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Chapter 2

Economics of Defense in a Globalized World

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Chapter 2

Economics of Defense in a Globalized World

by

Martin C. McGuire

ABSTRACT

In a world continuously beset by conflict and violence, the positive study of international security and defense, has developed as a cohesive discipline within economics over the past decade. Part of the cause for this trend is surely the revolutionary effects of globalization and its new challenges to world security and stability.

This essay aspires to show how the recent developments in models of the political economy of security, predation, and governance relate to this phenomenal evolution of the world's strategic situation and challenges to its safety.

The field of play for defense economics has thus greatly increased, and the opportunity to exploit new insights from throughout economics grown accordingly. Here I give one perspective on how new economic models and concepts relate to the evolving challenges to global defense and security.

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1. Overview

1.1 Defense Economics: The Agenda - Update on a Field in Transition:

As most agree, getting the question right is more important than providing precise answers. A-propos of this aphorism defense economics has departed an era when the questions seemed clear, to a new phase where defining the issue itself is central. Whereas in Cold War days defense economics involved the study of how to achieve pretty clearly pre-defined given objectives, it now is much more engaged in helping to define the new objective itself. At the publication of Volume I of this handbook ten years ago, soon after the collapse of the USSR, the degree of change required in policies, forces, and other instruments of defense was yet to be recognized. We now see that changes in the sources, structure and diversity of the world's security problem are great indeed, challenging our ability to refocus and to identify the instruments required to combat the new challenges and to re-shape our way of thinking about them. Thus economics, as the study of how agents do and should react to incentives, to resource scarcities, to information and to each other has become of relevance not only in the management of world security but also in its definition. A perusal of the foci of the chapters to follow attests to the diversity of problems that the scholarly and analytic community must address to shape a new definition of security and conflict management.

Defense economics can no longer represent merely effective self-serving defense resource allocations by Western countries. This is partly as a consequence of the terror attacks of Sept 11, 2001. Deeper than this though we can now see that the end of the Cold War marks a

tectonic change: after centuries, the territorial security-status of European countries seems basically settled. But this is not the case for the other parts of the globe, from Taiwan south and west to the steppes of Asia and so on. This tells me that we should regard the present period of solitary US power and minimal overt great power conflict as one of transition, to some new phase where new powers will struggle over resources and spheres of influence and territory. A major task, therefore, for a volume such as this is to identify the economic and strategic incentives by which rational calculation may lead to new fault lines in security of countries and their defense.

The problem overlaps two rather distinct though interconnected time frames: for the medium term while the US continues to have unquestionably unique power, issues such as: containment of terrorism, dealing with rogue states, controlling weapons of mass destruction, and reform of failed states predominate. But for the longer term, transition to a new multi-polar power configuration and shared or partitioned spheres of influence is probable, and how to manage the transition across time frames without major war is preeminent. For the long run, neither the US alone nor the West in aggregate will retain a monopoly of force as today; relative economic dynamics will not permit this. But for the interim, before zones of supremacy or spheres of influence are re-established, US security, by default, has become inherently global. And precisely because this global monopoly permits US interventionism in all manner of internal conflicts and civil strife it becomes incumbent on defense economics to help identify when intervention is wise --- to develop criteria for when positive involvement is good. This is not made easier at all by the fact that Cold War arsenals, logistics and thought processes are uniquely unqualified to address the new exigencies, including especially to know when to refrain from intervention.

For the moment in this transitional world the front rank security issues are neither primarily presented nor resolved by large scale force-on-force military component of defense. But those days may well return. Thus the requirements for defense paradoxically have expanded compared to Cold War requirements. In this epoch where the US security commitment and responsibility is worldwide, it is even more necessary to understand the motives and incentives of threatening adversaries, troublemakers, wobbly allies, and false friends. Defense economics with its emphasis on incentives is thus more central than ever. A security challenge notably amenable to economic analysis, concerns how to evolve relationships of trust with others and how to merit trust from others.

1.2 Economics as the Source of Conflict

For recognizing/understanding the sources of conflict both on the immediate horizon and over the longer sweep of the future, economics is utterly crucial. Territorial issues have receded, at least temporarily, and economic issues have replaced them. Examples of these economic sources include:

- Binding resources scarcities brought on by surges in global demand
- Incidence, restriction, and repair of environmental degradation and health
- Import/export monopoly and monopsony injustices
- Migrations of persons and capital with ensuing redistribution of rents.
- International monetary system, capital markets, and transfers of risks

Here the role of defense economics is to understand how these trends and structures lead to international conflict and military insecurity. Consider the health example. The role of defense in this case is not to cure or treat disease, but it can be to control national borders when

international population movements, ignited by health hazards require more control by force than police can provide. Or as a second example take the case of monetary instability and wealth transfer as causes of power redistribution and security conflict.

1.3 Political Economy-International Public Choice: Fight and Grab or Work and Trade

The new challenges to world security, thus, have their roots in political economy of our 21st Century world. These roots include the deepening inequality and elevated volatility/turbulence of the world economy, the evolving vagaries for creation of surplus rents within societies and their capture by privileged elites vs. more equitable distribution among the citizenry. Consequently, to become more deeply involved in the definition of international security, economics of defense must be related much more intimately with political economy and international public choice. Ignorance of the structure and dynamics of autocratic societies for instance may lead to ineffective policy and self-defeating decisions e.g. the invasion of Iraq, 2003 and its aftermath. Contemporary challenges to peace and those just over the horizon --- more convoluted than for the old NATO-Warsaw Pact paradigm --- are tightly bound up with globalization and the inter-penetrations of commerce-culture-security. Examples abound, including the interdependence of finance, trade, political development and strategic salience that is the Taiwan-China tangle.

Serendipitously, building on the work of pioneers [Boulding (1962), Grossman (2002), Grossman and Kim (1996), Grossman and Mendoza (2004), Hirshleifer (1988, 1989, 1994, 2001), Olson and Zeckhauser (1966), Polachek (1980), Sandler (2000), Schelling (1960, 1966, 1967), and Tullock (1974)] the economics of conflictual systems has advanced substantially in the past decade. The challenge now to defense economics is to exploit these conceptual

advances --- how to make them practical in a policy context. For example consider the voluntary public good model. How practically can we help induce the diverse bureaucracies of the world to overcome tendencies to free ride, not merely in established groups but with respect to incentives to form security promoting clubs in the first place? Could this be achieved by crafting Stackelberg-strategies, or by bundling? Practical analysis is needed for how to achieve this in many realms: finance, environment, population migrations, disease control, terror, etc.

