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THE STATE OF KNOWLEDGE ON THE DETERMINANTS OF
OFFENSIVENESS AND DEFENSIVENESS IN
CONVENTIONAL GROUND FORCES

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Stephen D. Biddle

September 1989

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PREFACE

This paper was produced by the Institute for Defense Analyses (IDA) under the IDA Central Research Program. The paper surveys the military theoretical literature to establish the current state of knowledge with respect to the determinants of offensiveness and defensiveness in conventional land forces. It has several purposes. It is intended in part as a resource to researchers, and as a source of background knowledge to policy makers. It is also meant to serve as a point of departure for further work to advance the state of knowledge described in the paper, and thereby to contribute to an improved basis for policy making on issues of conventional arms control, conventional force planning and Alliance strategy.

The paper reviews the work of the "classical" military theorists -- Clausewitz, Jomini and Sun Tzu; the twentieth century theorists J.F.C. Fuller and Basil Liddell Hart; Lanchester theory and modern operations research; political science scholarship on the "offense-defense balance;" and insights from the conventional arms control, conventional balance, and non-provocative defense debates. The paper concludes that while this literature fails as yet to provide a coherent, systematic body of theory, it is nevertheless rich in insight and thus constitutes a valuable heuristic device for the construction of more rigorous theory. In particular, three recurrent themes are identified as "proto-theories" for use as departure points in further work. These are: (1) that offensive capability is proportional to the fraction of "offensive" weapon types in the combatant force structures; (2) that offensive capability is proportional to the degree of numerical imbalance, in the form of either the force-to-force ratio (to which offensive capability is directly proportional) or the force-to-space ratio (to which offensive capability is inversely proportional); and (3) that offensive capability is a function of how the respective forces are used -- and in particular, that a combination of defense in depth with counterattack produces weak offenses and strong defenses, while shallow, passive defenses produce powerful offensive opportunities.

This paper was reviewed by Dr. Victor Utgoff, IDA, Dr. Ivan Oelrich, Office of Technology Assessment, and General Ennis Whitehead (USA, Ret).

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A. INTRODUCTION

Is there a difference between the capacity to attack and the capacity to defend with conventional weapons? If so, what traits of a force posture are responsible, and are these traits visible to potential combatants in advance? Can offensive capability be transformed into defensive capability by negotiated agreement or unilateral action? These questions have become increasingly important in recent years. Under Gorbachev, the Soviet Union has proclaimed "defensive sufficiency" as its security policy objective, while the Red Army has undertaken a "defensive restructuring" of its forward deployed ground forces. The Conventional Forces in Europe (CFE) arms control talks aim at reducing invasion potential while preserving states' capacity to resist attack. Many in Europe and elsewhere advocate a unilateral restructuring of Western military forces to provide a more defensive posture at lower force levels.

To make sense of these developments, it is necessary to begin with the best possible understanding of the underlying determinants of offensive and defensive conventional military capability. The purpose of this paper is thus to take a first step in the direction of such an understanding by summarizing and evaluating the current state of knowledge on the offensiveness or defensiveness of conventional ground forces.

To do this, we must begin by asking three questions. First, what is the existing theoretical literature on the determinants of conventional offense and defense? Second, what are the strengths and weaknesses of this literature; and finally, what needs to be done to improve that body of thought so as to provide a stronger basis for policy?

As for the first of these, there is little or no existing body of systematic, falsifiable theory in this area. There is a large and heterogeneous literature on the conduct of conventional warfare, but very little of it was prepared with the clarity required to support selection among competing hypotheses by systematic comparison with experience. Given this, the critical task for the analytic and academic community must be to produce an initial statement of theory which *is* sufficiently clear and systematic to sustain attempted falsification.

Although this literature may not be scientific in this sense, it is nevertheless rich in insight. As such, it constitutes a valuable heuristic device, and a substantial asset for the development of theory. Our primary purpose, then, in reviewing the literature will be to collect a body of ideas and observations to serve as seed stock for the development of new theory.

In doing this, our aim will be to present existing thought rather than to develop a new understanding of the determinants of offensiveness and defensiveness here. The present inquiry is intended to be preparatory to such an effort, but theoretic development per se is beyond the scope of this paper. In surveying existing thought, we will focus on theorists who have proven particularly influential for contemporary thinking, and on the results of a small collection of ongoing policy debates directly related to the question of conventional offense and defense. In particular, we will review the work of the "classical" military theorists -- Clausewitz, Jomini and Sun Tzu; the twentieth century theorists J.F.C. Fuller and Basil Liddell Hart; lanchester theory and modern operations research; political science scholarship on the "offense-defense balance;" and insights from the conventional arms control, conventional balance, and non-provocative defense debates.

B. CLASSICAL MILITARY THEORY: CLAUSEWITZ, JOMINI AND SUN TZU

1. Clausewitz

Carl von Clausewitz' On War has been described by Bernard Brodie as "not simply the greatest, but the only great book about war."¹ Written in the aftermath of the Napoleonic Wars and first published between the years 1832 and 1834, it is still a widely read and broadly influential book. It is also enjoying a particular resurgence of interest among current military officers.² Clausewitz, however, must be approached with caution. Much has changed in the 150 years since his work was first published. It is also a stylistically complex work, juxtaposing thesis and antithesis, and leaving ideas introduced in one section to be developed only much later. It is thus easy to reach misleading conclusions by taking isolated passages out of context. Nevertheless, its status as the preeminent work of military theory compels careful attention. It thus seems an appropriate point of departure.

On War comprises eight separate books, dealing respectively with "The Nature of War," "The Theory of War," "Strategy in General," "The Engagement," "Military Forces," "Defense," "Attack," and "War Plans." Taken together, the books explore an overarching theme described by Peter Paret as "two dialectical relationships: the relationship between war in theory and real war; and the relationship between the three factors that together

¹ As quoted by Michael Howard in Clausewitz (Oxford: Oxford University Press, 1983), p.1

² See, for example, Col. Lloyd J. Matthews' skeptical treatment of this trend in "On Clausewitz," Army, February 1988, pp.20-24

make up war -- violence, the play of chance and probability, and reason."³ At a somewhat lower level of abstraction, Clausewitz develops a number of ideas of particular importance for the study of war, among them that war should be understood as a continuation of politics, the importance of moral and psychological factors in war, the notion of "friction," and the argument that defense is a stronger form of war than attack.

It is of course this final argument that most directly concerns us here. What does Clausewitz mean by this, and how does he substantiate his contention? To begin with, for Clausewitz, neither attack nor defense are "pure" activities. An essential component of defense is counterattack, and an essential component of attack is the need to defend against counterattack.⁴ Indeed, he describes the hypothetical case of a wholly passive defense as absurd, a contradiction of the very idea of war.⁵ But if both sides engage in both activities, then the crucial difference between them is one of sequence and of emphasis -- the initial defender waits, then acts; the initial attacker acts then waits. Thus when Clausewitz argues that the defense is the stronger form of war, he is in effect asserting that attacking second is superior to attacking first; that awaiting the opponent's first move, then attacking after the opponent has committed himself offers a better outcome than initiating battle and awaiting the opponent's counterstroke.

Why would this be so? Clausewitz offers several reasons. At the level of tactics, he argues that only three effects offer "decisive advantages" -- surprise, the benefit of terrain, and concentric attack (which he defines as "tactical envelopment"). Of these, the benefits of terrain accrue solely to defenders. Surprise and concentric attack would be advantageous to the attacker, but they are even more effective when used in counterattack, after the opponent has exhausted himself in the attempt to penetrate the defender's positions.⁶

At the level of strategy, terrain, surprise, and concentric attack are again decisive, as is fortification of the theater of operations, popular support by the indigenous population, and exploitation of moral effects. Of these six factors, only one clearly favors the attacker,

³ Peter Paret, "Clausewitz" in Peter Paret, ed., Makers of Modern Strategy (Princeton, NJ: Princeton University Press, 1986), p.199

⁴ Carl von Clausewitz, On War, edited and translated by Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), Book VI, Chapter 1, p.357; also Book VI, Chapter 5, p.370

⁵ Ibid., Book VI, Chapter 1, p.358

⁶ Ibid., Book VI, Chapter 2, pp.360-1; also Book VII, Chapter 2, p.524; and Book VII, Chapter 22, p.572

while three favor the defense (and two convey no preference). More specifically, strategic concentric attack is available only to invaders, who alone have the numerical strength to support such sweeping maneuvers. Moral effects are neutral, accruing mainly to the victorious rather than belonging to attackers or defenders per se. Strategic surprise is a potential advantage to the attacker, but to achieve it requires gross error by the defender; this will not normally occur.⁷

Terrain, fortification, and popular support, by contrast, all favor the defense.⁸ These weaken attackers operating on foreign soil, but do not interfere with counterattacks conducted within one's own borders.⁹ But while strategic defenders can counterattack effectively, strategic attackers find defense difficult:

all elements of defense that occur during an offensive are weakened by the very fact that they are part of the offensive This is not simply hairsplitting. Far from it: this is the greatest disadvantage of all offensive action namely, the defensive that will follow.¹⁰

For Clausewitz, then, defense is the stronger form of war, but only for an aggressive defense emphasizing counterattack -- indeed, it is the superiority of counterattack to invasion that constitutes the real strength of defense. Clausewitz, of course, has a great deal more to say about the conduct of both defense and attack, although parts of this material are too specific to the Napoleonic era to be relevant today. We will address only one further point here: the defender's choice between deployment at the frontier and withdrawal into the interior.

Clausewitz sees substantial advantages for the defender in delaying decisive engagement while withdrawing from the border. This is because attacks normally diminish in strength as they advance. Attackers must occupy conquered provinces, defend their own rear areas and lengthening lines of communication, and detach forces to conduct sieges -- in addition to losses from casualties and disease. Further reductions in combat power can be expected as a result of increasing distances from sources of supply, a predictable

⁷ Ibid., Book VI, Chapter 3, pp.363-5

⁸ Ibid., Book VI, Chapter 3, pp.363-6

⁹ If successful, however, the defender's counterattack can be carried beyond the original border and into enemy territory: "It may be left to circumstances whether or not a victory so gained [by counterattack] exceeds the original purpose of the defense." Ibid., Book VI, Chapter 8, p.380; also: "We maintain unequivocally that the form of warfare that we call defense not only offers greater probability of victory than attack, but that its victories can attain the same proportions and results." Ibid., Book VI, Chapter 9, p.392

¹⁰ Ibid., Book VI, Chapter 3, p.365

"relaxation of effort" on the part of the advancing troops as *fatigue sets in*, and likely defection of allies.¹¹ Defenders, by contrast, often *increase* in strength over time as they receive reinforcements from elsewhere in the theater.¹²

The result of this is that if the campaign is long enough, all attacks will eventually reach a "culminating point" at which "their remaining strength is just enough to maintain a defense and wait for peace."¹³ For the attacker, this culminating point represents both a high-water mark and the moment of greatest weakness: he has too little combat power to continue his advance, but he has not yet prepared his position for defense. This point is thus the ideal moment for counterattack. Only the quick, total defeat of the defender can prevent this condition -- if the attacker cannot force an early peace, his attack will eventually culminate in unprepared defense.

Defense at the frontier, however, presents the attacker with just such an opportunity for quick victory. It offers an early opportunity to bring the defending army to battle and destroy it before the attacker's strength drains away with time and distance. A defender at the frontier is forced to counterattack quickly, and thus meets stronger resistance than if the counterattack were delayed. Withdrawal into the interior, on the other hand, postpones the climactic engagement until a moment of greater relative strength for the defense, and increases the likelihood that the attacker will reach his culminating point prior to the collapse of the defense.¹⁴

¹¹ Ibid., Book VII, Chapter 4, p.527

¹² Ibid., Book VI, Chapter 25, p.470. Clausewitz notes, however, that the opposite is likely to obtain if the defender's withdrawal is involuntary as a result of an unsuccessful attempt to defend at the frontier. Ibid., Book VI, Chapter 25, p.469

¹³ Ibid., Book VII, Chapter 5, p.528

¹⁴ Clausewitz believed that this would normally be the case even for a defense at the frontier -- i.e., that only in rare circumstances can attackers achieve a favorable peace prior to reaching their culminating point and transitioning to defense. See Ibid., Book VII, Chapter 5, p.528. Withdrawal to the interior, however, causes the attacker to "perish as a result of his own exertions" rather than "perishing as a result of the sword" and thus decreases the attacker's odds still further. Ibid., Book VI, Chapter 8, p.384. Clausewitz does note two disadvantages for the defender in a withdrawal to the interior -- the temporary loss of territory and its potential effect on morale -- but he does not believe these to be compelling. See Ibid., Book VI, Chapter 25, pp.470-1; also Book VI, Chapter 8, 382-4.

