) approaches outlined above – as adhering to any logical "rule" of strategy would make an actor predictable and, therefore, vulnerable. This point of view is epitomized in the film "Patton" when General George S. Patton (played by George C. Scott) says of his defeated enemy: "Rommel, you magnificent bastard! I read your book!" It is implied in this exclamation that, by adhering to his own stated rules, his German opponent had made himself predictable, and therefore, vulnerable.[23]

Luttwak's work on paradoxical logic has generated strong reactions. Martin Van Crevald has described it as "brilliant" and as having been "written in heaven."[24] Others have decried it as a "trivial word game," "foolish" and – as a potential guide for policy – "just plain frightening."[25] Others have settled into more reasoned critiques: "Luttwak's brilliant explanation of how what works today in strategy may not work tomorrow, precisely because it worked today ... is persuasive, but limited in its explanatory power ...."[26] The most fundamental critique of Luttwak comes from Bartholomees:

> [the] paradoxical nature of war is too broad a generalization ... if war were completely paradoxical ... war would not yield to study. In fact, much of war – including its paradox – is very logical. In a sense, Luttwak's argument proves the proposition and refutes itself.[27]

Does Luttwak's argument indeed consume itself? Or can it be salvaged from its own seeming contradiction? How can the single penetrating insight of paradoxical logic be reconciled with the search for principles of war?

Luttwak hints at a structure for rescuing strategic choice from becoming a purely random (and therefore unknowable) process. He does so by arguing that,

> [a]t the limit, surprise could in theory be best achieved by acting in a manner so completely paradoxical as to be utterly self-defeating ... Obviously, the paradoxical path of 'least expectation' must stop short of self-defeating extremes, but beyond that it is a matter of probabilistic calculations.[28]

Two notions are captured in this quote that bear further scrutiny. The first is that some strategies should be excluded *a priori* due to their extreme unattractiveness, dropping nuclear weapons on your own capitol would surely astonish your opponent, but the costs associated with this strategy would surely outweigh the gains of surprise.

The second is that the remaining strategies under consideration should each be weighed according to some probabilistic mechanism. Luttwak leaves this distinction at an informal level of discussion – what is required is a more precise analytic framework for dismissing some strategies and conceptualizing the use of probabilism in choosing from among those which remain under consideration. The following section discusses some conceptual tools for doing precisely these things, before using these tools to reconcile the three approaches to strategic studies outlined above.

Game theory: the mixing and domination of strategies

An obvious statement someone might make about war is that it is a strategic contest among two or more self-interested actors. The implications of this point, however, are often neglected in the study of military strategy. Even one of the most celebrated students of war, Clausewitz, has been accused of neglecting this aspect of strategy:

> Clausewitz advises that "in the whole range of human activities, war most closely resembles a game of cards" … a thought that leads us to expect careful treatment of interaction among calculating adversaries. In fact, *On War* says much more about how "to impose our will on the enemy" than it does about the perils posed by the enemy's will. *On War* insists properly from the outset on recognition that war is not a unilateral exercise. Nonetheless, the book is weaker than it should be in the analysis of the "enemy."[29]

The proper study of war and military strategy should include analytic concepts designed to model choice over outcomes which are jointly determined by two or more self-interested actors. An appropriate model would, therefore, recognize that decisions must be made with some anticipation of what the opponent might do. This is, by definition, making choices within the realm of strategic uncertainty – an environment for which game theory was created.

Game theory is a very contentious methodological tool and has inherent limitations. Many social scientists eschew the approach because it is too abstract, culturally bound, and fails to capture the "plasticity" of creative human behavior. Specifically within the realm of security studies, game theoretic approaches have raised concerns. Stephen Walt, for example, argues that rational choice models (of which non-cooperative game theory is a subset) are too mathematically obscure to be evaluated by a wide audience, are completely alien to policy-makers and military practitioners, tend simply to re-package well-established or obvious conclusions, and generally engage in methodological "overkill."[30]

A general debate on the efficacy of rational choice models and their contribution to strategic analysis is beyond the scope of this article.[31] Yet, given this discussion, it may not be appropriate to import the entire formal framework of non-cooperative game theory to strategic studies. It may be useful, however, to utilize some baser components and their attendant logic – such as examining how an actor should make a decision when the outcome also depends on the choices of others. To do so, one should ask how that actor would consider all of the possible outcomes of each choice available to him against the various outcomes that would come about contingent on the available choices of the opponent. Two tools from game theory, "dominant strategies" and "mixed strategies," embody this logic of analysis at the simplest level.