Or as another example: economists agree that property right protection is essential to growth and success of a society while corruption undermines necessary legitimacy and trust [Tullock (1974), Konrad and Skaperdas (2005), Olson (1981), McGuire and Olson (1996), Tanzi (1998)]. So how can defense allocations and policies of emerging countries cultivate governance of the *right quality*, supporting property protection with required/sufficient force without spilling over into corruption and confiscation? Performance on this dimension influences our defense directly (as, say, in Central America) and indirectly via its impact on international stability generally.

1.4 Governance and Economic Calculus of War

But possibly the foremost example of how the economic study of defense should include political economy concerns the impact of the system of governance itself upon so many defense issues. One entry point for the political economy of war and defense should be Immanuel Kant (1795) for his introduction of the notion of a positive connection between the institutions of governance --- specifically democratic representative institutions --- and incentives for peace. Although many following Kant have endorsed this idea, it has been the role of economists to derive the connection between quantitative differences in the incidence of costs and benefits of

war and the governance systems of adversarial parties. The recognition of this as an economic phenomenon may first be due to Angell (1910) for the idea that in a perfect consensual and representative democracy all the citizens share in the country's costs of war and all of them share in its benefits. Pursuing this logic, unanimous consensual democracies should avoid those wars where the country loses on balance, since if the country loses every citizen loses, and war-decisions are made by the citizens [Anderton (1999), Thompson (1974), Thompson and Hickson (2001)]. This assumedly would include (a) avoiding wars that would be lost, and (b) those that it is not worth winning even though winnable [(McGuire, 2002)]. On the other hand, for the polar opposite unrepresentative society an autocrat pays nothing (or only a small fraction) of the costs of a war if he wins it and reaps all the benefits, so an autocrat is more likely to enter wars that it will win even those that are "unprofitable" for "his" society as a whole. And what of wars he could lose? Although the autocrat may lose everything, his country's loss is much greater. This idea is summarized in Table 1 where costs and benefits are assigned.

TABLE 1 HERE

The entries of Table 1 represent only one side in a quarrel, and the Table assumes without evidence that a democracy would not exercise its claim to booty if it wins. But even though other tableaux may reflect other assumptions and even though this Table may be incomplete it raises a rich menu of research issues germane to defense economics. For example:

- Is a potential war situation in the aggregate (among all affected parties and interests) zero sum or positive sum? The answer to this will depend on which parties and interests are recognized when counting values --- entire societies, two autocrats, elites and proletariat?

- For comparing the incentives for cooperative, Pareto optimal seeking, and war averting resolutions with those for non-cooperative more violent behaviors, what is the role of alliances, information, and commitment in conditioning incentives on opposing sides to fight or negotiate?
- Can outside intervention (e.g. side payments) influence/reverse incentives for fighting, and if so does autocratic or democratic organization favor resolution in this manner?
- Do geographical and/or inter-temporal patterns of benefits/cost make committed agreement to work-invest-produce-and-trade hard to sustain, and do such incentives vary systematically with the style of governance?

This is only a short list, but the point is that the defense economics research agenda should extend to the effects of *institutions* and their organization on peace and war fighting. Fortunately many of these questions are the focus of our thriving literature on the new institutional economics [e.g. Thompson and Hickson (2001)] and economic logic of political predation [Anderton (2000), Grossman and Kim (1996), Skaperdas (1992), Skaperdas and Syropoulos (2002)]. But Kant's idea that rent redistribution underlies all rational calculation of war is not always affirmed by modern analysis. His principles relate closely to similar concepts in modern public economics, and those suggest that an economic approach to war should distinguish wars as instruments of redistribution among states and as instruments of redistribution within states. Those schooled in the mentality of WWII and the Cold War have often tended to think of wars as patriotic, or public good wars supported voluntarily by an entire nation, and representing the will or welfare of its entire people. For this category everyone benefits or possibly everyone avoids a loss (of being conquered), and costs are broadly shared in some reasonable and justifiable

fashion. Such opinion of war obviously no longer dominates the consensus within Western societies but it could return and impact war calculus in the future.

A second category of war is founded on redistribution within adversaries --- a war for the private benefit of some privileged subgroup in the country, to its rulers (and their support) or opposing insurgents as foreshadowed by Eisenhower's "military industrial complex." A conviction that US defense initiatives of the past fifty years has these as sources represents a good fraction of current opinion. Or in the inverse of this Orwellian case, suppressed factions may foment wars hoping that their rulers will be defeated and overturned, such being the assumption behind the idea that modern terrorism is really a type of civil war that partisans can only pursue outside of their country's borders. While it risks politicizing defense economics --- undesirable to be sure --- a careful identification of the costs and benefits of war within countries and its incidence should help to identify motives and thus clarify the true nature of terrorism and insurrection especially in African and Muslim worlds.

This way of looking at international conflict has proven of increasingly insightful over the past couple of decades, as it relates to when wars may be rational for both parties, and not the result of some sort of mistake. It also can show how alternatives of acquiring the capability short of actual resort to arms may produce outcomes that are Pareto superior. In fact such results show that bilateral, "public good," democratic wars are quite possible as an expression of non-cooperative equilibrium pursued to resolve information deficits, or because binding future bargains cannot be struck due to transaction costs or various commitment problems [Garfinkel and Skaperdas (2000), Garfinkel (2004)]. Such studies show for example, that trade concessions, economic assistance, offer of asylum or other instruments will have different impacts depending on the economic structure of the conflict. They show and the consensus opinion among

economists trained in Public Choice reflects that conflict, war, and governance contain an intertwined economic structure. These are in the vanguard of defense economics as it will develop to incorporate and exploit the insights of political economy and public choice.