2. Jomini

Antoine Henri Jomini, with his contemporary Clausewitz, has sometimes been described as the "co-founder of modern military thought."¹⁵ Certainly the two men have together had a tremendous influence on the twentieth century literature. Between themselves, however, the co-founders found much to disagree about. Neither held the other in particularly high esteem. More important, they differed significantly in both their general outlook and their substantive conclusions. For Clausewitz, for example, war is a moral struggle between commanders who strive to impose their will on a fundamentally chaotic process. Jomini saw war more as a match of wits than of wills; by contrast with Clausewitzian friction, the Jominian battlefield is dominated by rational calculation and careful observation of constraints on movement and supply.¹⁶

For our purposes, however, their most significant disagreement concerns the relative advantages of attack and defense. Whereas for Clausewitz defense is the stronger form of war, Jomini argues in his Summary of the Art of War, published in 1838, that "for a single operation, the offensive is almost always advantageous, particularly in strategy."¹⁷

Jomini's conclusion follows from his "fundamental principle of war:"

One great principle underlies all the operations of war -- a principle which must be followed in all good combinations. It is embraced in the following maxims:

1. To throw by strategic movements the mass of an army, successively, upon the decisive points of a theater of war, and also upon the communications of the enemy as much as possible without compromising one's own.
2. To maneuver to engage fractions of the hostile army with the bulk of one's forces.
3. On the battlefield, to throw the mass of the forces upon the decisive point, or upon that portion of the hostile line which it is of the first importance to overthrow.

¹⁵ Crane Brinton, Gordon A. Craig and Felix Gilbert, "Jomini" in Edward Mead Earle, ed., Makers of Modern Strategy (New York: Atheneum, 1969), p.80

¹⁶ For a more detailed comparison, see Michael Howard, "Jomini and the Classical Tradition in Military Thought" in Michael Howard, ed., The Theory and Practice of War (New York and Washington: Praeger, 1966), p.10

¹⁷ Antoine Henri Jomini, A Summary of the Art of War, translated and edited by J.D. Hittle (Harrisburg, PA: The Military Service Publishing Co., 1947), pp.68-9

4. To so arrange that these masses shall not only be thrown upon the decisive point, but that they shall engage at the proper times and with ample energy.¹⁸

In effect, Jomini contends that the single most important determinant of combat outcomes at the campaign level is differential concentration of forces -- the ability to attain local numerical superiority at a point of one's choosing by massing at that point and accepting risks elsewhere. It follows, then that:

if the art of war consists in throwing the masses upon the decisive points, it is necessary to take the initiative. The attacking party knows what he is doing and what he desires to do; he leads his masses to the point where he desires to strike. He who awaits the attack is everywhere anticipated; the enemy fall with large force upon fractions of his force; he neither knows where his adversaries propose to attack him nor in what manner to repel them.¹⁹

Since the attacker has the greater power to concentrate differentially, and since differential concentration is the key to warfare, then attack must be superior to defense. For Jomini, defense is an expedient to be resorted to only when confronted with prohibitive numerical inferiority in the theater of operations, or when compelled to break off the attack by tactical reverses.²⁰ But if forced to defend, an army can still exploit the advantages of the initiative by counterattacking in what Jomini terms the "defensive-offensive:"

If what may be called the defensive-offensive is used, it may have strategical as well as tactical advantages. It combines the advantages of both [offensive and defensive] systems, for one who awaits his adversary upon a prepared field, with all his own resources in hand, surrounded by all the advantages of being on his own ground, can take the initiative with hope of success.²¹

How does this compare with Clausewitz? In fact, the difference between the two is less striking than initially meets the eye. Both agree on the weakness of passive defense, and the need for defenders to regain the initiative by counterattack.²² Clausewitz believes

¹⁸ Ibid., p.67

¹⁹ Ibid., p.69

²⁰ Ibid., p.69-70

²¹ Ibid., p.69

²² Jomini, for example, argues that "the best thing for an army on the defensive is to know how to take the offensive at a proper time, and to take it." Ibid., p.103. Also: "Every army which maintains a strictly defensive attitude must, if attacked, be at last driven from its position; but if it takes advantage of the benefits of the defensive system and holds itself ready to take the offensive when occasion offers, it may hope for the greatest success." Ibid., p.104. For Clausewitz' views, see On War, Book VI, Chapter 1, p.358.

that a counterattack directed against the invader's flank, preferably after the latter has been given the opportunity to exhaust himself in an extended advance, offers the most advantageous use of the initiative. Jomini holds that the initiative is better used from the outset and should never be voluntarily relinquished. Each, however, advocates an active, aggressive form of warfare aimed at controlling the circumstances of the decisive engagement, and at taking the battle to the enemy at the appropriate point. It is over the nature of that point that they disagree.

Of course, Jomini's theory extends further than the relative advantages of attack and defense per se. He deals extensively with the geography and geometry of military operations; morale; logistics; reconnaissance and signals. As with Clausewitz, substantial parts of this are of limited relevance for modern combat. One further issue raised by Jomini is worthy of note, however, and this is his treatment of combined arms.

Jomini devotes a chapter to the issue of combined arms integration at the end of his Summary. In it, he notes the varying roles and functions of infantry, cavalry, and artillery on the Napoleonic battlefield. He particularly notes the weaknesses of individual arms used alone, and recommends that commanders employ each "so that they will give mutual support and assistance" to cover one another's weak points.²³ Of perhaps greatest interest is his discussion of Napoleon's organizational innovation of the corps, a combined arms formation placing detachments of infantry, cavalry and artillery under a single commander so as to facilitate mutual support.²⁴ Although battlefield conditions have changed dramatically since 1838, this emphasis on combined arms integration has proven particularly important in the twentieth century -- an insight lost, however, on many twentieth century theorists.²⁵

3. Sun Tzu

Sun Tzu's Art of War constitutes the first known attempt to codify a theory to guide the conduct of war. Its direct influence on modern warfare has been principally in Asia, where it has long been highly regarded by both soldiers and statesmen.²⁶ In the West, its

²³ Jomini, pp.155-6

²⁴ Ibid., pp. 147-8

²⁵ Notably Frederick William Lanchester, J.F.C. Fuller and Basil Liddell Hart, as described in greater detail below.

²⁶ See, for example, John Shy and Thomas W. Collier, "Revolutionary War" in Peter Paret, ed., Makers of Modern Strategy op. cit., pp.815-62, esp. p.823; and Samuel B. Griffith, "Sun Tzu and Mao Tse-Tung"

influence has been mainly indirect, through its effects on the thinking of various Western theorists. Prominent among these is Basil Liddell Hart, who has described it as "the concentrated essence of wisdom on the conduct of war."²⁷ The book itself constitutes a set of maxims and associated commentary by later authors, loosely organized under 13 chapter titles. Its actual authorship and date of origin are subject to some uncertainty, but it is generally thought to have been written in China in the fourth century B.C.

Unlike Clausewitz or Jomini, Sun Tzu says little about the relative advantages of offense and defense per se. His direct treatment of the subject, albeit brief, is suggestive of Clausewitz' analysis of the advantages of the second move taken from a skillfully prepared position:

Anciently the skillful warriors first made themselves invincible and awaited the enemy's moment of vulnerability.

Invincibility lies in the defense; the possibility of victory in the attack.

One defends when his strength is inadequate; he attacks when it is abundant.

Therefore the skillful commander takes up a position in which he cannot be defeated and misses no opportunity to master his enemy.

Generally, he who occupies the field of battle first and awaits the enemy is at ease; he who comes later to the scene and rushes into the fight is weary.

And therefore those skilled in war bring the enemy to the field of battle and are not brought there by him.²⁸

For our purposes, however, Sun Tzu's principle utility is perhaps less as a direct source of insight on the problem of offense and defense, and more as a general observation on the importance of intelligence and information for the successful conduct of operations. He describes the problem of differential concentration, for example in terms that clearly identify the crucial role of information for successful concentration:

If I am able to determine the enemy's dispositions while at the same time I conceal my own then I can concentrate and he must divide. And if I concentrate while he divides, I can use my entire strength to attack a fraction of his. There, I will be numerically superior. Then, if I am able to use many to strike few at the selected point, those I deal with will be in dire straits.

and "Sun Tzu's Influence on Japanese Military Thought," both in Sun Tzu, The Art of War, trans. Samuel B. Griffith (London: Oxford University Press, 1963), pp.45-56 and 168-78, respectively.

²⁷ Basil H. Liddell Hart, in the foreword to Sun Tzu, op. cit., p.v.

²⁸ Sun Tzu, op. cit., p.85, verses 1, 5, and 6; p.87, verse 13; p.96, verses 1 and 2, respectively.

The enemy must not know where I intend to give battle. For if he does not know where I intend to give battle he must prepare in a great many places. And when he prepares in a great many places, those I have to fight in any one place will be few.²⁹

More generally, he argues that:

All warfare is based on deception.

Therefore I say: Know the enemy and know yourself; in a hundred battles you will never be in peril.

When you are ignorant of the enemy but know yourself, your chances of winning or losing are equal.

If ignorant both of enemy and of yourself, you are certain in every battle to be in peril.³⁰

For Sun Tzu, knowledge -- very broadly interpreted -- is thus of great importance for military operations. By contrast with Clausewitz or Jomini, Sun Tzu stresses the utility of cleverness and subtlety over brute force. The Art of War as a whole is characterized by an emphasis on highly selective uses of force calculated to obtain the commander's goals with minimum effort. Sun Tzu exhorts the commander to strike weakness and avoid strength; to seek to win without fighting; to take the path of least resistance; and to outwit an opponent rather than overpowering him. Of course, it is difficult to apply such unspecific guidelines to the solution of any given operational problem. While such formulations are far too imprecise to offer much direction for the development of theory, they are at least a useful corrective to a too-reductionist view of war. As such, they can serve as a valuable warning to the analytically unwary.

C. TWENTIETH CENTURY MILITARY THEORY: FULLER AND LIDDELL HART

In the twentieth century, the two most influential theorists on offense and defense have been the British "military intellectuals" J.F.C. Fuller and Basil H. Liddell Hart. As the Napoleonic wars produced Clausewitz and Jomini, so Fuller and Liddell Hart were very much the products of the First World War. Both were motivated by revulsion at the trench stalemate on the Western Front, and both wrote largely as advocates of particular means for preventing its recurrence in any future war.

²⁹ Ibid., p.98, verses 13 and 14, respectively.

³⁰ Ibid., p.66, verse 17; p.84, verses 31, 32 and 33, respectively.

This motivation worked to the detriment of their long term contribution to scholarship, however. Neither man could be considered a dispassionate observer, and it has been argued that Liddell Hart in particular was quite willing to bend theory to suit policy preference where necessary.³¹ Their partisan intent and often journalistic style thus complicate the task of interpretation; each is highly repetitive, and neither wrote the type of authoritative magnum opus associated with either Clausewitz, Jomini or Sun Tzu.

Nevertheless, each was a perceptive observer of military matters at a particularly pivotal time. Between them, they created a body of literature on the theory of warfare that is still highly influential, and that bears particularly closely on the problem of offense and defense. As such, their work merits careful attention -- albeit with considerable wariness.

1. J.F.C. Fuller

John Frederick Charles Fuller was a prolific writer, and produced a long series of ideas on the nature and conduct of war.³² Of greatest interest for us, however, are four ideas on the nature of offense and defense: that weapons technology and tactics together determine whether "siege or mobility" characterize combat; that warfare swings back and forth between these extremes over time; that at any given time, actual combat requires close integration of offensive and defensive action; and that to counter mechanized attack requires defense in depth.