Dominant and dominated strategies

The process of strategy domination allows a player to compare the potential payoffs of their various available strategies against all possible strategies available to their opponent(s). It comes in two forms: strict (or strong) domination and weak domination. A strategy strictly dominates another strategy for a player if it is superior (provides a higher payoff) regardless of what the other players play.[32] For example, in the classic 2 × 2 game "prisoners' dilemma" (Figure 1) Row player should play "bottom" as it results in a higher payoff *regardless* of the strategy chosen by Column player (3 > 2 if Column plays "left" and 1 > 0 if Column plays "right"). Similarly, Column player should play "right" regardless of what Row player plays.

This concept of a "strictly dominated strategy" accords nicely with Luttwak's notion of a strategic choice that is so unattractive as to be a "self-defeating extreme." If it results in a worse payoff than an available alternative, regardless of what choice the opponent makes, then it

Prisoners' Dilemma

		Column Player	
		Left	Right
Row Player	Top	2, 2	0, 3
	Bottom	3, 0	1, 1

Figure 1. Prisoners' dilemma.

should be discarded *a priori*; it is never attractive and cannot even be threatened to confound a rational opponent in expectation.[33]

Mixed strategies

The second part of Luttwak's paradoxical logic is that of randomization of choice. Once strictly dominated strategies are eliminated from consideration and no dominant strategy has been identified, any remaining strategies can be played according to some probabilistic mechanism. This randomization component is captured nicely with the notion of "mixed strategies." Consider the game of "matching pennies" (Figure 2). The players choose to show either "heads" or "tails" of a penny; if the two coins match, Row player wins a dollar and Column player loses a dollar. If they do not match, Column player wins. It is obvious that neither player has a dominant strategy (if Column player plays "head," then Row would prefer to also play "head," *but* if Column were to play "tail" then Row would also prefer to play "tail"). If Row player *knew* what Column was going to play (perhaps due to a discernible pattern or faithfulness to some "rule book") then Row player would be able to use this advantage to win the dollar. In fact, in the "matching pennies" game, the only Nash equilibrium is for both actors to play each strategy with a probability of 1/2 (which they could do easily by flipping their pennies rather than consciously choosing a strategy to play).

The use of mixed strategies in the matching pennies game raises a number of interesting questions, both for the application of game theoretic models in general and to military strategy in particular. How can we regard mixed strategies in practice? Do generals (or any strategic actor) actually randomize over strategy? ("Should we engage in a surgical airstrike of Cuba or an invasion at the Bay of Pigs? Let's flip a coin!") There is not a consensus on this point. One way to interpret the mixed-strategy equilibrium in the "matching pennies" game (as described above) is to argue that each player actually flips a coin to decide. A second interpretation is that, as samples of potential players are drawn from an underlying population, one half of those

Matching Pennies

		Column Player	
		Head	Tail
Row Player	Head	1, -1	-1, 1
	Tail	-1, 1	1, -1

Figure 2. Matching pennies.

players would be expected to play heads with probability one, and the other half would be expected to play tails with probability one.[34]

Perhaps the most useful way to apply the concept of randomization to strategic studies is to focus on the uncertain expectations that are formed in the mind of a rational opponent when confronted with player in a "matching pennies" type situation.[35] In this case, it includes observable actions that you take which exacerbate the enemy's uncertainty. Liddell-Hart captures this logic, to some degree, with his maxim of threatening multiple objects with the operational line of approach – thereby creating uncertainty as to which object will be attacked and forcing the enemy to waste resources by fortifying both.[36] The essential point is that randomization over strategies is only useful when it serves to create uncertainty in the mind of the enemy, whereas actually choosing randomly (flipping a coin in your command tent) may not be useful.

The "dominate-mix" approach in practice

How can we translate the insights of dominated strategies and mixed strategies into a useable framework for strategic studies? We can do so by integrating the three approaches outlined above into a strategic choice process in the following manner:

- "Universal principles": This approach is utilized to help estimate the outcomes for each strategy match-up (this will be necessary to predict likely outcomes – what will actually occur in every permutation of strategic interactions).
- "Context-dependent": This approach is utilized to evaluate and rank the attractiveness of the various potential outcomes by embedding the military result within the cultural, diplomatic, political context – and to help to theoretically delimit the population (geographically, technologically), to consider how principles apply in the given context.
- "Paradoxical logic": This approach is utilized to systematize the use of randomization over strategies (mix) to achieve surprise, and identify strategic options that are to be dismissed outright (dominated) or should be chosen outright (dominant).