1.5 Core Economics of Resource Allocation Remains Central:

While augmenting the field of defense economics in this fashion and incorporating new insights from political economy of institutions it is well to remind ourselves again of what the ECONOMIC approach uniquely brings to the problem. One wants to take care not to neglect the core of the subject --- not to abandon the established framework of defense economics. Without the anchor of resource scarcity, "utility" or net benefit maximization, individual interactions (whether competitive or strategic), information and rational incentives, the jumble of problems would cast us intellectually adrift. Our task --- advanced by the essays in this book --- is to adapt the tools and ideas created in an earlier and simpler environment to the more complex world of contemporary insecurity not to throw them out. Any contributions we can make to understanding defense and security whether national or global will involve application of these principles:

- First and above all, even defense is ruled by the iron law of scarcity of resources, and even for the “richest” group of countries. “Pay any price, bear any burden” will not suffice to judge how much defense really is too much [Enthoven and Smith (1971)].
- Second, defense or security economics as a normative project will always include a concern for efficiency and the many attendant conceptual, measurement, and implementation questions surrounding it.
- Third, economics of defense must be always alert to the role of incentives, our own, an ally’s, an adversary’s --- and to the possibilities of influencing those incentives

for our long run benefit. A special instance of incentives especially relevant to security and defense is the interdependence among own and others actions in small interacting groups as distinct from the conventional large competitive markets.

2. World Trends and Big Picture Security Themes:

The end of the Cold War marks more than the terminus of an historic confrontation. As the downfall of the Iron Curtain dissolved our adversarial presuppositions, the parameters that define where national security terminates have dissolved and muddled. And on the heels of the Cold War comes the phenomenon of globalization. The new environment thus consists of a mix of these two factors. A result has been painful and groping efforts at reorganization by the national defense establishments worldwide, the temporary resignation by most countries to a world of a solitary superpower, and jarring adjustments demanded of armed forces and defense industries alike. In particular the need for at the ready standby Warriors has evolved to a need for on-the-job Peacekeepers. The adjustments of defense industries have also been dramatic with the relentless pressures are to down-size, discard, and replace formerly critical weapons systems, as well as the pressures to exploit new technologies created by the modern digital revolution. Associated with the shift to peacekeepers has been a shift in the distribution of the security threat. Rather than one quite improbable but overwhelming threat of unspeakable catastrophe, we face much higher chances of unwelcome but still qualitatively lesser, repetitive, or continuing violence. The US has become increasingly involved in undertaking actual operations on an ongoing basis rather than holding back all out retaliatory forces on the stand-by and hoping never to use their capabilities. The proliferation of regional and sub-regional conflicts that can require peacekeeping action seems a new, if regrettable, fixture of defense most unlikely to subside or

even attenuate in the foreseeable future or until once again the world is partitioned into antagonistic blocks. Here I merely sketch out selected parameters that I think will characterize this evolving conflict-security environment and condition any economic analysis of it.

2.1 Technology Driven Globalization:

A Source of New Threats, Risks, Opportunities, and Resources

Swift changes in technology, culture, and the devolution of power, have fed new needs for security while simultaneously provided new resources for defense. But significantly these new factors can restrict the tools we have to employ against new threats and/or the uses to which old tools can be put. An example is the inability to construct a policy of "retaliation." I am struck by the difference in defense response from the 1960's where the US announced it would blatantly slaughter about 200 million innocent civilians if it were attacked by Cuba, while official announcements of punitive retaliation after Sept. 11, 2001 were low keyed at most. Although military action was taken against the Taliban after Sept. 11, its purpose seems to have been preventive rather than a promise of future punitive retribution for any future attacks. At the time, absence of a pre-announced policy of retaliation is not surprising --- a policy that would harm terrorists in terms they understand. It is noteworthy though that even today since it seems so very difficult to know in advance who would be responsible for future attack or to hold a governmental or quasi-government entity responsible in advance, we continue to have no policy of retribution and no public debate on its merits. That such a policy by Israel against terror bombers seems to have been ineffective may explain why the US has none.

2.2 Great World Prosperity: Greater Costs and Benefits of Conflict

Within this new threat environment, it is useful to remind ourselves that the lives of a good majority of humanity have become more secure and richer over the past few decades where the green revolution and wide spread conquest of primary disease have benefited billions. How this affects the incentive to fight/thieve vs. produce/trade is at once highly relevant and hard to judge.

Globalization has made us all richer but more vulnerable to interruption by attack. By expanding the scale of production and exchange and communications the need for greater insurance, mutual protection, and defense has increased. Thus, a requirement has arisen for conflict management institutions on a grander scale. In the same vein, communication and targeting advances have made precise wars more possible, but under the watchful and distorting eye of the media. Other vulnerabilities point especially to internet dependence or international indebtedness as a reflection of peacetime prosperity but an albatross for nations who might require outside financial support in emergencies. Or consider the obvious benefits of migration as a source of labor and manning for armed forces but co-mingled with the concomitant costs of security vulnerability. The upshot of these effects, I believe, is that net opportunity costs of conflict across countries are greater now, even as within some countries these net costs have diminished for many groups. I say this because on average productivity has increased so much relative to the payoff from war-theft, that returns to work under peaceful circumstances seems to have far outpaced returns from fighting, conquest, and oppression. The high productivity and growth of modern tech driven society is simply unobtainable from suppressed or enslaved populations.

These trends and processes --- with sources in both technological change and globalization --- have several implications for defense and the design of forces. (1) They have

invoked changes in the relative costs to an enemy of imposing damages vs. the damage imposed or of our costs of deterring, of defending, and of defeating, or recovering from destruction. Therefore, these trends induce changes in cost effective methods available to us for combating them. For example, at the scale of terrorism we have hitherto experienced, a dollar's worth of damage can be imposed by the enemy at a cost to him of very much less than one dollar (though this may well change at greater scales). And to defeat or defend against one dollar's worth of damage may require more than one dollar of our expenditures, making such defense pointless, and stimulating needs for other methods of dissuasion such as deterrence, retribution and punishment. (2) Analysis and clarification of these impacts of globalization should surely be a major program for defense economics. It would seem for instance that the cost to terrorists is vastly less even relative to their limited resource levels, than our costs of defense. (3) How has globalization influenced the relative cost effectiveness of protection, retribution, insurance, etc.? That is, how do our diverse options to combat terror compare on a cost effectiveness basis? (4) The same question arises for evaluating protection against conventional threats from conventional states such as how to share costs and missions between Japan and the US for combined security of Japan-China-US --- it being understood that the defensive security of China is in the interest of all three.