As for the first of these, Fuller saw the "siege warfare" of the First World War as a product of the introduction of new weapons technologies such as the machine gun and improved artillery.³³ The stalemate that resulted from such weapons could be broken only

³¹ See John J. Mearsheimer, Liddell Hart and the Weight of History (Ithaca and London: Cornell University Press, 1988), esp. pp.6-7. See also Brian Bond, Liddell Hart: A Study of his Military Thought (New Brunswick, NJ: Rutgers University Press, 1977), esp. pp. 90, 94, 95, 98, 113, 173; On Fuller's motivations and their impact on his theoretical conclusions, see Brian Holden Reid, J.F.C. Fuller: Military Thinker (New York: St. Martin's Press, 1987), esp. pp.140, 198.

³² Including his doctrine of strategic paralysis, the principle of economy of force, his thoughts on the unity of war and peace, and of course his advocacy of mechanization and his proposals for mechanized tactics and doctrine. For surveys of Fuller's thought, see Anthony John Trythall, "Boney" Fuller: Soldier, Strategist and Writer (New Brunswick, NJ: Rutgers University Press, 1977); and especially Reid, op. cit.

³³ See, for example, J.F.C. Fuller, Lectures on F.S.R. III (London: Sifton Praed and Co., Ltd., 1932), pp.105-6. Fuller, however, is inconsistent on the role of weapons technology in promoting offensive or defensive advantage; see, for example, his arguments in J.F.C. Fuller, "What is an Aggressive Weapon?" English Review, June 1932, pp.601-5, and Fuller, "Aggression and Aggressive Weapons: the Absurdity of Qualitative Disarmament" Army Ordnance XIV (1933), pp.7-11, where he contends that to label

when a new technology -- the internal combustion engine applied to the tank and the airplane -- appeared in 1916. Technology alone, however, proved necessary but insufficient to break the deadlock. The first tanks were merely "thrown into the mud" in support of old-fashioned infantry offensives. Improperly used, the tank is little better than the foot soldier; tactics must fit the new weapons for the technology itself to have any effect.³⁴ In fact, combat outcomes are as often the product of misapplication of prevailing technology as they are of the nature of the technology itself:

The supreme danger in war is not that the scientist will cease to help the soldier, but that the soldier will cease to understand the scientist, and, bound as he generally is to the old methods of war, will be unable to evolve new and more economical methods out of the new and more economical devices science provides him with. Nothing is more depressing than to look back on the last War and watch general after general, through misuse and opacity of mind, throw away one invention after the other, or attempt to apply new weapons like old ones, and consequently sacrifice tens and hundreds of thousands of lives unnecessarily.³⁵

Fuller's second observation concerns the cyclic nature of offense and defense. Fuller argued that any successful weapons development or tactical innovation gives its opponent a powerful incentive to develop a counter. Moreover, military technology is closely related to progress in the civilian economy, which is constantly changing. This ever-changing technology base means that an antagonist with an incentive to thwart an opposing capability will eventually find the technical means to do so. The result is that no balance between offense and defense can ever be permanent -- the development of a powerful new technique for either contains within itself the seeds of its own overthrow. Fuller called this process of evolution "the constant tactical factor:"

Every improvement in weapon-power (unconsciously though it may be) has aimed at lessening terror and danger on one side by increasing them on the other; consequently, every improvement in weapons has eventually been met by a counter-improvement which has rendered the improvement obsolete; the evolutionary pendulum of weapon-power, slowly or rapidly swinging from the offensive to the protective and back again in harmony with the speed of civil progress.³⁶

individual weapons technologies as "offensive" or "aggressive" for the purpose of qualitative disarmament is meaningless - even though much of his own writing does, effectively, just this.

³⁴ See J.F.C. Fuller, *The Dragon's Teeth. A Study of War and Peace* (London: Constable and Co., Ltd., 1932), pp.266-7

³⁵ *Ibid.*, pp.218-19

³⁶ *Ibid.*, pp.213

Although Fuller argued strenuously on behalf of mechanization as a device by which to prevent a recurrence of the trench stalemate of the Western Front, he thus did not believe that the offensive potential of mechanized forces would prove permanent:

Thus the motor car and the tank re-establish the offensive as the stronger form of war, yet this fact does not justify us in supposing that mobile warfare will endure for ever; but rather that sooner or later means of slowing down tank offensives will be resorted to, and once again armies will be faced by siege warfare.³⁷

The tendency in military evolution towards increased mobility, which is becoming paramount, will find its reaction in attempts to defeat this mobility by means of permanent and field fortifications As the defensive gains on the offensive military operations will become slower and slower, until battles between mechanized armies are likely to grow as static as they were between the enormous muscular armies of the World War.³⁸

Fuller's third observation involves the interaction between offensive and defensive combat. For Fuller, defense is "as closely related to offense as is the left arm to the right arm of the boxer."³⁹ Without a solid defense of its "base of operations," no attack could hope to survive defensive counterattack; without counterattack, defense is "merely delayed suicide."⁴⁰ Like Clausewitz and Jomini, Fuller thus argues that invaders should be met with a "defensive-offensive" oriented toward decisive counterattack rather than passive resistance.⁴¹

Fuller's final point concerns the proper conduct of a defense against mechanized attack. In particular, Fuller argues that mechanized attack requires depth for successful defense. While linear defense is suitable for opposing an infantry attack, only an area defense consisting of separate but mutually supporting antitank positions spread into depth

³⁷ Fuller, Lectures on F.S.R. III, pp.106-7

³⁸ Fuller, The Dragon's Teeth, pp.289-90

³⁹ As quoted in Reid, op. cit., p.153; Also: "the art of fighting depends upon the closest combination of the offensive and the defensive, so closely as does the structure of a building depend on bricks and mortar." Fuller, Lectures on F.S.R. III, pp.117

⁴⁰ As quoted in Reid, op. cit., p.100

⁴¹ Fuller's emphasis on the defensive-offensive, however, tends to conflict with his emphasis on the role of weapons technology in determining whether offense or defense enjoys the advantage in war at any given point. If technology at any given time favors either attack or defense, then would not any technology (e.g. mechanization) that facilitates attack also facilitate counterattack and thus strengthen defense as well as offense? For Fuller's own observations on this point, see "What is an Aggressive Weapon?" op. cit., pp.601-5, and discussion above.

behind the initial line of contact is capable of resisting a mechanized attacker. Fuller termed this system the "archipelago defense." The system was further organized into two zones, a forward static defense and a rearward mobile force. The static defense canalizes and wears down the attack, in the process buying time for the mobile reserve elements to concentrate on the attacker's flanks for a decisive counterstroke. Given proper fortification of the antitank "islands" of the archipelago (particularly through the liberal use of antitank mines), Fuller believed that such a defense could be highly effective in containing armored attack; indeed, he implies that it is primarily the development of such tactics that would swing the pendulum of the constant tactical factor back to siege warfare.⁴²

2. Liddell Hart

Like his contemporary and close colleague Fuller, Basil Liddell Hart was prolific. Of his many observations, he has become particularly associated with five ideas: the "expanding torrent" system of infantry tactics, mechanization of the British army, the theory of the indirect approach, naval blockade as "the British way in warfare," and the superiority of the defense.⁴³ For our purposes, the last of these is of particular significance.

While Liddell Hart's views on the relative strength of offense and defense changed significantly over the course of his career, his most detailed, most extensive argumentation

⁴² See, for example, Fuller, The Dragon's Teeth, op. cit., p.289; also: "mobile warfare will inevitably lead to static warfare, and possibly to warfare as static as that experienced during 1914-1918; yet with this difference: That whilst then entrenched line held entrenched line, in static mechanized warfare fortified zone will hold fortified zone." Fuller, Lectures on F.S.R. III, op. cit., p.128. For a detailed description of the "archipelago defense," see J.F.C. Fuller, "Armor and Counter Armor," Infantry Journal, May 1944 pp.39-43

⁴³ Mearsheimer, Liddell Hart and the Weight of History, op. cit., pp.5-7

was in support of the contention that defense is superior to offense.⁴⁴ The basis of this contention was his belief that the relative superiority of offense and defense is determined by a combination of weapons technology and force size, and that both of these determinants indicated that post-World War I combat would increasingly favor the defense.

With respect to weapons technology, Liddell Hart argued that certain weapons contribute most strongly to success in the attack, while others strengthen mainly the defense. The distinction is based on his analysis of the cause of the stalemate on the Western Front. For Liddell Hart, the foundation of the deadlock was the power of the entrenched machine gun (and to a lesser extent its supporting riflemen) to make frontal assaults by infantry impossible. Hence, the machine gun and the fortification are primarily defensive. Any weapon that tends to weaken the power of this combination is therefore offensive. Tanks, for example, are impervious to machine gun fire; heavy artillery can destroy fortifications by bombardment; aircraft can overfly entrenchments to strike vulnerable targets in the rear -- all are thus primarily offensive. Antitank and antiaircraft weapons restore the power of the entrenched machine gun by destroying systems which threaten it, and are therefore defensive.⁴⁵

⁴⁴ As John Mearsheimer has pointed out, during the 1920's, Liddell Hart projected that the next war would be characterized by mobility and quick offensive campaigns (if the British government followed his advice and mechanized its ground forces). By the early 1930's, however, he had changed his mind, and began to argue that the next war would be even more defense-dominated than the last one. Mearsheimer has argued that this shift was motivated by Liddell Hart's desire to avoid commitment of British ground forces to the defense of the Continent. As Mearsheimer notes, if warfare were defense-dominant, France could withstand a German attack alone and there would be no need for a British expeditionary force -- a requirement Liddell Hart wished very much to avoid. The offensive successes of the Wehrmacht in 1939-41, however, led Liddell Hart subsequently to downplay his arguments as to the superiority of defense and emphasize his earlier role in the promotion of mechanization in the 1920s. See *Ibid.*, pp.19-48, 99-123, 178-217; see also Bond, *op. cit.*, pp.12-36, 88-118. Of these successive positions, however, the superiority-of-defense arguments of the late 1930's were clearly the most explicit, systematic, and detailed. They were also echoed in Liddell Hart's final substantive analyses of Western defense after World War II, in which he advocated a purely defensive posture for NATO: see Bond, *op. cit.*, pp.170-2. We will therefore focus here on Liddell Hart's arguments for the superiority of defense as expressed in the 1930's, rather than detailing at length his shifting views in the 1920's and 1940's.

⁴⁵ See, for example, Basil H. Liddell Hart, The Liddell Hart Memoirs. Vol. I. 1895-1938 (New York: G.P. Putnam's Sons, 1965), pp.186-9; Basil Liddell Hart, The Defence of Britain (London: Faber and Faber, Ltd, 1939), pp.120-1, and esp. p.105, where Liddell Hart defines the conditions necessary for successful attack as either immense superiority of weaponry, failure of defensive morale, an unrealistically large disparity of skill in favor of the offensive commander, or the absence of suitable antitank or antiaircraft weapons on the part of the defender. None of these appeared to Liddell Hart as likely to obtain in Europe.

Although some contemporaries countered that tactically "offensive" weapons such as tanks or heavy artillery were necessary for defenders as well in order to permit counterattack, Liddell Hart disagreed:

[It] is beside the point to argue that a country that is defending itself needs such weapons to eject an invader, for the abolition of these weapons would help the defender far more than the invader. It is to the preponderant advantage of the defender to ensure that there can be no invasion in the first place. If there is no possibility of successful attack, there is no need for a counterstroke -- and no need for the defender to have the means of making it. Thus only a potential aggressor loses by giving up these essential aids to the offensive.⁴⁶

In this competition between the machine gun and its antagonists, Liddell Hart argued that post World War I technological change was shifting the balance increasingly in the direction of the defense. While mechanization had brought the tank, it brought improvements in antitank weapons as well -- and the latter in much greater numbers than the former. Moreover, mechanization produced motorized machine gun carriers and engineer vehicles, which would permit reinforcements to be rushed to a threatened point, and enable defenders to obstruct promising avenues of advance on short notice. As Liddell Hart put it in 1937:

My own view is that these potential developments in offensive power are far exceeded by the actual growth, largely unrecognized, of defensive power: and that the progress of mechanization hitherto has already reinforced the capacity for resistance more than it has any good prospect for strengthening the capacity for attack. Not only fire, but the means of obstruction and of demolition, may now be moved more swiftly to any threatened spot, to thwart a hostile concentration of force the proportion of machine-gun-destroying weapons -- artillery and tanks -- is at present lower in all armies than it was in 1918. And, on the other hand, the proportion of machine guns, heavy and light, has greatly increased. Thus, it is a matter of simple arithmetic to deduce that the advantage of the defensive is even greater than before.⁴⁷

⁴⁶ Basil Liddell Hart, "Aggression and the Problem of Weapons," English Review, July 1932, pp.71-78, esp. pp.74-5 Liddell Hart's views on counterattack, however, are ambiguous. He often writes, for example, of the advantages of the "defensive-offensive," the "luring defense," or the "baited gambit defense," all of which are based on counterattack; see, for example, The Liddell Hart Memoirs, Vol. I, op. cit., pp.166, 221, 243. In The Defence of Britain, Liddell Hart's ambivalence on this score reaches the point of a suggestion on p.107 that Britain consider a "purely defensive" posture (strongly implied to be a passive defense, given his preceding description of the unsuitability of British troops to tactical offense), followed less than 20 pages later by a recommendation that Britain employ "both tactical and strategic ripostes" in a defensive-offensive doctrine on p.121.