The first two approaches are necessary to flesh out the counterfactual strategic interactions (principles) and evaluate the relative worth of the results (context). In terms of the first approach, some acknowledgement of the existence of "principles" must exist for any commander to mentally work through the potential outcome of strategic, operational, or tactical choices. If, on the other hand, each military encounter is taken to be *sui generis*, then no form of prognostication (and hence no planning) is possible; to some extent, potential outcomes today must be comparable to other events (evidence from previous conflicts or perhaps from training and simulations) to form reasonable expectations of battlefield outcomes.

This was seen in recent debate over US strategy, as operational emphasis switched from Iraq to Afghanistan. Were these two warfare environments alike? Or were they at least comparable enough to allow tactics and strategy that had been effective in one to apply to the other?[37] If not, should we instead look for lessons from the nineteenth-century British experience in Afghanistan?[38] Or is the current conflict utterly unique? This question is answered as counterfactual arguments are made concerning the impact of proposed strategic choices; an analysis of trivial necessary conditions helps to lend rigor to these comparisons by scoping out to what proposed sub-population of wars the current Afghan conflict belongs.

The second approach also allows for military outcomes to be evaluated and ranked according to the broader social and political context. For example, a squad of soldiers takes fire from a single sniper, who subsequently retreats into an otherwise peaceful village. One possible course of action is for the squad leader to call in an airstrike to kill the sniper – and flatten the village in the

process. If the squad were German soldiers operating in the Ukraine during the summer of 1941, this might be an appropriate choice. For a squad of US soldiers operating in present-day Afghanistan, it is not. In both cases the military outcome is identical, but the broader context determines the degree to which the outcome of such a choice is deemed desirable. To determine this, it is necessary to look above the level of the battlefield, to the political, social, and cultural context in which the battle is taking place.

Once the likely outcomes of various strategy match-ups are determined and evaluated, they must be considered in light of the "paradoxical logic" of strategy. Those strategies remaining under consideration would need to be chosen according to some rule of randomization.[39] For example, the Allies consciously engaged in strategic deception to make the Germans uncertain as to whether Calais or Normandy was to be the target of the D-Day invasion. This resulted in the Germans spreading their resources in fortifying both locations and failing to commit crucial armor reserves when the actual invasion took place. At the other end of the spectrum, the German attack at Kursk (Operation Citadel) was planned and executed with a dearth of subterfuge:

> Aerial reconnaissance and patrol activity showed the Russians … had no doubt where and how the Germans would strike, and were energetically preparing to meet them … Once again the old *Blitzkrieg* formula – Stukas, short, intense artillery bombardment, massed tanks and infantry in close contact – was fed into the computer …

This lack of subterfuge, however, resulted in a resounding operational defeat for the Wehrmacht.[40] As has been shown, the concept of "mixing over strategies" captures this logic, particularly when the notion of randomization can be interpreted in terms of taking actions for the purpose of making the opponent uncertain as to the actions you intend to take. When this is done, the opponent is put at a disadvantage.

Once again, this simple "dominate-mix" process does not provide a theory of strategy, but it helps to integrate the insights of three existing schools of thought on strategic choice. By utilizing such a choice mechanism, both analysts and practitioners may gain some insight. Analysts may benefit from simply seeing the complementarity of seemingly disparate approaches and how they may be broken into component parts of a logical whole. Practitioners may be able to utilize such a simple process in the actual planning of future campaigns or the vetting of on-going operations.

The conceptual framework provided lends itself to existing treatments of strategic planning. Art Lykke's emphasis on a balanced structure of "ways-ends-means-risk" developed at the US Army War College matches quite nicely.[41] The structure of the interaction (asking what strategies are available to each player) would fit with his "ways": the generation of the counterfactual results of each strategic interaction would require an appreciation of available "means" and "risk"; and the valuation of each outcome by the political leadership would constitute "ends." Professional expertise and deep knowledge of military affairs would be required to construct the "ways-ends-means-risk" framework, while the "dominate-mix" approach provides an additional toolkit with which to analyze it.