The above trends also have caused lightening dispersal of information, rumor, hope, fear, with ensuing challenges to government's media management (e.g. China and SARS), to such a degree that the role of the media in national and international security deserves to be a new study area, included under intelligence. Thus might one hope to avoid domino effects, such as preceded WW I. Co-mingled with revolutions in cultural attitudes, the modern avalanche of information has fed a vast media machine that limits governmental action, provokes fear, and

may inflame hatreds --- all told, troubling issues of instability. A clear implication for defense studies in this environment is that the government function of understanding and then leading public opinion has grown immensely. So again, analysis of the intelligence and public opinion leading agencies of governments has become much more important and a proper focus for defense economics. And when success requires steady enduring commitment from elites and the public at large, a decline in the power of governments if it extends to incompetence in leadership and persuasion has a special even ominous impact.

2.3 Governments Paradoxically Overshadowed

All of these developments imply significant new responsibilities for individual governments and for multi government organizations, and therefore needs for new effective power at diverse strata of enforcement and coordination. But ironically, the powers of governments have been subject to challenge and dilution by the very same forces. Combined with gigantic changes in technology and culture, globalization has modified the roles of borders among countries, and other groups. Borders have become porous to people, commercial goods and services, information, money, weapons, laws and to ideas. This aspect of globalization has put great pressure on governments, raising demands for performance by way of relief from economic and security impacts, but undermining the powers of government at the same time. Border and institutional porosity, for example, undermines government power to control terrorist finance. Government at all levels must have resources and power to tax. But the multi-national corporation and ease of population movement and communication reduce governments' powers to capture the resources, by taxes or conscription necessary to fight. Such shifting foundations of security have yielded a dilution of government ability to manage global dangers. Because of the

emergence of so many alternative foci of organized power (such as the modern multinational corporation, internet finance, the modern subversive interest group) it has become inherently more difficult to control and direct resources, and to control information, opinion, movements of people, and how groups are organized. Paradoxically then, governments enjoy unprecedented technological tools and may have more raw power in some sense but less control over events. Globalization, it seems, has induced new limits on power to control from the center, even though governance is central to conflict management.

But this genre of problem is not new to economists. The economic theory of clubs --- and of nation-states as a particular form of club --- has always seen a need to balance scale economies in private sector (and therefore the required reach of private regulation by collective authority) with diseconomies of scale in the governance mechanism itself [Olson (1969)]. Thus, one way to conceive the multi-national governance problem is that of a mismatch between optimal scales of public and private organization between regulator and regulated [Alesina and Spolaore (1997, 2003)].

2.4 U.S. Hegemony: A Fading Monopoly

US Privileged Economic and Security Stature Dissolving The present mode of unbounded hegemony is surely transitional. The future, I believe, will record that the past ten years and the coming 20 as transitional, toward a new era where centers of rival Asian populations, economic strengths, and strategic power set the parameters of global war and peace. The world seems happy to sit back, to free ride and to enjoy the benefits of American hegemony, while the US pays. But once unable to foot the bill, America will no longer call the shots. Basic cultural features also will strongly influence the situation for the next generation such as trends

in military conscription vis-à-vis mercenary armed forces. Such factors as these make new strategic configurations especially hard to anticipate yet essential for deriving our near future strategic force requirements.

Some influences on the other hand seem quite predictable over the medium term, such as population trends and national/international debt. Similarly a highly fixed factor is geography and in particular the influence of the Pacific Ocean, on natural spheres of influence. Consequently, the heightened strategic significance of South America seems quite predictable and conflict over a Monroe Doctrine of the Pacific not implausible. Why South America? To capture the idea of a strategic shrinkage of the Pacific Ocean due to technologic change imagine that the longitudinal displacement from Shanghai to San Francisco were 30° rather than 120° . The strategic importance of South America then as a potential forward base against North America becomes rather clear.

Debt and World Influence: Is it coincidental that for the past several years the entire US military budget has, in effect, been financed by borrowings from abroad? History shows unmistakably that borrowing capacity is necessary to conduct war [Neal (2004), Grossman and Hahn (1993)]. Contrasting this historical fact with Table 2 below gives one good cause for discomfort. The Table shows net US private and public holdings abroad minus foreign private and public holdings of US assets real and financial. For some scenarios gross figures may be more representative of vulnerability or more telling as estimates of assets at risk.

TABLE 2 HERE

However the current and astonishing debt position of the US plays out (it is projected to grow exponentially), its existence will greatly constrain US capabilities to confront new emerging great powers in the future. Although the international debt position may not much influence

abilities vis-à-vis Iraq, once inflated by a magnitude of 2 or 3, it will most certainly influence capabilities vis-à-vis China sometime down the road. "It may be our debt but their problem," won't wash if in the future the US should require trillions to outgun a new adversary in an arms race. Whether or not the US can reverse its gigantic foreign indebtedness without destroying itself and others, the monstrous size of that debt suggests that the creation of financial alliances will assume far greater importance than ever. They will be at the heart of long run western strategy and thus of the future of defense economics --- alliances first because management of such debt is indeed a collective international security problem, but also because more equal collaborative partnerships will surely replace US hegemony as it is weakened by its indebtedness. Without debt forgiveness foreigners will have to dramatically increase their imports from the US whereas they have spent a generation building capacity for sending exports to the US.

2.5 A New Frequency Distribution of Violence/Conflict

Compared to the Cold War another dramatic change that we face concerns the threat profile. I refer to the shift from rare catastrophic perils (i.e. super power nuclear war), to more probable, frequent, ongoing and less ultimate threats (e.g. suicide bombers, air hijackings, internet "strikes"), most prominently terrorism from sub-state groups, and lesser threats. The military and readiness consequences of protracted violent actualization of conflict needs more serious exploration from the defense economics community. For example, the effect of this change on the comparative roles of regular forces, reserve and home guard forces, and police needs examination and the susceptibility it poses to manipulation from the media.