⁴⁷ Basil H. Liddell Hart, Europe in Arms (London: Faber and Faber Limited, 1937), pp.83, 334

Liddell Hart was not a pure technological determinist, however. For Liddell Hart, the size of the forces engaged, as well as the weapons technology with which they were equipped, was an important determinant of the relative advantages of offense and defense. Moreover, numerical strength was important in two senses: the relative strength of the two combatants (i.e., the force-to-force ratio), and the size of the defending army in comparison to the length of the frontier it must defend (the force-to-space ratio).

As for the force-to-force ratio, Liddell Hart believed that only an extremely large "power superiority" of at least 3 to 1 could permit an attacker to advance. "Power" was to be measured in terms of weapon strength rather than mere manpower, but since European armies were about equally well equipped, he argued that a European attacker would therefore require at least three times the defender's manpower to succeed.⁴⁸ Moreover, since motorization made counter-concentration easy for defenders, attackers could not rely on differential concentration to provide local numerical imbalances without theaterwide superiority. Liddell Hart thus argued that to succeed, an attacker would require at least a 3 to 1 manpower superiority at the theater level.⁴⁹

Of course, most theorists acknowledge that numerical imbalance plays an important role in combat results, although few are as emphatic in their assessment of its role.⁵⁰ Liddell Hart's most distinctive contribution on the role of force size concerns the role of the force-to-space ratio. His conclusion that attack requires a 3 to 1 power superiority is conditioned on the defender maintaining an adequate ratio of "force to space." If the defender has sufficient forces to establish a continuous front across the entire length of the frontier, the attacker is forced to execute a frontal assault, with all the difficulties that Liddell Hart argued would accompany such tactics given modern weapons. If the defender's force is too small to man the entire frontier, however, gaps are created through

⁴⁸ See, for example, Liddell Hart, *The Defence of Britain*, op. cit., pp.54-5

⁴⁹ For a particularly emphatic statement of this point, see Captain Liddell Hart, "The Power of Defense," *Evening Standard*, February 17, 1940, p.7

⁵⁰ For Clausewitz' views on this point, see for example *On War*, op. cit., Book VI, Chapter 8, p.389; Book VII, Chapter 15, p.545. Jomini, of course, sees numerical superiority as the key to war, although he refers to local superiority and assigns no particular value to the numerical threshold for success. See Jomini, op. cit., p.67. For Sun Tzu's views, see for example, *The Art of War*, op. cit., chapter III, verses 12-17, pp.79-80.

which attackers can maneuver to strike defenders in the flank and rear. Under these circumstances, attackers could succeed even without a large numerical superiority.⁵¹

According to Liddell Hart, there is thus a "minimum force-to-space ratio" above which only very large attacks have any chance of success, but below which much smaller attackers can advance by skillful maneuver. This minimum force-to-space ratio, however, changes with prevailing weapons technology. In particular, Liddell Hart argued that improvements in weapons were lowering the minimum ratio, allowing fewer and fewer troops to hold a given front with each passing year. Given this, he concluded that defensive forces then deployed in Europe would be dense enough that only impractically large attacks would have any chance.⁵²

Between the defensive effect he anticipated from mechanization, and the absence of the overwhelming force imbalance he thought necessary for attacking a dense defense, Liddell Hart saw an extreme superiority for the defense in the 1930's. But in fact he went further than this, and argued that offense had rarely if ever produced victory in historical combat, and that the only reason the Germans had been defeated in the First World War was that they had foolishly exhausted themselves in futile offensives.⁵³ While his contemporary Fuller saw the relative advantage of offense and defense swinging back and forth over time, Liddell Hart thus tended to view the superiority of defense as a near-universal constant, at least for industrialized, twentieth century armies. Indeed, for Liddell Hart, the only real threat posed to the general welfare by conventional armament was the danger that a secure defender would fail to recognize his good fortune and attack.

⁵¹ See, for example, Liddell Hart, The Defence of Britain, op. cit., p.123; The Liddell Hart Memoirs, Vol. II, op. cit., pp.138, 253. Liddell Hart makes scattered but persistent references to the importance of force-to-space ratios in pre-Second World War writings, but did not treat the subject systematically until after the war, in B. H. Liddell Hart, "The Ratio of Troops to Space," Military Review, Vol.XL, April 1960, pp.3-14; and B. H. Liddell Hart, Deterrent or Defense: A Fresh Look at the West's Military Position (New York: Praeger, 1960), pp.97-109.

⁵² Liddell Hart argued that even if the necessary offensive forces were available, congestion problems would prevent the attacker from using them effectively to penetrate such a defense: see, for example, Liddell Hart, Europe in Arms, op. cit., pp.89-91. In fact, Liddell Hart saw many examples of such self-limiting processes. He argues that artillery, for example, could only destroy a dense entrenchment by ploughing the ground to the point where the terrain becomes impassible to the attacker; artillery, while necessary for the attack, is therefore itself "an automatic military brake." Ibid., p.297. More generally, Liddell Hart's treatment of the force-to-space ratio implies a diminishing marginal return effect for both offensive and defensive forces: once the defender has attained the requisite minimum density, his marginal utility to additional forces declines substantially; while for the attacker, additional forces suffer diminishing marginal returns by consuming a finite resource in the form of maneuver room at the point of attack.

⁵³ See, for example, Liddell Hart, The Defence of Britain, op. cit., pp.29-34, 36-8, 42-3, 44; also, Liddell Hart, Europe in Arms, op. cit., pp.125-6, 268, 292.

D. CONTEMPORARY POLITICAL SCIENCE: TECHNOLOGY AND THE "OFFENSE/DEFENSE BALANCE"

In the aftermath of Hiroshima, the bulk of postwar national security studies has been concerned with nuclear, rather than conventional weapons issues. Consequently, the Second World War, unlike the Napoleonic Wars or the First World War, has yet to inspire a body of theory on the conduct of conventional warfare with the scope and influence of Clausewitz, Jomini, Fuller or Liddell Hart. Nevertheless, some relevant postwar work has been done on conventional offense and defense. Scholarly work on the subject has mainly centered in the political science community, where a small but growing literature has developed arguing that at any given time there exists an "offense-defense balance" determined largely by geography and the nature of prevailing weapons technology.

While individual authors vary in detail,⁵⁴ as a general rule mobility is seen as the key to offensiveness. Geographic conditions that impede movement, for example, are held to promote defense. Forests, mountains, rivers and swamps thus favor defenders, whereas plains and deserts favor attackers. Weapons technologies are likewise characterized on the basis of their tendency to promote mobility. Machine guns, mines, barbed wire and fortifications are typically assessed as discouraging movement and are therefore defensive. Tanks and heavy artillery are thought to encourage movement and are therefore offensive. Circumstances in which open plains and tanks predominate thus produce an offense-dominant balance; wooded terrain, machine guns and barbed wire are thought to produce defense-dominance.

The earliest work in this school was produced by Quincy Wright in the 1940's and Bernard Brodie in the 1960's.⁵⁵ The most influential pieces, however, are Robert Jervis'

⁵⁴ For more detailed descriptions of specific works and authors, see below.

⁵⁵ Although Wright and Brodie were less deterministic than later theorists. For Quincy Wright, see A Study of War (Chicago and London: University of Chicago Press, 1942, second edition published 1965), esp. pp.291-313, 792-810; also Wright, "Modern Technology and the World Order," in W.F. Ogburn, ed., Technology and International Relations (Chicago: University of Chicago Press, 1949). For Bernard Brodie, see Bernard and Fawn M. Brodie, From Crossbow to H-Bomb: The Evolution of the Weapons and Tactics of Warfare (Bloomington, IN: Indiana University Press, 1962, second edition published 1973); also Bernard Brodie, "Technological Change, Strategic Doctrine, and Political Outcomes," in Klaus Knorr, ed., Historical Dimensions of National Security Problems (Lawrence, KS: University Press of Kansas, 1976), pp.263-306.

"Cooperation Under the Security Dilemma," published in 1978, and George Quester's Offense and Defense in the International System, written in 1977.⁵⁶

Jervis' primary concern is to distinguish between conditions that sharpen and those which mitigate the "security dilemma" -- that is, the inability of one nation to increase its own security without decreasing that of its neighbors. He identifies offensive military capability as a principle contributor to the security dilemma, and suggests geography and technology as primary determinants of offensiveness. Jervis cautions that the precise balance between offense and defense may be difficult to determine, and that it will not always be possible to distinguish in advance which will prevail. Jervis argues that four relevant states of the balance must therefore be distinguished: a "doubly stable" condition in which defense is stronger and opponents can identify defensively oriented forces as such; a "doubly unstable" condition in which offense is stronger and opponents cannot distinguish between offensive and defensive military power; a state in which defense is stronger but the opponents cannot distinguish; and a state in which offense is stronger but it would be possible to discern attempts to deploy "defensive" forces as such were they attempted.⁵⁷

Similarly, Quester's primary focus is to identify the international political consequences of differing states of the offense-defense balance. For Quester, "Offenses

⁵⁶ Robert Jervis, "Cooperation Under the Security Dilemma," World Politics, January 1978 (Vol.30, No.2), pp.167-214; see also, Jervis, "Realism, Game Theory and Cooperation" World Politics, Vol.XL, No.3, April 1988, pp.317-349. George H. Quester, Offense and Defense in the International System (New York: John Wiley and Sons, 1977); see also Quester, Defense over Offense in Central Europe (Princeton, NJ: Aspen Institute for Humanistic Studies, 1978). For more recent work in this school, see Stephen Van Evera, "The Cult of the Offensive and the Origins of the First World War" International Security, Summer 1984 (Vol.9, No.1), reprinted in Steven E. Miller, ed., Military Strategy and the Origins of the First World War (Princeton, NJ: Princeton University Press, 1985), pp. 58-107, esp. pp.59-60; Jack Snyder, The Ideology of the Offensive: Military Decision Making and the Disasters of 1914 (Ithaca and London: Cornell University Press, 1984), pp.9, 15-15, 20-22; also Snyder, "Civil-Military Relations and the Cult of the Offensive, 1914 and 1984" International Security, Summer 1984 (Vol.9, No.1), reprinted in Steven E. Miller, ed., Military Strategy and the Origins of the First World War (Princeton, NJ: Princeton University Press, 1985), pp. 108-46, esp. p.108; Robert Gilpin, War and Change in International Politics (Cambridge: Cambridge University Press, 1981), pp.60-2. Israeli tank losses in the 1973 October War inspired a variety of other, more journalistic expressions of broadly similar arguments as to the impact of technology on the relative advantage of offense and defense; see, for example: Jeffrey Record, "The October War: Burying the Blitzkrieg" Military Review, April 1976, pp.19-21. For a more recent version of this view, see George C. Wilson, "Defense Getting the Upper Hand" Astronautics and Aeronautics, May 1980, pp.26-27.