Conclusions and ways forward

The purpose of this article has been to utilize a simple and intuitive framework to help systematize how researchers and practitioners engage in strategic decision-making. In doing so, the "dominate-mix" approach contributes to the study of strategy in two ways. The first contribution is to the field of strategic studies. By reconciling the "universal principles" "context-dependent", and "paradoxical logic" schools – three disparate and seemingly contradictory approaches to strategy – it helps to construct the logical foundations for unification within the field. It does so by recasting concepts such as "strategic uncertainty" and the "principles of warfare" into

terms that fit with the broader social scientific endeavor. Finally, the "dominate-mix" approach may be of utility to practitioners – the simple logic of the approach can easily be applied to real-world situations. Tactical, operational, or strategic choices can be laid out; "dominated" choices may be removed from consideration, and – if no dominant strategy has been identified – the enemy should be made uncertain over the remainder.

Future work on this topic may proceed in two directions. Game theory offers a wealth of insight into strategic interaction that is currently being ignored by the strategic studies community. Such a body of knowledge can be further mined for useful ideas – even if the attendant math and abstraction are not imported along with them. In an opposite vein, the "dominate-mix" approach can be further concretized, both as a descriptive theory for the purpose of rigorous empirical testing ("have actors acted in an analogous manner in past military encounters?") and as prescriptive theory for practitioners ("can we derive teaching tools for military planners to improve strategy choice in the future?"). In the end, both directions seek the same overall goal, furthering our understanding of military strategy.

Acknowledgements

Notes

1. Harrison Mark, 'Preface', in *The Economics of World War II: Six Great Powers in International Comparison*, ed. M. Harrison (New York: Cambridge, 1998), xix–xx.
2. Michael I. Handel, *Masters of War: Classical Strategic Thought*, 3rd ed. (London: Frank Cass, 2001), 3.
3. Harold Kincaid, 'Defending Laws in the Social Sciences', in *Readings in the Philosophy of Social Sciences*, ed. M. Martin and L.C. McIntyre (Cambridge: MIT Press, 1994), 111–30.
4. One can press further on this issue by distinguishing more formally between "risk" and "uncertainty" following the classic treatment by Knight. "Risk" is applied to sets of outcomes which occur with a known probability distribution (such as the flipping of a fair coin or the rolling of a fair dice). "Uncertainty" is applied to sets of outcomes that occur without a known probability distribution (such as the occurrence of an earthquake). It is beyond the scope of this article to explore the full impact of this distinction on the field of strategic studies. See: Frank H. Knight, *Risk, Uncertainty, and Profit* (Mineola, NY: Dover, 1921/2006).
5. George Tsebelis, 'The Abuse of Probability in Political Analysis: The Robinson Crusoe Fallacy', *American Political Science Review* 83, no. 1 (1989): 77–91.
6. Colin S. Gray, *Modern Strategy* (New York: Oxford University Press, 1999), 20.
7. Carl von Clausewitz, *On War*, trans. M. Howard and P. Paret (Princeton: Princeton University Press, 1976).
8. For a brief survey on the evolution of the pertinent philosophical debates regarding such a hypothetico-deductive approach, see Alexander Rosenberg, *Philosophy of Social Science*, 3rd ed. (Boulder, CO: Westview Press, 2008).
9. Quoted in Azar Gat, *A History of Military Thought: From the Enlightenment to the Cold War* (New York: Oxford University Press, 2001), 22–3.
10. Antoine Henri De Jomini, *The Art of War* (London: Greenhill, 1862/1992).
11. J.F.C. Fuller, *Foundations of the Science of War* (Fort Leavenworth, KS: US Army Command and General Staff College Press, 1926/1993), 18.
12. Antoine Henri De Jomini, *The Art of War* (London: Greenhill, 1862/1992), 71.
13. Quoted in Gat, *History of Military Thought*, 114.
14. J. Boone Bartholomees, Jr., 'A Survey of the Theory of Strategy', in *US Army War College Guide to National Security Issues, Volume I: Theory of War and Strategy*, ed. J.B. Bartholomees, Jr. (Carlisle Barracks, PA: Strategic Studies Institute, 2008): 13–42.
15. These dimensions include: people, society, culture, politics, ethics, economy, logistics, organization, military administration, information, intelligence, strategic theory, doctrine, technology, military operations, command, geography, friction, chance, uncertainty, the adversary, and time. He further argues that "truly poor performance in any of [these] dimensions has the potential to offset excellence

elsewhere. Similarly, a selective excellence . . . may well offset inferior performance in other dimensions. In general, the analysis finds that that there is no single 'master' dimension of strategy . . .." Colin S. Gray, *Modern Strategy* (New York: Oxford University Press, 1999), 16.

16.   Gray, *Modern Strategy*, 43.

17.   Ibid.

18.   von Clausewitz, *On War*, 593.