Rather than being ever-ready for a 500 division war in Europe we are going to have to actually conduct continuous ongoing peacekeeping. Rather than a 1/100 % risk of 100 million casualties, we face actual losses ranging say from 1000 to 200,000 annually (depending on who is counted as a casualty of conflict, whether only soldiers or also bystanders and/or refugees also). Even as the source of disease or pandemic, these threats if realized are incomparably less grave than thermonuclear annihilation. That is, an important feature/principle of our new security environment is that our primary concern is no longer the prevention of one unspeakable cataclysm. This concern may resurface but for these transition years, world conflict, (like in Iraq), will basically disrupt commerce and population movements, and may be characterized by engagements of a few hundred thousands of soldiers, guerillas, peacekeepers, partisans and criminals more or less continuously. Without wishing to minimize the tragedy, misery and unacceptability of such an equilibrium as a steady state, its difference from the threat of thermonuclear war deserves emphasis. Even recurring low yield nuclear events can not be omitted from our menu of today's world threats. These would indeed set a new milestone in human catastrophe, and thus they demand determined opposition to nuclear proliferation. Nevertheless such threats are altogether different from the world of Herman Kahn (1959).

With a broader spectrum of threat we should reasonably expect a greater and more diverse need for defense resources. Because the American defense establishment is driven by estimates of threats, this may explain American "extravagance" in military spending. Yet, critics may come to conclude that the reason others can afford to spend so little, is precisely because the US spends so much. Irrespective of polemics, it is not extravagant to assume that the broader spectrum of defense need will create increasing resource pressures in future years, more than offsetting savings from Cold War programs.

FIGURE 1 HERE

Just to visualize this point suppose one could measure worldwide violent damages in dollars, and the likelihood of violence occurring. Then Figure 1 above illustrates my meaning about a change in the distribution of threatened damage as between the Cold War compared to the present. Using number strictly to illustrate, the Figure depicts the idea that during the Cold War we confronted a small chance of nuclear disaster (2%) and a strong chance (98%) of non-violent "peaceful" standoff. Contrasted with this in today's world the risks of protracted low intensity fighting are quite great (50% for illustration) and of minor nuclear event not at all negligible (10%) so that genuine non-violence is not very likely (40%). Our plans, readiness, and above all psychology are governed by this: whereas the confrontation with the Soviet Union threatened horrific damage with a very small likelihood, our present situation threatens much lesser damage with much much greater probability. The diagram pictures low yield nuclear events or equivalent conventional shocks, disasters that in no way equate with the cataclysm of thermonuclear exchange that informed all defense policy for 40 years. Such a revision in the threat probability profile summarizes the transformation of our defense/security challenge from that focused over 1950-1990 on a pin-point catastrophe to its present multi-layered fuzzy unfocused fog.

But this raises a crucial issue for defense economics: does deterrence have a role in this new environment and if so what is it? Deterrence, dissuades enemy actions in a specific fashion: it works on an adversary's incentives and motives, in advance as it credibly promises punishment for transgression. But deterrence assumes that a responsible entity can be identified, and that it is some sort of government. Now for the distribution given by the diagram the challenge seems

more and more to be to defeat attack, or limit its damage and disruption to our population and assets, knowing pretty well that some continuing and repeated losses are highly likely.

The option to punish the attacker (if we know who he is and he has not achieved sanctuary) may prove elusive. Of course it is axiomatic that we want to dissuade attack. If we face a rational and calculating enemy we may achieve dissuasion by preventing attack, defeating it, deflecting it. But should we try to deter attacks by promise of punishment?

Should deterrence in the future focus on a specific restricted range of contingencies or on the greater part of the spectrum of violent threat? This raises the interesting question whether strategic arms inventories should be multi-purpose. Or should future deterrence be designed for a more specific narrow range of contingencies --- merely to combat the residual threat of nuclear attack from nuclear weapon armed states? (The Cold War nuclear arsenal was the ultimate single-purpose weapon, and deterred only a very narrow range of threats.) If the future of nuclear forces is for highly specific/single defense only then downsizing of Western nuclear forces will continue with capability diminishing possibly to levels only needed to dissuade other's attempts to leapfrog [Nalebuff (1988), O'Neill (2001)].

But then can an effective non-nuclear deterrent be created? It could easily turn out that the broader more diverse spectrum of threats as suggested by Figure 1 will require more diverse and specialized defense resources in response, and in the aggregate higher resource demands compared to Cold War. The only conclusion now sustainable seems to be that future deterrence will differ greatly from the Cold War variety.

2.6 Whither Defense? Warring Alliance Blocks?

Criminal Disorder? Partitioned Global Security?

Aside from knowing that "splendid isolation" is no longer possible just how population, resources, technology, wealth and governance patterns will evolve to configure the international system over the next generation it is not for an economist to guess. Speculation that terrorism, or more generally finely disaggregated and uncoordinated population-to-population violence will displace nation-state confrontations seems to me to be a bad bet. What will endure though is the economic insight that this system is driven by incentives, incentives to collaborate or compete, build or destroy, produce or prey upon others. For the American, European, and Eastern friends the creation of new alliances to counterbalance the strength of emerging Asiatic powers will become crucial, with the purpose to make the preferred option for all sides to continue with investment, production, and trade rather than violent quarrel. Most intriguing is to speculate how the world's great powers in 50 years will manage the competition, and whether the vast space of the Pacific Ocean will serve as a barrier to Sino-American conflict, or instead be bridged by ever advancing technology.

3. Defense: A Normative Problem in Economics

This lengthy and disperse list of changes to security makes it harder to think through and organize the normative defense problem in the aftermath of the Cold War, where all objectives are no longer merged into the goal of containment. But the goal still remains achievement of a good overall Pareto resolution of risk and conflict.

Even though the underlying environment has changed a lot, in a way the same normative imperatives endure. Assuming armed force can advance these objectives, the old imperatives include:

- Avoid/minimize global or great power war but prevail if it occurs.

- Avert/minimize nuclear war but suffer least and prevail in the event.
- Prevent/minimize nuclear, chemical, biologic terror, or other large ongoing criminal events.
- Facilitate peaceful political and economic development favorable to democratic ideals, and the interest of democratic countries
- Manage/Minimize "free lance" inter-state violence in its many forms.
- Suppress or diminish intra-state violence where desirable to do so.