⁵⁷ Jervis, "Cooperation Under the Security Dilemma," op. cit., pp.186-214

produce war and/or empire; defenses support independence and peace."⁵⁸ The determinants of the offense-defense balance itself are primarily technological. Weapons that promote mobility, or whose sustainability is limited, are offensive, while "any weapon that relates to the peculiarities of the terrain" is defensive.⁵⁹ Numerical imbalance, however, if large enough, can convey an offensive threat even if technology otherwise favors the defense.⁶⁰ Quester is interested in issues of nuclear, as well as conventional offense and defense; thus nuclear counterforce is assessed to be offensive or destabilizing in effect, countervalue capability is defensive or stabilizing.⁶¹

This literature, however, has recently come under criticism. Jack Levy, for example, has argued that "the notion of the offensive/defensive balance is too vague and encompassing to be useful in theoretical or historical analysis."⁶² He continues:

These analyses are not generally meaningful, because they are rarely guided by any explicit definition of the key concept of the offensive/defensive balance. The concept itself has been defined in a variety of ways which are often contradictory and which confuse the meaning of the hypotheses in question. Attempts to classify the balance historically are also inconsistent. These inconsistencies are obscured by the failure of both the theoretical and historical literature to acknowledge and build upon earlier scholarship and also by the absence of any general review of the literature. As a result, little is known about the offensive/defensive balance and its impact on war.⁶³

Jonathan Shimshoni argues that this literature depends on a number of assumptions as to the nature of combat and military technology that are not sustainable:

To make such theory workable it is necessary to map technologies into either offense or defense, or at least to tag them as enhancing one more than the other. In turn this requires that the offense and defense be distinct and independent phenomena, and that each of them be homogeneous enough in form to place a set of unique and consistent demands on technology. Since our interest, ultimately, is in doctrine or even grand strategy, such mapping

⁵⁸ Subject to the proviso that extreme offense-dominance may also promote peace in the form of the eventual triumph of a single global hegemon with powers too great to be challenged. Moreover, extreme defense-dominance, while peaceful, may also be undesirable if it promotes "the degree of autonomous fractionation that applied in feudal Europe," given the damage this may inflict on "commerce and culture and quality of life." Quester, *Offense and Defense*, op. cit., p.208

⁵⁹ Ibid., pp.2-6, 4

⁶⁰ Ibid., pp.116, 118, 122, 212

⁶¹ Ibid., pp.6, 155-162

⁶² Jack S. Levy, "The Offensive/Defensive Balance of Military Technology: A Theoretical and Historical Analysis" *International Studies Quarterly* 28 (1984), pp.219-238, esp. p.219

⁶³ Ibid., p.219

requires a certain transitivity among levels of operations. Operational offensives should consist of tactical offensives, and strategic offensives of operational offensives. If this is so, then a weapon identified as enhancing the tactical defense (machine guns?), can be said to enhance the grand strategic defense. Similarly, a weapon said to have a direct operational effect (railroads?), will be assessed as having the same effect at the strategic level. These conditions do not hold.⁶⁴

Shimshoni argues that offense and defense are in fact inseparable phenomena -- that in any given campaign, each combatant may be engaged in both offensive and defensive tactical actions simultaneously in different parts of the theater, and that victims of aggression often engage in substantial counteroffensive action later in a campaign. It follows that offense and defense are strategically intransitive, in that "an operational defensive may be served by tactical offensives, and a strategic defensive may be composed of operational offensive operations."⁶⁵ Offense and defense are each heterogeneous, capable of taking on forms as varied as mobile, static, and elastic defenses; or attrition, infiltration, indirect, broad front and concentrated attacks. Moreover, different nations may dispose of different levels of military technology, and even the same military technology may vary in effectiveness with the differing war aims, military doctrines, cultures, and national psychologies of the various combatant states. Shimshoni therefore concludes that it is impossible to arrive at a technologically determined offense/defense balance with any predictive power for actual outcomes. Instead, Shimshoni believes that combat results are primarily a function of the "military entrepreneurial skills" of the combatants, which cannot be translated into any offensive/defensive balance knowable in advance of a war.⁶⁶

Thus, there is little consensus within the political science community as to the validity of a technologically or geographically determined "offense/defense balance" as advanced by Jervis, Quester, Van Evera, Snyder, or Gilpin.⁶⁷ Although this literature

⁶⁴ Jonathan Shimshoni, "1914, The Cult of the Advantage, and Military Entrepreneurship: A Case Against Technological Determinism," Center for International Studies, Massachusetts Institute of Technology, January 1989, unpublished manuscript, pp.5-6

⁶⁵ Ibid., p.7

⁶⁶ Ibid., pp.45-61, 62-72

⁶⁷ For other, broadly similar critiques of the idea of a technologically determined offense/defense balance, see John Mearsheimer, Conventional Deterrence (Ithaca NY: Cornell University Press, 1983), pp.24-8; Colin S. Gray, "New Weapons and the Resort to Force" International Journal, Spring 1975, pp.238-258; Gray, "People, Not Weapons, Make War" Bulletin of the Atomic Scientists, May 1989, p.34; Richard Burt, New Weapons Technologies: Debate and Directions Adelphi Paper No.126, (London: International Institute for Strategic Studies, 1976), pp.12-14; Phillip A. Karber, "The Battle of Unengaged Military Strategies" in Uwe Nerlich, ed., The Soviet Asset: Military Power in the Competition over Europe (Cambridge, MA: Ballinger, 1983), pp.207-29, esp. pp.220-1.

contains ideas of value for further work, it is not as yet a source of conclusive, systematic theory.

E. LANCHESTER THEORY AND INSIGHTS FROM OPERATIONS RESEARCH

A final body of explicit theory bearing on the problem of offense and defense is the work of Frederick William Lanchester and its adaptations in modern military modeling. Lanchester was an Edwardian British engineer and inventor. In 1916 he published a simple set of differential equations describing the attrition suffered by opposing armies under a specified set of circumstances.⁶⁸ Little noticed at the time, Lanchester's equations were rediscovered after World War II, when the new discipline of operations research found in them an analytic means for projecting land combat outcomes.⁶⁹ Since then, Lanchester's original formulation has been extensively elaborated and extended, and today constitutes the theoretical basis for much of the Defense Department's military modeling effort.⁷⁰

⁶⁸ Frederick William Lanchester, "Mathematics in Warfare" reprinted in James R. Newman, The World of Mathematics (New York: Simon and Schuster, 1956), Vol.4, pp.2139-2157

⁶⁹ For a brief history of the development of Lanchester theory, see James G. Taylor, Lanchester Models of Warfare (Arlington VA: Operations Research Society of America, 1983), Vol.1, pp.115-122

⁷⁰ For exemplary general surveys of Defense Department net assessment modeling, see James G. Taylor, "Attrition Modeling" in Reiner K. Huber, et. al., eds., Operational Research Games for Defense (Munich: R. Oldenbourg, 1979), pp.139-89; Alan F. Karr, "Lanchester Attrition Processes and Theater-Level Combat Models" in Martin Shubik, ed., The Mathematics of Conflict (New York: Elsevier, 1983), pp.89-126; Reiner K. Huber and Bernt-E. Wobith, "Analysis for Force Balance Assessment" in Rudolph Avenhaus and Reiner K. Huber, eds., Quantitative Assessment in Arms Control (New York and London: Plenum, 1984), pp.205-241; Garry D. Brewer and Martin Shubik, The War Game: A Critique of Military Problem Solving (Cambridge, MA: Harvard University Press, 1979); U. Candan, L.S. Dewald, and L.R. Speight, Present NATO Practice in Land Wargaming, (The Hague: SHAPE Technical Center, 1987), Professional Paper STC-PP-252; C. White, Conventional Force Assessment Methods: An Introductory Appraisal (The Hague: SHAPE Technical Center, 1983), Professional Paper STC-PP-195; Wayne P. Hughes, Jr., ed., Military Modeling (Alexandria, VA: Military Operations Research Society, 1984); John A. Battilega and Judith K. Grange, eds., The Military Applications of Modeling (Washington D.C.: U.S. Government Printing Office, 1984); Francis P. Hoerber, Military Applications of Modeling: Selected Case Studies (New York: Gordon and Breach Science Publishers, 1981); Lawrence J. Low, ed., Theater-Level Gaming and Analysis Workshop for Force Planning, 2 Vols., Volume 1: Proceedings, Volume 2: Summary, Discussion of Issues and Requirements for Research (Menlo Park CA: SRI International, 1981) Operations Research Program, Office of Naval Research Contract No. N00014-77-C-0129; Reiner K. Huber, ed., Systems Analysis and Modeling in Defense (New York and London: Plenum Press, 1984); Reiner K. Huber, Lynn F. Jones, and Egil Reine, eds., Military Strategy and Tactics: Computer Modeling of Land War Problems (New York and London: Plenum Press, 1975); M. Shubik, G. Brewer, and E. Savage, The Literature of Gaming, Simulation, and

Lanchester's original paper posited an engagement in which all combatants on either side could see each other and exchange fire, and further assumed that each side would distribute its fire uniformly over surviving opponents. He then characterized each side in terms of two variables: the number of combatants (or "shooters") present; and their effectiveness, expressed as the number of enemy shooters each could kill per unit time. It follows that either side's losses per unit time will be equal to the number of the enemy's shooters times the enemy's effectiveness per shooter. If losses are characterized this way, it can be deduced mathematically that the two sides will be of equal fighting power (i.e., a fight to the finish would produce a draw) when the product of the effectiveness multiplied by the square of the number of shooters present is the same for the two sides. Hence the Lanchester "square law" -- fighting power varies as the square of the number of shooters, times their effectiveness.⁷¹

Lanchester himself thus did not distinguish between attacker and defender; he simply assumed two forces in contact and exchanging fire. He does not explore how those forces came to be in contact, or what their missions are, or whether they are armed with "offensive" or "defensive" weapon types. But he does illuminate a point of considerable importance for the relative advantage of offense and defense: i.e., the effects of differential concentration.

Lanchester's equations imply that an army with a numerical advantage in a local engagement will enjoy a disproportionate advantage in killing power. In a square law engagement between 120 "red" shooters and 100 "blue," for example, red can wipe out blue while losing only 54 of its own shooters.⁷² This means that an army which can concentrate its forces for a series of high-force-ratio engagements against successive

Model-Building: Index and Critical Abstracts (Santa Monica, CA: Rand, 1972), Rand Report R-620-ARPA; also Taylor, Lanchester Models, op. cit.

⁷¹ Or, more formally, for two sides Blue and Red with numbers of shooters B and R and effectiveness per shooter of b and r, losses to Blue can be written as $dB/dt = rR$; losses to Red, as $dR/dt = bB$. A condition of equal percentage losses on each side (to yield parity at engagement termination of $B = R = 0$), or $dB/(Bdt) = dR/(Rdt)$, implies $-rR/B = -bB/R$, and thus $rR^2 = bB^2$, the parity condition for the Lanchester square law. Lanchester, op. cit., pp.2140-5. Lanchester also defines a "linear law" for which $dB/dt = rRB$ and $dR/dt = bBR$, under the assumption that concentration of fire is imperfect. Lanchester, however, argued that the square law better suited "modern" conditions; in any case it has certainly enjoyed wider subsequent use. See *ibid.*, pp.2147-8

⁷² Assuming equal effectiveness coefficients $b = r$, for which red survivors at termination is given by $(R^2 - B^2)^{.5}$; see Karr, "Lanchester Attrition Processes," op. cit., pp.92-3 for a derivation.

fractions of the opposing array can dramatically improve its fate relative to a single, wholesale engagement at a lower force ratio. Lanchester illustrates this point with an analysis of Nelson's victory at Trafalgar, in which the British cut the French line of battle in two -- concentrating 32 of the British total of 40 ships against only 23 of the French fleet of 46. By Lanchester's analysis, a fight to the finish in which the British engage half the French fleet at a numerical advantage of 1.4:1, then turn on the other half with the surviving British ships would produce the annihilation of the French fleet with 5 British survivors. A single engagement between the entirety of the two fleets, by contrast, would annihilate the British fleet and leave 23 surviving French.⁷³

This powerful concentration effect implies a considerable advantage for the side which is either larger overall, or better able to mass its forces for local numerical superiority -- characteristics most often ascribed to attackers. In effect, Lanchester theory thus provides a quantitative rationale for Jomini's emphasis on the importance of differential concentration, and the corresponding Jominian emphasis on the offensive as the form of war most likely to ensure it. In a Lanchestrian world, even a smaller attacker can succeed if he can concentrate differentially to provide a local advantage (recall Lanchester's Trafalgar example); a defender, however, courts disaster by ceding the initiative -- and thus the opportunity to concentrate against a chosen point -- to the attacker.