19.   Charles C. Ragin, *Fuzzy Set Social Science* (Chicago: University of Chicago Press, 2000), 50.

20.   John Arquilla, 'The New Rules of War', *Foreign Policy* March/April (2010): 60–7.

21.   Theodore Ropp and Stephen S. Roberts, *The Development of a Modern Navy: French Naval Policy, 1871–1904* (Annapolis, MD: Naval Institute Press, 1987).

22.   Edward N. Luttwak, *Strategy: The Logic of War and Peace.* rev. ed. (Cambridge: Belknap, 2002), 3–4.

23.   Previous writers had noted this paradox long before Luttwak. In 1809, the Prussian Georg von Berenhorst wrote of Jomini's "rules" of warfare: "As long as Napoleon was the only one to exercise them, he could achieve success, but once everyone employed his system, it would cancel itself out, and numerical superiority, courage, and the general's fortune would again reign supreme" (paraphrased in *History of Military Thought*).

24.   Cited in David Goyne, 'Book Review of Edward Luttwak: Strategy: The Logic of War and Peace', *Journal of Battlefield Technology* 5, no. 2 (2002): 33.

25.   Gregory R. Johnson, 'Luttwak Takes a Bath', *Reason Papers* 20 (1995): 121–4.

26.   Gray, *Modern Strategy*, 87–8.

27.   Bartholomees, *US Army War College*, 26.

28.   Luttwak, *Strategy*, 7.

29.   Gray, *Modern Strategy*, 103–4.

30.   For Walt's full argument and several critical responses see Michael El Brown, Owen R. Cote, Sean M. Lynn-Jones, and Steven E. Miller, eds., *Rational Choice and Security Studie: Stephen Walt and His* (Cambridge: The MIT Press, 2000). See also, Jeffrey Friedman, ed., *The Rational Choice Controversy* (New Haven: Yale University Press, 1996).

31.   In fact, the explicit use of game theory to study military and operational strategy has been extremely limited (a noteworthy exception being O.G. Haywood, 'Military Decision and Game Theory', *Journal of the Operations Research Society of America* 2, no. 4 (1954): 365–85. Even its impact on the golden age of nuclear deterrence theory has been overstated Thomas C. Schelling, 'Review of "Strategy and Conscience" by Anatol Rapoport', *American Economic Review* 54, no. 6 (1964): 1082–8, and Marc Trachtenberg, *History and Strategy* (Princeton: Princeton University Press, 1991). For an excellent critical survey see Frank Zagare, 'Game Theory and Security Studies', in *Security Studies: An Introduction*, ed. P.D. Williams (London: Routledge, 2008), 44–58.

32.   Weak domination occurs when a strategy results in payoffs as good as and sometimes better than another, regardless of what the other player plays. For example, if the number 3 in the "top, right" box was changed to a 2, the strategy "right" for column player would weakly dominate "left" – as the player would always do as well or better playing "right" than if he played "left" ($2 = 2, 1 > 0$).

33.   In other words, a strictly dominated strategy is not used with positive probability in any mixed strategy Nash equilibrium. This is not the case with weakly dominated strategies, which may be assigned a non-zero probability in a mixed strategy Nash equilibrium. See, Martin J. Osborne, *An Introduction to Game Theory* (New York: Oxford University Press, 2004), 120–1.

34.   Osborne, *Introduction to Game Theory*, 99–105.

35.   Fernando Vega-Redondo, *Economics and the Theory of Games* (New York: Cambridge University Press, 2003).

36.   B.H. Liddell Hart, *Strategy*, 2nd rev. ed. (New York: Meridian, 1991), 126–37.

37.   Sameer Lalwani, 'The Limits of Replicating the "Anbar Awakening"', *Washington Post*, June 4, 2009.

38.   Ashley Jackson, 'British Counter-Insurgency in History: A Useful Precedent?', *British Army Review* 139 (Spring, 2006): 12–22.

39.   Given that the alternatives will, in almost all cases, be simply rank ordered, rather than given cardinal values with a common metric, the determination of actual probabilities ("choose strategy A with probability 2/3 and strategy B with probability 1/3") would not be possible.

40.   Alan Clark, *Barbarossa: The Russian-German Conflict 1941–45* (New York: Quill, 1965), 324–30.

41.   Harry R. Yarger, 'Toward a Theory of Strategy: Art Lykke and the US Army War College Strategy Model', in *US Army War College Guide to National Security Issues, Volume I: Theory of War and Strategy*, ed. J.B. Bartholomees, Jr. (Carlisle Barracks, PA: Strategic Studies Institute, 2008), 43–50.