The objective of "prevail" remains essential even if it places defense economics on one side of a quarrel. The normative problem of defense economics then involves (a) how to specify these (and others since the list is incomplete) goals, (b) how to measure and weight them, (c) recommend the extent to achieve them and (d) do this at least cost (comprehensively defined). At this level of national and international policy the academic community of defense experts remains on the fringes. Moreover, economics has competition: the entire discipline of international relations is devoted to understanding the deeper roots of conflict. Yet economics retains an important role even at this level of grand strategy --- the role of identifying relationships among policies and objectives, and searching for efficient resolutions. A good example for economists here would be the work of Rosendorff and Sandler (2004) warning of unintended implications for terrorist recruitment of excessive counterterror pressure from the biggest most prominent target in the international system.

4. New Century Salients in Defense Economics

Hoping to proceed beyond generalities, I now attempt to itemize a list of concerns, more structured and based on the history of international conflict and violence, although the categories are by no means exhaustive.

4.1 *Carry-over or legacy issues from Cold War*

Certain aspects of the Cold War conflict continue as questions for analysis, and as threats that require vigilance and absorb resources. And some problems originate in the termination of the Cold War rather than as an extension or residual of it. An example of this would be non-proliferation security which has become more difficult to control than when the globe was divided into two rival camps. This is closely related to retirement and destruction of excess and dangerous warhead stockpiles of both the USSR and the US and thus prevention of unwanted ownership of them. A useful economic analysis in this area should calculate the benefits and costs of various components such Nunn-Lugar activities so as to prioritize among different programs. Such would include, for example, purchase then destruction of redundant Soviet nuclear weapons and delivery systems, subsidy of Russian nuclear weapons dismantlement projects, safeguarding of weapons useable atomic energy facilities and stockpiles, and collaborative programs for monitoring criminal activity connected to nuclear safety.

Another example concerns the status of inherited institutions, including notably the composition and function of NATO. The military function of NATO grows increasingly uncertain. Though the political, economic, and financial function remains of high consequence its role in international defense, including how to re-employ NATO for global security seems open. How can economic concepts of comparative advantage be useful to NATO/US coordination and collaboration in a new strategic era where their policies interests overlap less and less?

Still another example of legacy issues would be grand cost effectiveness analyses of US forward basing (itself essentially an artifact of the Cold War). This more generally would be an instance of the need for ongoing skeptical economic critique of capabilities requirements for conventional wars. Such continuing issues would center on the needs for continental ground war capabilities in Asian and Mid-East contexts, and the implied changes in force structures, especially programs for combined force integration.

4.2 Security Issues of Traditional Geopolitical Origin: China

As the large populous states of Asia develop, issues will arise as to whether international conflict over territory and spheres of influence will re-emerge as a norm --- resource driven competitions created by changes in scarcities and other economic factors. These fault lines could soon displace terrorism as the issue of ongoing priority.

Here the major foreseeable security challenge that the world faces concerns coexistence between China and the US --- so tightly bound to the western political net, to the US-Japan alliance, and to international trade and finance. Who can project whether paths of economic growth and technical progress will make Taiwan more or less critically important to China's vital strategic interests? China is a nuclear power, with growing strategic power and reach. In this realm, the old tension between deterrence and defense will reassert itself, and debates regarding nuclear war come up again. For Western interests a continued ability to deter and defeat nuclear attack will re-emerge. But this need and the implied requirement--- to keep abreast along so many independent dimensions at once --- may well increase the gigantic resource cost of maintaining a dominant defense capability. This burden on the US will eventually be unsustainable. Can it be shared among friendly powers? The answer boils down to an unaccustomed degree of power sharing by the US.

4.3 Culture Driven Conflicts

Worldwide Islamacist and psycho-terrorist threats come first to mind under this category [Huntington (1993)]. Can economics enhance our understanding of how to manage these conflicts, and especially of how to decide when entanglement is justified? The presumption should be for non-involvement by regular forces --- a lesson to be learned from Iraq 2003. These conflicts place special demands on an extended role for unconventional forces, covert action, and intelligence --- missions that segue into police and border security functions, enhancing the need for police, anti-narcotic, anti-terror skills/capabilities. Again such threats may burden free societies with new and onerous costs --- costs measured in loss of privacy and free movement, empowerment of continuous surveillance mechanisms and a prolonged struggle in the shadows where economic analysis is needed for uncovering the full costs of protection and defense. Although economists have occasionally entered this milieu, [Nordhaus (2002)] more is needed.

4.4 Defense and the Media.

Ruled by the iron law of scarcity, governments require resources to provide defense. In a democratic decentralized economy this depends on government's abilities to tax and when necessary and possible to conscript. Complementary to this requirement in a modern society is government's need to influence or to mould public opinion to unify, rally support, and otherwise employ its favored advantage in scale of communications. This means that for Western style democracies the world media is both a resource for and a constraint on security. As an area for study, the field of "media and defense" deserves closer analysis: for media is often the source of demands for governments to take action, yet a restriction on its behavior. This interplay of

constraint and instrument, I believe, will assume ever greater relevance. For example, the strength as well as the weakness of the North Korean dictatorship lies in the isolation of its supporting population. Break that communication monopoly and one will have gone a long way to break the grip of the tyrant.

4.5 Moral-Political Limits on the Military Instrument

A novel factor in such an inventory of emerging salients in defense economics concerns new limits on the use of the military. These have been created by education and globalization of culture. Events which generations ago would have provoked swift military response --- including reprisal --- do so no longer. Military responses have evolved to become more and more police-like, requiring specialized management. Consequently, the need for closer scrutiny of such questions as when does advance preparation for war provoke hostility, and when is payback counterproductive? [Rosendorff and Sandler (2004)]. A far more self-critical comparison of the carrot vs. the stick in applications of military force would seem to be needed.

5. Tasks for Defense Economics: Two Special and Timely Topics

5.1 Rogue States, WMD, and Failed States: Economic Analyses of Predation and Tyranny

Where news reports often focus on gee-whiz technologies of WMD or disaster spectacles, economics focuses on the incentive driven behavior of those who threaten their use. Developing conflict theory puts at our disposal some clue as to how such behavior could vary as between alternative forms of governance, (e.g. autocrats, oligarchies, representative governments, and non-governmental groups). Recent work on Hirshleifer's (1991) "paradox of

power" should, for instance, shed light on how the structure over time of gains/losses from "fight," versus "produce" identifies levers for dealing with pariah states. With a better understanding of the incentives that operate we may be able to fashion better instruments to counter these threats.