Lanchester theory, then, implies a potential offensive advantage in the form of disproportionate returns to differential concentration. Two further points should be noted, however. First, this does not necessarily mean that official net assessment models based on Lanchestrian foundations will predict victory for the attacker in any given situation.⁷⁴ This is a function of how specific models translate theaterwide forces into local concentrations, and of the effectiveness coefficients used in the attrition calculations. Many models, for example, assume a "defender's advantage" in the form of higher effectiveness coefficients for defending forces in tactical combat. Of course, Lanchester theory implies a

⁷³ Lanchester, op. cit., pp.2156-7

⁷⁴ The term "Lanchestrian foundations" is meant to apply to models using basic or extended Lanchester equations (where "Lanchester" is taken as a class of models defined following Vincent Roske, A Taxonomy for the Methodological Aspects of Defense Modeling, Methodology Working Group of the MORS SIMTAX Workshop, March 1987, pp.27ff) for attrition calculations, and to models whose behavior parallels that of Lanchester's equations, strictly defined. James Taylor, for example, has shown that many net assessment models contain functional relationships between force ratios and attrition results that mirror Lanchester results almost exactly, although the functions themselves do not employ Lanchester equations per se. See Taylor, "Attrition Modeling," op. cit., pp.180-9. Following Taylor, it can thus be concluded that most official net assessment models are at least broadly "Lanchestrian" in their underlying behavior.

stronger proportional influence for numerical strength than for effectiveness per shooter in a local engagement; hence large advantages in effectiveness are required to offset disadvantages in numbers of shooters.⁷⁵ *Ceteris paribus*, Lanchestrian models will thus tend to reward the side which can concentrate differentially, but everything is not always equal.

Second, Lanchester theory has been harshly criticized on several counts, including absence of empirical validation;⁷⁶ exclusion of military phenomena such as withdrawal, trading of space for time, imperfect allocation of fire, or diminishing marginal returns to

⁷⁵ If, for example, we assume a rather sizeable "defender's advantage" of $b = 3r$, then a local numerical ratio of about 1.7:1 or more (i.e., $R > (3)^{.5}B$) in favor of red will still produce a red victory in a fight to the finish. An engagement between 200 red attackers and 100 blue defenders under such conditions would still produce the annihilation of blue at a cost of about 100 red casualties.

⁷⁶ For unsuccessful attempts at empirical validation of Lanchester theory, see Herbert K. Weiss, "Combat Models and Historical Data: The U.S. Civil War" Operations Research, September-October 1966, pp.759-90; Daniel A. Willard, Lanchester as a Force in History: An Analysis of Land Battles of the Years 1618-1905 (Bethesda, MD: Research Analysis Corporation, 1962), RAC-TP-74; James J. Busse, "An Attempt to Verify Lanchester's Equations" in Benjamin Avi-Itzhak, ed., Developments in Operations Research, Vol.2 (New York: Gordon and Breach Science Publishers, 1971), pp.587-97; Robert L. Helmbold, "Some Observations on the Use of Lanchester's Theory for Prediction" Operations Research, September-October 1964, pp.778-81; Janice B. Fain, "The Lanchester Equations and Historical Warfare: An Analysis of Sixty World War II Land Engagements" in Proceedings of the 34th Military Operations Research Symposium (Alexandria VA: Military Operations Research Society, 1975); D.L.I. Kirkpatrick, "Do Lanchester's Equations Adequately Model Real Battles?" Journal of the Royal United Services Institute, June 1985 (Vol.130, No.2), pp.25-7; William W. Fain, et. al., Validation of Combat Models Against Historical Data (Arlington, VA: Center for Naval Analyses, 1970), CNA Professional Paper No.27; Robert L. Helmbold, Historical Data and Lanchester's Theory of Combat (Ft. Belvoir, VA: Combat Operations Research Group, 1961), Part I: CORG-SP-128, Part II (1964): CORG-SP-190; William A. Schmiemann, The Use of Lanchester-Type Equations in the Analysis of Past Military Engagements (PhD. dissertation, Georgia Institute of Technology, August 1967). For a call for more rigorous validation, see U.S. General Accounting Office, DoD Simulations: Improved Assessment Procedures Would Increase the Credibility of Results, GAO/PEMD-88-3, December 1987, pp.3-5. For a partial validation, see J.H. Engel, "A Verification of Lanchester's Law," Operations Research, May 1954, pp.163-171; and Robert W. Samz, "Some Comments on Engel's 'A Verification of Lanchester's Law,'" Operations Research, January-February 1972, pp.49-52. For a partial validation of a theater-level extension of Lanchestrian theory, see Seth Bonder, "Summary of a Verification Study of Vector-2 with the Arab-Israeli War" in Huber, Systems Analysis and Modeling in Defense, op. cit., pp.155-170. Although empirical validation has thus been the subject of considerable labor, its results must be regarded as inconclusive. See Robert L. Helmbold, "Some Observations on the Choice of Exponent in Lanchester's Law" Unpublished manuscript, 1979; Battilega and Grange, op. cit., pp.67-8; Hoeber, op. cit., pp.145-51.

scale;⁷⁷ and frequency of misuse in practical application.⁷⁸ Taken together, these arguments constitute a serious indictment of the direct use of simple Lanchester equations as the basis for theater-level combat modeling. Given this, the primary utility of Lanchester theory is as an heuristic device for better understanding the dynamics of small-scale local engagements -- as at the point of attack in a Jominian offensive by differential concentration. It is least useful as an umbrella description of the outcomes of theater campaigns, which involve a great deal more than the exchange of perfectly concentrated fire between intervisible shooters (as Lanchester himself implies in his analysis of Trafalgar). Lanchester theory is thus a source of useful insight, but it is not in itself an adequate theory for explaining either theater combat results as a whole, or the relative advantage of offense and defense in particular.

F. INSIGHTS FROM THE NONPROVOCATIVE DEFENSE DEBATE

In addition to more directly theoretical literature, there are also a number of contemporary policy debates from which theoretical insights can be gained. Of these, the nonprovocative defense debate is the most directly relevant.

The term "nonprovocative defense" (or "nonoffensive defense," or "defensive defense") refers to a number of mostly European proposals for restructuring forces for specialized defensive use while reducing their offensive capability. Many such proposals have been advanced, including Horst Afheldt's "Porcupine Defense," Norbert Hannig's "Fire Barrier," Andreas von Bulow's "Defensive Entanglement," Albrecht von Muller's "Integrated Forward Defense," Jochen Loser's "Area-Distributed Defense," and Lutz Unterseher's "Spiderweb" or "Interactive Defense."⁷⁹

⁷⁷ See Joshua M. Epstein, The Calculus of Conventional War: Dynamic Analysis Without Lanchester Theory (Washington, D.C.: Brookings, 1985), pp.4-13; also L. Bruce Anderson, "Notes on Fire Allocation in the Lanchester Square Law," Unpublished Manuscript, Institute for Defense Analyses, 1988

⁷⁸ See John W.R. Lepingwell, "The Laws of Combat? Lanchester Reexamined" International Security, Summer 1987 (Vol.12, No.1), pp.89-134; also Thomas F. Homer-Dixon, "A Common Misapplication of the Lanchester Square Law" International Security, Summer 1987 (Vol.12, No.1), pp.135-139

⁷⁹ For general surveys of these proposals see Jonathan Dean, "Alternative Defense: Answer to NATO's Central Front Problems?" International Affairs Winter 1987/88 (Vol.64, No.1), pp.61-82; David Gates, "Area Defense Concepts: The West German Debate" Survival July/August 1987 (Vol.29, No.4), pp.301-317; Stephen J. Flanagan, "Nonprovocative and Civilian-Based Defenses" in Joseph S. Nye, Graham T. Allison, and Albert Carnesale, eds., Fateful Visions: Avoiding Nuclear Catastrophe (Cambridge MA: Ballinger, 1988), pp.93-109; Flanagan, "Nonoffensive Defense is Overrated" Bulletin of the Atomic Scientists, September 1988 (Vol.44, No.7), pp.46-8; Hans W. Hoffmann, Reiner K. Huber, and Karl Steiger, "On Reactive Defense Options" in Reiner K. Huber, ed., Modeling and Analysis of Conventional Defense in Europe (New York and London: Plenum, 1986), pp.97-140; R. Levine, et. al., A Survey of

Most rely on a dispersed, static, infantry-heavy defense in depth, armed with short range, precision guided antitank weapons and without traditional massed armor formations. All downplay the role of counterattack relative to NATO's current defense, and all would remove theater nuclear weapons from West German soil. Within these general bounds they differ considerably in detail -- particularly with respect to the balance they maintain between forward, infantry-heavy elements and rearward, relatively armor-heavy forces, and with respect to their tolerance for the use of those rearward mobile forces in a counterattack role. The most conservative in these respects approach traditional conceptions of mechanized defense in depth; the more radical depart dramatically from accepted military practice.⁸⁰

For the most part, the nonprovocative defense literature emphasizes description of proposals rather than statements of general theory. Nevertheless, there are a few key theoretical propositions critical to these proposals. The first is that technology and tactics have a strong influence on the relative advantage of offense and defense. Infantry, antitank and antiaircraft weapons, and short range indirect fire systems, for example, are seen as defensive; tanks, long range aircraft, and deep strike surface-to-surface missiles as offensive. As for tactics, defense in depth and careful preparation of terrain are seen as particular keys to defensive capability (and intent).⁸¹ As general propositions, these points are not new. As noted above, they date back at least as far as Fuller and Liddell Hart in the 1920s and 30s, and as far as Clausewitz in the 1830s with respect to the role of depth and the advantages of prepared positions for the defender.

A second, more theoretically novel aspect of this literature concerns the perceived role of counterattack and numerical imbalance. While tolerance for counterattack differs

NATO Defense Concepts (Santa Monica, CA: Rand, 1982) Rand Note N-1871-AF; Ben Dankbaar, "Alternative Defense Policies and the Peace Movement" Journal of Peace Research, Vol.21, No.2, 1984, pp.141-155; and Ian Brzezinski, The Literature of Nonoffensive Defense: A Review and Critique (Alexandria, VA: Institute for Defense Analyses, 1989) IDA M-510.

⁸⁰ Von Bulow's and Unterseher's proposals, for example, are strongly reminiscent of Fuller's 1944 concept of the "Archipelago Defense;" see Andreas von Bulow, "Defensive Entanglement: An Alternative Strategy for NATO" in Andrew J. Pierre, ed., The Conventional Defense of Europe: New Technologies and New Strategies (New York: Council on Foreign Relations, 1986), pp.112-51; Lutz Unterseher, Defending Europe: Toward a Stable Conventional Deterrent (College Park, MD: University of Maryland, 1987), Center for Philosophy and Public Policy Working Paper SB-2; John Grin and Lutz Unterseher, "The Spiderweb Defense" Bulletin of the Atomic Scientists, September 1988 (Vol.44, No.7), pp.28-31; Fuller, "Armor and Counter Armor," op. cit. More radical proposals, such as Afheldt's original "techno-commando" defense, would be wholly unprecedented. For a description of Afheldt's original proposal, see Brzezinski, op. cit.

⁸¹ Brzezinski, op. cit.

across proposals, all are more passive in nature than current NATO doctrine. In fact, some approach the status of a purely passive, static defense. This passive, or reactive property is intended largely as a signal of political intent (i.e., since it would be difficult for the Soviets to distinguish between forces intended for counterattack and those required for invasion, it is best to minimize reliance on anything that might be misinterpreted). Nevertheless, some proponents argue that modern weapons technology might make a purely "reactive" defense militarily more effective. In effect, they contend that as weaponry becomes more accurate, the advantages of defensive cover and concealment will become so overwhelming that any movement toward the enemy will become too expensive to justify -- whether for invaders or for counterattackers.⁸²

With respect to numerical imbalance, this literature downplays the role of parity or superiority in numbers. While parity is preferable to imbalance, numerical advantages are substantially less important for the ultimate outcome than are the equipment or employment of the forces that are available. Albrecht von Muller, for instance, gives an example of two cowboys in a show-down -- although numbers and equipment are perfectly symmetrical, there is still a tremendous incentive to strike first.⁸³ For advocates of nonprovocative defense, parity under force structures that encourage preemption is thus less desirable than imbalance under force structures that encourage defensive reaction.

G. INSIGHTS FROM THE CONVENTIONAL BALANCE DEBATE

A second policy debate of importance for the question of offense and defense concerns the conventional balance in Europe. Although arguments in this debate are rarely couched in terms of offense and defense per se, the conventional balance is clearly a related problem: the point of the debate, after all, is ultimately to determine whether a Soviet offensive could defeat a NATO defense.⁸⁴ This literature should thus be relevant for the theory of offensive and defensive capability generally. As a practical matter, however,

⁸² Ibid.

⁸³ Albrecht A.C. von Muller, Conventional Stability in Europe: Outlines of the Military Hardware for a Second Detente (Stamberg: Max Planck Society, 1987), pp.8, 11

⁸⁴ For more detailed surveys of this debate, see Stephen D. Biddle, "The European Conventional Balance: A Reinterpretation of the Debate" Survival, March/April 1988, pp.99-121; Natalie J. Goldring, The Conventional Balance: How Far Beyond the Bean Count Are We? (Washington, D.C.: Defense Budget Project, 1989); Charles A. Kupchan, "Setting Conventional Forces Requirements: Roughly Right or Precisely Wrong?" World Politics, July 1989 (Vol.41, No.4), pp.536-578; U.S. Congressional Budget Office, Assessing the NATO/Warsaw Pact Military Balance (Washington, D.C.: Congressional Budget Office, 1977)

discussion to date has been focused tightly on near-term budgetary issues, typically whether current spending is adequate to meet the expected Soviet threat, and if not, how much more must be appropriated. Given this, analyses are tied closely to the specific forces and doctrines of the current NATO and Warsaw Pact armies. Moreover, by approaching the conventional balance as a decision-analysis problem (do we spend x, or y?) it becomes possible to employ a variety of analytic techniques that finesse underlying uncertainties and conceptual voids. Argument by conservative estimation, for example, can be an extremely powerful tool for deciding between discrete alternatives, and is heavily exploited in the conventional balance literature. It is less useful, however, in specifying general relationships between cause and effect, and tends to make conventional balance assessments less useful as statements of general theory.

The conventional balance debate in practice is thus too specialized to be directly applicable to the general theory of offense and defense. By the same token, however, the quantitative nature of budgetary issues has driven this debate toward unusually precise formulation of arguments. As such, it still comes closer to providing falsifiable, relevant hypotheses than does much of the literature surveyed in this chapter, and in the process sheds some light on the underlying problem of offense and defense. In particular, three participants in this debate have produced insights of value for theoretical purposes: Joshua Epstein, John Mearsheimer and Barry Posen.⁸⁵

Epstein's central theoretical contribution is his identification of defensive withdrawal as an important variable, and his general emphasis on the role of doctrinal choice for attackers and defenders. In Epstein's Adaptive Dynamic model, the willingness of the defender to withdraw and the intensity with which the attacker prosecutes his attack interact to produce the rate at which the front moves. This in turn affects the rate of

⁸⁵ For Epstein, see The Calculus of Conventional War, op. cit.; The 1988 Defense Budget (Washington, D.C.: Brookings, 1987); "Dynamic Analysis and the Conventional Balance in Europe" International Security, Spring 1988, (Vol.12, No.4), pp.154-65; and "The 3:1 Rule, the Adaptive Dynamic Model, and the Future of Security Studies" International Security, Spring 1989, pp.90-127. For Mearsheimer, see "Why the Soviets Can't Win Quickly in Central Europe" reprinted in Steven Miller, ed., Conventional Forces and American Defense Policy (Princeton: Princeton University Press, 1986), pp.121-58; "Numbers, Strategy and the European Balance" International Security, Spring 1988, (Vol.12, No.4), pp.174-85; "Assessing the Conventional Balance: The 3:1 Rule and its Critics" International Security, Spring 1989, pp.54-89; and Conventional Deterrence, op. cit., pp.165-88. For Posen, see "Measuring the European Conventional Balance: Coping with Complexity in Threat Assessment" International Security, Winter 1984/1985 (Vol.9, No.3), pp.47-88; and "Is NATO Decisively Outnumbered?" International Security, Spring 1988, (Vol.12, No.4), pp.186-202.

attrition. By giving ground, the defender can reduce casualty rates, which the attacker can attempt to maintain by pressing the attack:

Each side's adaptation may damp or amplify, penalize or reward, the adaptation of the other. It is the interplay of the two adaptive systems, each searching for its equilibrium, which produces the observed dynamics -- the actual movement that occurs and the actual attrition suffered by each side.⁸⁶

Epstein's model thus highlights the role of force employment decisions in determining outcomes, an unusual property for a quantitative combat model. In effect, Epstein accords force employment a substantially more important role than does, for example, Lanchester theory -- in which the primary determinant is assumed to be the number and quality of forces available, not *how* they are used.

John Mearsheimer argues that four factors determine whether or not a Warsaw Pact blitzkrieg-style attack will succeed. These are: the relative strength of the opposing forces; terrain; the severity of force-to-space ratio constraints; and the relative rates of reinforcement into the breakthrough battle area.⁸⁷ While many of these issues have been discussed above, two are worth further note.

First is Mearsheimer's role in rediscovering the effects of force-to-space ratios on defense effectiveness. Liddell Hart's exposition of this concept had been largely forgotten until Mearsheimer reintroduced the phenomenon to the conventional force debate in 1983 in his book Conventional Deterrence. As a consequence of this, the issue has become prominent in both the conventional balance and conventional arms control debates.⁸⁸

A second point worth noting is Mearsheimer's description of the dynamics of reinforcement. Although the reinforcement process is implicit in, for example, Liddell Hart's discussion of the role of mechanization in facilitating defensive counter-concentration, Mearsheimer treats the issue in somewhat greater detail, and suggests a more significant role for the phenomenon. He argues that a defender with sufficient forward force densities can delay a terrain-limited attack without yielding terrain, but that casualties will lower forward densities and eventually permit an attacker to break through if the attacker can replace his losses. Defenders must therefore reinforce forward defenses to

⁸⁶ Epstein, The Calculus of Conventional War, op. cit., pp.17-18

⁸⁷ Mearsheimer, "Numbers, Strategy and the European Balance," op. cit., esp. pp.175-80

⁸⁸ For a more detailed history and evaluation of the development of the force-to-space ratio issue, see David G. Gray, Force-to-Space Ratios and Conventional Defense: A Review and Critique of the Literature (Alexandria, VA: Institute for Defense Analyses, forthcoming).

keep pace with the losses and maintain density -- a process which requires either operational reserves or the ability to disengage forward forces on quiet sectors of the front.⁸⁹

Barry Posen argues that NATO systematically underestimates the performance of its own forces by failing to account properly for the value of its greater investment in command and logistics. He then evaluates the balance under differing assumptions as to the value of these investments using the FEBA Expansion model. In the process, he contributes several theoretically relevant observations.

First, Posen argues that combat support functions are substantially more important for outcomes than would be conveyed, for example, by basic Lanchester theory.⁹⁰

Second, his use of the FEBA Expansion model highlights an important aspect of the dynamics of a breakthrough battle: the two sides' increasing "overhead cost" to man the expanding salient created by the attacker's advance. As the attacker penetrates, the bulge this creates in the defender's line increases the length of the front to be manned by each side. This generates a demand for additional forces over time as the advance continues. Barring major reinforcement from outside the theater, the attacker must therefore devote an increasing fraction of his forces to unproductive flank defense as he penetrates. The defender, by contrast, risks thinning his forces until the force-to-space ratio falls to the point where breakthrough becomes possible. For each, the analysis suggests the importance of changes in the nature of the engagement as the attacker advances into depth, and the need to recalculate force requirements as circumstances change during a campaign.⁹¹

H. INSIGHTS FROM THE CONVENTIONAL ARMS CONTROL DEBATE

A final policy debate with significant ramifications for theory concerns conventional arms control. On January 10, 1989, the representatives of 23 industrialized states signed a "Mandate for Negotiation on Conventional Armed Forces in Europe" which committed them to negotiations whose aim would be the "elimination, as a matter of priority, of the

⁸⁹ See, for example, Mearsheimer, "Numbers, Strategy and the European Balance," op. cit., pp.174-185.

⁹⁰ Although extended versions of Lanchester theory, as incorporated in more sophisticated net assessment models, often include more elaborate treatments of these issues. See Biddle, op. cit., pp.117-8; Taylor, Lanchester Models of Warfare, op. cit., Vol.1, pp.110-22.

⁹¹ See Posen, "Measuring the European Conventional Balance" op. cit., pp.47-88

capability for launching surprise attack and for initiating large scale offensive action."⁹² The resulting talks on Conventional Forces in Europe (CFE) thus bear directly on the question of offense and defense. These are not, however, the first negotiations with such an aim. The 1932 World Disarmament Conference in Geneva pursued "the abolition or reduction, or alternatively, the internationalization in a world police force, of those classes of weapons and forms of military organization deemed 'aggressive,' or 'offensive,' or of greater utility to the attack than to the defense."⁹³ While the 1932 Conference failed in its objective, the CFE process may prove more successful; in either case, the extensive public debates accompanying the negotiations offer insights of value for the development of offense-defense theory.⁹⁴

In particular, the objectives of the two negotiations imply similar assumptions as to the determinants of offense and defense. The CFE talks, for example, have focused on numerical parity and on reduction of particular weapon types judged to be offensive or destabilizing. The 1932 Conference was oriented less toward numerical disparities per se, but concentrated on "qualitative disarmament" -- i.e., the elimination of offensive weapons. Although widely separated in time and political circumstance, the two negotiations thus imply a similar understanding of the determinants of offensiveness (subject to a difference in emphasis on force size).

While this understanding largely parallels issues raised above, the arms control debate offers an unusually clear articulation of these ideas -- and especially of opposing

⁹² "Mandate for Negotiation on Conventional Armed Forces in Europe," Palais Liechtenstein, Vienna, Austria, January 10, 1989, reprinted in Arms Control Today, March 1989, pp.18-19

⁹³ Marion William Boggs, Attempts to Define and Limit "Aggressive" Armament in Diplomacy and Strategy (Columbia, MS: University of Missouri, 1941), University of Missouri Studies, Vol.16, No.1, p.14

⁹⁴ For a survey of the CFE debate to date, see Michael Moodie, "Conventional Arms Control: An Analytical Survey of Recent Literature" The Washington Quarterly, Winter 1989, pp.189-201. For descriptions and assessments of the 1932 Disarmament Conference, see Boggs, op. cit.; also J.W. Wheeler-Bennett, The Pipe Dream of Peace (New York: William Morrow, 1935).

An additional negotiation of potential interest was the MBFR, or Mutual and Balanced Force Reduction talks of the 1970's and early 1980's. The seriousness of the parties to this negotiation, however, was questionable, and the talks themselves stagnated. The modest activity that resulted largely involved haggling over data and units of account for ground forces; very little of interest for the development of theory transpired. For more detailed discussions, see Jonathan Dean, Watershed in Europe: Dismantling the East-West Military Confrontation (Lexington, MA: Lexington Books, 1987), pp.153-84; and John G. Keliher, The Negotiations on Mutual and Balanced Force Reductions: The Search for Arms Control in Central Europe (New York: Pergamon, 1980).

counterarguments. In support of a negotiating focus on destabilizing weapons, for example, Jonathan Dean argues:

[If] NATO made radical reductions in armaments which can be used to seize territory or also to prepare that seizure -- missiles, ground attack aircraft, armed helicopters, tanks, infantry fighting vehicles and artillery -- what I call outreach weapons -- and instead built up its infantry, short range rocket artillery, obstacles, and mine fields -- it would have emphasized the defensive capability of NATO forces over their offensive capability if both Alliances adopted this new configuration of forces, greater stability would result [However], a more equal confrontation just below NATO's present level in tanks and artillery could result in more crisis and arms race instability rather than less. Two more equal forces armed with the same type and level of offensive weapons could make each other very nervous.