An important application of conflict and property-right models should be to discern how much and what type of force must a well run government possess [e.g. Hegre and Sandler (2002)]. So called failed states even with elements of tyranny may lack power to police their own populations which may diminish any ability to control extra-governmental violence originating within their boundaries. Some of these states have emerged in the fall-out from other battles: Cold War, WWI and II. What can our economic models of dictatorship, kleptocracy, and predation and of the incentive structures they embody yield in the way of useful policies for dealing with dictators and with failed states?

Economics has special contribution to make to analyses of rogue states which act outside the bounds of acceptable norms, trafficking in drugs, counterfeit currency, kidnapping foreigners or exploiting its own populations. Typically these will be states that can be influenced by economic incentives --- economic carrots or sticks. Rewarding atrocious action with carrots runs the risk of stimulating more, or other copycats. Punishing the perpetrators can be agonizing because of the shield they create with their own people. How can we leapfrog and enlist support of dis-enfranchised oppressed within rogue states? All is not lost though; some rogue states have been restored (Cambodia, Libya, Vietnam possibly). One hopes that governments can learn for the future from these lessons.

5.2 New Dimensions of Alliance Cooperation:

The rogue states example is also a development with particular relevance to new issues for alliance formation and governance because of the strong multifaceted temptation it offers for an alliance member to free ride. Covert cooperation with the pariah may be highly lucrative for private interests in an "ally," more than merely saving the costs of cooperative action which will often only accrue to a government from free riding. Building on seminal contributions [Sandler (1977)] and more recent ones [Sandler (1999), Sandler and Hartley (2001)] how can we economists help in the design of future alliance arrangements? Can our model for incentive mechanism design help? Bailey (2001) would say most definitely yes. Will the US lose the role of the unchallenged leader, or can we help in devising systems of shared governance? Creativity in building incentive structures to hold groups together should have an especially high payoff. New, single function alliance-like agreements may evolve among countries with rather little in common along the axis of defense. These include agreements concerning intelligence acquisition and sharing, financial security, corporate crime, narcotics control and human rights abuses, prisoner management, and world health, or space exploration to take a few examples. Consider the role of the International Energy Authority in oil stockpile releases following hurricane Katrina in 2005. Where economic alliances are successful, strategic conflicts may be more trustingly resolved. Alternatively, in the approaching era of return to multiple centers of power, benefits of economic cooperation could be a necessary cement to sustain military collaboration. Thus, from the viewpoint of defense economics, economic collaborations between countries and groups may generate crucial external economies along diverse dimensions; success along one dimension may presage a more formal alliance. The idea that alliance-generated common goods should be funded by

contributions according to comparative advantage is heard often [McGuire (1990)]. If we write the standard pure public good model with i denoting countries, Y_i the endowed numeraire income, and C_i each country's contribution to the pure collective good, denoted by X then the alliance members' welfares U^i can be written :

$$(1) \quad U^i [(Y_i - C_i), X(\sum C_i)]$$

And allowing for comparative advantage in different contributions changes this to:

$$(2) \quad U^i [(Y_i - C_i), X(C_1, C_2, C_i \dots C_N)]$$

Equation (2) simply represents the case of "non-summation" consumption-aggregation technology inaugurated by Hirshleifer's (1983) "weakest link," and "best shot," innovations and developed extensively in such textbooks as Cornes and Sandler (1996) or Mueller (2003). Less standard but no less worth as a representative is the mirror image of comparative advantage in contribution, where common contributions governed by non summation aggregation generate different goods $X_i = f^i ((C_1, C_2, C_i \dots C_N))$ for different countries as in :

$$(3) \quad U^i [(Y_i - C_i), f^i (C_1, C_2, C_i \dots C_N)], \quad i = 1 \dots n$$

As in the IEA case another good example of economic collaboration with strong externalities for security can be international risk management. This includes crafting insurance against supply disruptions --- an especially good example which asks economics to incorporate its large corpus of knowledge about risk reduction, insurance, and risk sharing, into models of collective action. And here the dynamics and limits of groups that insure each other may be quite different than groups that improve their common risk profile [Ihori and McGuire (2006)]. More generally, the challenge for defense economics is to include the insights from public finance [Ihori (1996)], public choice and international

relations to evolve a better understanding of the new century's groupings of states, including criteria for when to limit membership, or when to exclude some agents altogether. Examples include applying the theory of clubs, principal agent theory, theories of rent seeking behavior, as well as recent developments in risk analysis and insurance theory to interactions among states. Applications of Ehrlich and Becker's (1972) analysis of self-protection, self-insurance, and market insurance to alliance formation, allocative behavior, and stability would be especially timely [Ihori and McGuire (2006)].

6. Some Examples of Economic Method Applied to Defense

Just as a decade (1955-65) was required to work out our governing Cold War deterrent-defense strategy (in the final analysis successful), similarly, we have yet to form a comprehensive new strategy that incorporates (1) new constraints, resources, instruments, (2) new objectives attainable, and (3) new hazards and losses that we are willing to risk. Here, the relative isolation of academe from defense analysts is particularly unfortunate. The academic specialist's focus should be on how to bring the recent insights of research to bear on policy problems. There have indeed been significant advances in our understanding in many areas of economics of particular relevance to security studies. Many of these concern discovery of new structures of incentives, such as in the analysis of asymmetric information and its impact on markets. Other areas include developments in management of financial risk, and the entire new field of financial engineering, or advances in understanding the structure of incentives when agents are only partially, boundedly, rational. Yet another example is our improved grasp on the mixed structure of

incentives as between productive trading activities and expropriating predating ones, together with deeper understandings of the interactions among wealth, security, and forms of governance. These should all serve better to illuminate such weighty questions as how to defang terrorists, how to induce local security collaboration from developing countries, how better to organize and interpret intelligence, or when to punish defection and when to bribe cooperation.