Conversely, General John Galvin, NATO's Supreme Allied Commander in Europe, has argued that distinctions between offensive and defensive weapons are misleading, and that the talks should emphasize early attainment of numerical parity:

I hope that our goal [in the CFE talks] will be to move quickly and to get a rough parity as the first major step in lessening the overall level of the confrontation on the European continent between NATO and the Warsaw Pact [With respect to offensive and defensive weapons], it is a combination of capabilities that allows you to either defend or attack, and in order to defend you have to have the same abilities that you do to attack Just because the Russians have a lot of tanks, that isn't why I would say they are offensively oriented. It is, what do they do with them and how do they sustain them, and where do they put the sustainment, and what is their doctrine, and how do we see their plans revealed in their exercises and in other ways? That is the kind of thing that tells you whether you are defensive or offensive.

The CFE debate has also produced some of the most detailed expositions of the implications of decreased force-to-space ratios for defense effectiveness. In General Galvin's words:

⁹⁵ Remarks of Jonathan Dean before the Defense Policy Panel of the House Armed Services Committee, in Defining Conventional Stability in the European Theatre. Hearings Before the Defense Policy Panel of the Committee on Armed Services, U.S. House of Representatives, One Hundredth Congress, Second Session, HASC No. 100-104, (Washington, D.C.: U.S. Government Printing Office, 1989), pp.2, 3. For similar arguments, focusing on the role of tanks in offensive capability, see Robert D. Blackwill, "Conventional Stability Talks: Specific Approaches to Conventional Arms Control in Europe" Survival, September/October 1988, pp.429-447, esp. pp.437-9; Phillip Karber, "An Alternative Approach to Military Stabilization Measures" in John Borawski, ed., A Better Peace: The Future of Arms Control in Europe (Boulder, CO: Westview, 1987); Jack Snyder, "Limiting Offensive Conventional Forces: Soviet Proposals and Western Options" International Security, Spring 1988 (Vol.12, No.4); and Zbigniew Brzezinski's remarks as reported in Rudy Abramson, "Brzezinski Urges Arms Pact OK, Focus on Conventional Forces" Los Angeles Times, February 17, 1988, p.5.

⁹⁶ Remarks of General John Galvin before the Defense Policy Panel of the House Armed Services Committee, in Defining Conventional Stability in the European Theatre, op. cit., pp.60, 95-6

Force-to-space ratios and the dictates of terrain mean there are certain force levels below which the West cannot reduce Western defensive doctrine allows for divisional frontages of 40-60 km in the defense [If driven below this level] Allied Command Europe would be forced to conduct more mobile operations, giving ground to gain time and to discover the main attack of the enemy, while holding on to a strong mobile reserve for counterattack. This is not the current NATO strategy; deep cuts would compel a change.⁹⁷

The 1932 Conference stimulated similar disputes, perhaps most notably the exchange between Fuller and Liddell Hart that resulted in Liddell Hart's argument for, and Fuller's argument against, the validity of offensive/defensive weapon distinctions as described above.⁹⁸ The 1932 debate, however, failed to produce a consensus. On one hand, the Conference dissolved without a treaty; on the other hand, it has been argued that this resulted from political, rather than substantive disagreements over the viability of qualitative disarmament.⁹⁹ The CFE debate may ultimately produce greater closure on these questions; to date, however, it has produced arguments, but little real consensus on questions of underlying theory.

I. ASSESSMENT

So what does this literature tell us about the determinants of offense and defense? Does it offer a sufficient basis for policy-making or the development of related theory, and if not, what work is required to provide such a foundation?

This review suggests a mixed assessment: the literature provides substantial insight, but this insight is neither systematic nor rigorous. Terminology is conflicting and ambiguous;¹⁰⁰ dependent and independent variables are rarely specified and regularly

⁹⁷ General John R. Galvin, "Some Thoughts on Conventional Arms Control" *Survival*, March/April 1989, pp.99-107, esp. pp.103-4. See also James A. Thompson and Nanette C. Gantz, *Conventional Arms Control Revisited: Objectives in the New Phase* (Santa Monica, CA: Rand, 1987), Rand Note N-2697-AF; Stephen J. Flanagan and Andrew Hamilton, "Arms Control and Stability in Europe: Reductions are not Enough" *Survival*, September/October 1988, pp.448-463; John Mearsheimer's comments as reported in Jack Beatty, "The Exorbitant Anachronism" *The Atlantic Monthly*, June 1989, pp.40-53, esp. pp.44-5; and comments of General Hans-Henning von Sandrart, Commander in Chief of Allied Forces Central Europe, in Peter Adams, "NATO has Little to Barter in Conventional Arms Talks, Commander Says" *Defense News*, November 7, 1988, p.5.

⁹⁸ For a summary of arguments advanced in support of, and opposed to, qualitative disarmament in general, and with respect to inclusion of particular weapons types, see Boggs, op. cit., pp.46-9, 79-85

⁹⁹ See *Ibid.*, pp.102-3

¹⁰⁰ As a simple example, how does one define the class of weapons to be categorized as "offensive?" If it is a trait that is determinant, how is it defined? Is "firepower" for example, to be measured in: weight of munitions the primary armament can fire per unit time; kill probability per shot against some specified target type at some specified range; kill probability against some other target or some other range? If it

conflated;¹⁰¹ boundary conditions are left unstated, and empirical work is infrequent and in no case conclusive.¹⁰² The literature thus provides no statement of cause and effect clear enough to be disproven if untrue -- much less a body of theory which had survived rigorous falsification attempts in sufficient number to inspire confidence in its validity.

Since none exists today, the critical task at this juncture must therefore be to develop a falsifiable theory, and to subject it to initial testing sufficient to establish its plausibility. While such an effort is beyond the scope of the present inquiry, such study warrants prompt attention by the analytic and academic community.

is weight of munitions, this will tend to bias the measure toward artillery; if it is kill probability per shot, the measure will count tanks more heavily. If the presence of specific weapon types is to be determinant, how are these to be defined? Is an armored, tracked, turreted combat vehicle with a 73 to 76 mm gun a "tank?" If so, then the BMP (usually labeled an infantry fighting vehicle) and the T34 (the premier Soviet main battle tank of the Second World War) are *both* tanks. Are the modern T80 and the obsolete M47 both "tanks," and if so, are we to believe they convey equal offensiveness to a force structure?

¹⁰¹ If, for example, "offensiveness" is defined in terms of rate of advance, or ability to move forward, and "defensive" weapons are defined (implicitly) only as those weapons which most obstruct rapid movement, then the formulation is circular. For a more detailed exposition, see Levy, *op. cit.*

¹⁰² A partial exception to this is the literature of conventional net assessment modeling, where statements are precise -- specifically in response to demand from the policy community. The problem here is threefold: imperfect applicability to the problem, unclear boundary conditions, and the absence of conclusive attempts at falsification. Existing conventional combat models were mostly developed to support the force planning process by evaluating the attrition impact of marginal changes in force structure or equipment. Attrition modeling is thus their focus -- not territorial gain, which the modeling community does not feel confident it can represent accurately (see, e.g., Rex Goad, "The Modeling of Movement in Tactical Games" in Huber, ed., Operational Research Games for Defense, *op. cit.*, pp.190-214). This, however, is precisely our focus. Related to this is the problem of boundary conditions. Most models are calibrated against the professional intuition of the modeler during the model's development phase. That intuition is checked against other analysts' intuition during the use of the model. Over several decades of development and use, the body of available models thus corporately develops what is probably a fair representation of the kind of force confrontation they have been planning against (assuming that the community's intuition is reasonably close to the truth, an assumption which is difficult to assess *a priori*). When the nature of the force confrontation changes dramatically, however, it is unclear whether existing models remain valid: they do not define the limits of their proper application, and the collective intuition on which they are built pertains only to a particular sort of combat. It is precisely this kind of radical change that most interests us here. Finally, as discussed above, empirical work for combat models has been inconclusive. This is unlikely to improve with additional effort, however. Most frequently-used models incorporate hundreds to thousands of input variables. Providing valid historical values for such a variable list is extremely problematic. Simple models which can more readily be tested (e.g., Lanchester's original, homogeneous square law equations) are widely regarded as too simple to capture more than a part of theater level combat phenomena -- and even these require rather detailed attrition history data (for both sides) for proper validation. These data have proven extremely difficult to produce. Other simple models, such as Joshua Epstein's Adaptive Dynamic model, incorporate multiple parameters for which historical data do not exist (notably withdrawal thresholds and prosecution rates in the case of the Adaptive Dynamic model), making empirical work problematical.

To develop a more rigorous theory, however, it will be necessary to exploit the heuristic value of the existing literature. In particular, this literature provides a number of recurring themes which can be organized into a series of rough "proto-theories," or broad classes of explanation for the relative strength of offense and defense. While not in themselves falsifiable, they provide a useful base on which to build a more explicit theory. These proto-theories involve weapons technology, numerical imbalance, and force employment.

Technological explanations generally identify certain weapons as "offensive" and others as "defensive." Tanks, heavy artillery and ground attack aircraft are the most commonly identified "offensive" technologies (with armored personnel carriers, armed helicopters, and long range surface-to-surface missiles occasionally added). Infantry, machine guns, antitank and antiaircraft weapons, mines, fortifications, and barriers are the most commonly identified "defensive" technologies (with light artillery, mortars, and railroads or other soft-skinned intratheater transportation systems occasionally added). Weapons are often categorized by reference to certain underlying characteristics. Mobility (especially under fire), armor protection, and long range, for example, are most commonly regarded as offensive traits. High firepower, immobility under fire, (and sometimes, high mobility when not under fire), are defensive. Offensive capability as a whole is identified with prevalence of offensive weapons, or with a high ratio of offensive to defensive weapons in the combatant force structures.

Numerical explanations emphasize one of two force ratios, either the force-to-force ratio, or the force-to-space ratio, as determinants of offensive capability. High force-to-force ratios, either in the theater as a whole or at a specific point of attack, produce offensive success. Conversely, low force-to-space ratios contribute to offensiveness. The combination of a high force-to-force ratio and a low force-to-space ratio would thus be highly offensive; high force densities combined with rough parity in the theater would be defensive.

Force employment explanations emphasize the sensitivity of outcomes to variations in *how* forces of given size and armament are used. In particular, certain characteristics of defensive force employment tend to be emphasized, especially the depth of the defensive deployment and the proclivity of the defense to counterattack. A defense in depth with counterattack produces the most powerful defense and the weakest offense; a shallow, passive defense permits highly effective offense.

These proto-theories are not mutually exclusive, and most writers subscribe to some combination of explanations. Clausewitz, for example, stresses force employment but also acknowledges the significance of numerical imbalance. Jomini emphasizes force employment as a *means* of creating numerical imbalance at the point of attack. Liddell Hart relies on technology, but combines this with an important role for numerical imbalance in the form of the force-to-space ratio. Fuller implicitly credits technology with great explanatory power, but emphasizes its interaction with force employment. Lanchester comes closest to offering a single explanation in the form of numerical imbalance (in the form of the force-to-force ratio), but Lanchester theory acknowledges the role of weapons technology in determining kill-rate coefficients.

Policy debates imply varying priorities, but also parallel one or more of these proto-theories. The conventional arms control debate, for example, was strongly technology-oriented in the 1930s. In the 1980s, the CFE process combines an early emphasis on reducing numerical imbalances with a longer-term objective of force restructuring that is widely assumed to be a question of replacing offensive with defensive weapons. The conventional balance debate focuses on numerical imbalances, but evaluates the aggregate effectiveness of the two sides' weapons and pays some attention to employment issues (e.g., prosecution rates and withdrawal thresholds in the Adaptive Dynamic model). Nonprovocative defense advocates rely on a combination of technological and force employment explanations, emphasizing relatively passive deployment-in-depth of defensive weapon types.

There is thus some support in the literature for each of these explanations, but no consensus on their relative importance, or on possible interactions between explanatory effects -- and of course, none of these proto-theories are articulated with sufficient clarity to support rigorous attempts at falsification. For this it will be necessary to develop a more explicit theory -- to interrelate the effects of numerical strength, weapons technology and force employment, and to permit some first-order assessments of their relative explanatory power.

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