To be specific, consider the carrot vs. stick problem. We hear the terms often. Can economics help identify when a carrot or a stick is more effective? We should try to shed some light. Charles Wolfe Jr. has suggested to me that there is a *prima facie* assumption against carrots and in favor of sticks! If an agent's utility $U(X)$ improves with his wealth X at a diminishing rate, then increasing his wealth by $\$ \Delta$ as a promise or a reward should have less effect than decreasing his wealth by the same amount $-\$ \Delta$ as a threat or punishment. With $U'' < 0$ if the costs to "us" of $+\Delta$ and $-\Delta$ are equal, we achieve less influence with the carrot than with the stick. This of course is just the beginning because the cost to us may not be the same and the simple $U(X)$ formulation may need to further distinguish gainers-from-the-carrot from losers-from-the-stick. Rewards vs. punishments may impact different agents in that country whose behavior we desire to influence, and different agents will have different responsiveness to incentives. So one should not favor punishment over bribery too swiftly. Nevertheless this suggests comparisons of carrot and stick instruments as a useful project for defense economics. Moreover, in principal agent analysis we have a ready made structure for thinking of this problem.

As another example consider this defense economic approach to homeland security, structurally having some similarity to defense against nuclear attack. One often hears as a

counsel of pessimism that for protection against terror attacks we cannot protect everything, or that terrorists will simply strike targets that we have not protected. Historically, once standard analytic techniques of defense economics [(e.g. McGuire (2004))] actually have a lot to contribute to dealing with such problems. To illustrate how to mine solutions to earlier problems for insight into current issues, let us focus for concreteness on protection of a country's transportation net. Any dispersed infrastructure system will serve just as well for illustration.

A defender's, π 's, problem of protecting (i.e. defeating, not deterring, or punishing) his rail and air infrastructure against terrorist or other enemy, γ 's, attack. The Table shows damages depending on what is attacked and what is defended. Only "pure" concentrated allocations are shown to simplify the illustration.

TABLE 3 HERE

The entries L_{JK}^π , J,K =Air or Rail, depend not only on the technical factors and relative costs mentioned but also on resource availabilities or budgets. An important economic issue, therefore, concerns how the defenders should allocate a budget of M^π dollars. (If γ were an organized society with its own infrastructure so that in-kind retaliation was a possibility then similar matrix could obtain for γ as defender and π as attacker, but that is unlikely in the context of terror threats).

The analytics of this problem as a game are available in an extensive literature originating in the early days of the Cold War MAD [Everett (1963), Pugh (1964)], with solutions depending on information distribution and timing, move sequence, etc. In addition to providing solutions to the allocation problem, the set-up raises important questions about how to defend, answers to which are highly context dependent. For example: Are the defender's losses just the negative of

the attacker's gains (consider the London bombings of 2005)? The answer is "probably not" in the current context. Would attacker and defender agree on the symbolic value (lost or protected) of some special targets (World Trade Center)? Could it be wiser for the defender to create costs for the attacker by making certain of the special targets more expensive to attack by imposing costs along another dimension such as promised retaliation against "his" village [Schelling (1967)]? Must an attacker have the last move, and if so how can a defender utilize this fact? How should the defender weigh losses L against budget costs (To defeat a 5% risk of loss of \$200 Bil, how much is it rational for a society to spend)? How does the problem change if the attacker is irrational/random? While answers to such questions may vary dramatically the issues they raise recur in any application of game theory to conflict.

This is just one instance of the fact that there is a large knowledge base available to proceed with a reasonable analysis of homeland security and defense against terror --- technical, economic, demographic, and strategic information [e.g. Enders and Sandler (1999, 2004)]. As this information is assembled it will become clearer how and what it is efficient to protect. Defense economics has much to contribute to such analysis, including the insight that simply because protection cannot be perfect is no reason to neglect it.

7. Conclusions: Future Direction of Defense Economics

As I hope this essay makes clear, "defense economics" is vital and evolving. But it differs markedly from those other fields in economics that one might denominate as "pure" --- like micro theory, or public finance, or international trade -- in two important respects.

First, its object of study is strongly conditioned by events outside the discipline itself. Major developments in the economics of international trade, for example have originated from

economic ideas about oligopoly inherent to economics itself. But challenges to defense economics have originated significantly from external events, such as the loss in Viet Nam, the End of the Cold War, or the attacks of Sept 11, 2001.

Second, economics makes a vital contribution to defense, but is not the decisive intellectual player. Defense, security, war, and peace are not the domain of economics in the manner that monetary or trade policy is. To the contrary, international relations and political science form the core of defense study. In the same way, economics is not the core of a nation's health systems delivery; medicine is.

So in a sense, the issues and problems for defense economics are not of its own internal evolving choice, but are given to it; the object of study shifts around. Nevertheless, in pursuit of a moving target, defense economics has many vital contributions to offer. The economic model of rational behavior with its focus on measurement, on calculated benefits and costs, on incentives and calculated goal maximization together with competition among participant-actors continues to provide essential insight into how we can deal with the dilemmas of war and peace.

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Table 1

System of Governance: Determines Definition of Costs and Benefits	War Outcome	
	Win	Lose
Monolithic Autocracy		
Autocrat's Costs	0	0
Autocrat's Gain	R_F	$-R_H$
Unanimous Consensual Democracy		
Society's Costs	C	C
Society's Benefit	0 *	$-R_H$

C= Home country's Social Costs of war.
 R_F = Surplus Rent Autocrat Acquires from Defeated Foreigners.
 R_H = Surplus Rent that Autocrat collects from his domestic subjects. He foregoes this amount in the event of a loss. I assume this to be the same as the amount a winner would extract from the home democratic society after conquest.

*How much a consensual democracy benefits from winning a war could be some positive amount, other than the prevention of the loss from losing should some synergism exist between winning a war and internal productivity following merger or trade.

Table 2

International Investment Position of the United States (Billions of USD)**					
		1976	1985	1995	2004
1.	Net Balance*	+165	+ 54	-458	-2,484
2.	US-Owned Assets Abroad	457	1,287	3,486	9,053
3.	Foreign-Owned Assets in the US	292	1,233	3,945	11,537

*Row 1 = Row 2 minus Row 3 except for rounding error.

**U.S. Department of Commerce, Bureau of Economic Analysis, "Net Investment Position of the United States" News release of June 30, 2005.

Table 3

$L_{JK}^\pi = \pi$'s loss when π defends Target J and γ attacks Target K		Attacker(s) = γ	
		Attackers Budget = M^γ	
Defender = π		K= 100% Air	K= 100% Rail
Defender's Budget= M^π	J =100% Airport/plane protection	L_{AA}^π	L_{AR}^π
	J =100% Railway protection	L_{RA}^π	L_{RR}^π

Figure 1

