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THESIS

VALIDATION OF RATIONAL DETERRENCE THEORY: ANALYSIS OF U.S. GOVERNMENT AND ADVERSARY RISK PROPENSITY AND RELATIVE EMPHASIS ON GAIN OR LOSS

by

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March 2010

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13. ABSTRACT (maximum 200 words)

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The fifth time is a charm! I remember sitting in my bedroom 15 months ago, exasperated and emotionally distraught because I had this concept in my head that I so desperately wanted to write about, but I couldn't figure out how to express the concept in even something so succinct as a basic problem statement. Fifteen months later, I am still a bit distraught, though only because I couldn't do more with this project than I already have, but so it goes.

That said, the following people were instrumental to my success in this endeavor: my wife, Amie; my daughter, Francesca; my mother, Susan; my sister, Emily; my parents-in-law, Carole Grills and David Grills; my cousin, Michael Norton; CAPT William Hishon; CAPT William Diehl; CAPT Richard Kaser; CAPT Marcus Woodring; CDR Shane Montoya; CDR Kevin Brown; CDR Thomas Glynn; CDR Diane Hauser; LCDR Brady Downs; LCDR Doug Lincoln; LT Dave Dixon; LT Tyana Thayer; MST1 Ian Hollan; Gerry DelRosario; Frank Hawthorne; Lieutenant Keith Barbier; Professor Nadav Morag; Professor Anders Strindberg; Professor Ted Lewis; Greta Marlett; Craig Coon; Karen Pren; Debbie Miller; the NPS Dudley Knox library staff; and any remaining Sector Houston-Galveston colleagues, Coast Guard Headquarters colleagues, NPS and CHDS staff, and family/friends whose individual names I simply do not have the mental capacity to retrieve as of this writing. RIP, Grandpa, you will be missed. Had I not listened to your advice on attending a military academy, I likely would not have taken the path I did, which has led to this opportunity.

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I.   INTRODUCTION

A.   PROBLEM STATEMENT

The U.S. Government (USG) has relied on rational deterrence theory as a cornerstone of its national security strategy. It represents "a framework that has 'dominated postwar academic thinking on strategic affairs' and lies at the core of the 'intellectual framework of Western military policy' " (Achen & Snidal, 1989). Recent presidential administrations have relied on rational deterrence against nation-states sponsoring terrorism, or dissuaded adversaries through threat of force as evident per *Presidential Decision Directive 39* (White House, 1995). PDD-39 provided a vague overview of the government's deterrence strategy, by stating that its "policies will not be affected by terrorist acts" and it "will act vigorously to deal with terrorists and their sponsors" (White House, 1995). However, there is no discussion of differences among the various types of terrorist groups or nation state threats specifically. Although the Presidential Directive starts with the assertion that the U.S. will apply all appropriate means to combat terrorism, without such differentiation among its adversaries, its deterrence policies and actions will not be appropriately tailored to the nuances of different terrorist groups and nation states. Deterrence may have worked against nation states in the past (e.g., during the Cuban Missile Crisis), but it may be less effective against present and future nation state and terrorist threats because such entities may use different strategic logic than do historically symmetrical entities.

Furthermore, to formulate deterrence strategies, the values, beliefs, attitudes, cultures, and motivations of one's adversaries must be known (Yost, 2009); it follows that deterrence must then be tailored based on these and other factors. The U.S. failed to deter a militarily and economically inferior Japan from attacking the U.S. mainland prior to U.S. entry into World War II; however, the U.S. successfully deterred a threat from a larger, more powerful nation during the Cuban Missile Crisis. These different outcomes against different opponents require an analysis of the core concepts of deterrence and Yost's criteria for formulating deterrence strategies. Thus, the recent U.S. emphasis on security against modern threats, particularly the persistent threat of terrorism, requires a

reexamination of the efficacy of deterrence against different adversaries and analysis of factors influencing their logic. As the U.S. still faces threats from nation states, the efficacy of deterrence against them must also be analyzed.

Rational deterrence has come under criticism, as policymakers challenge the strategies and academics challenge the theories behind these strategies. One problem is that rational deterrence theory does not account for the numerous possibilities inherent in foreign policy decisions, and thus can be seen as inadequate for U.S. foreign policy (Achen & Snidal, 1989). Huth and Russett (1984) emphasize: "if we do not know how deterrence works when it is most needed, policies assigned to assure general deterrence are likely to be based on incomplete or misleading notions of how deterrence works, and deterrence theory will be weak" (p. 497). Achen and Snidal (1989) claim that many cases "exhibit complexities which in many respects are not addressed by the abstract theory of deterrence" (p. 144). Thus, if policies based on deterrence do not account for the complex differences in all possible challengers to U.S. security, not only would the theory be weak, its application would predictably be ineffective. For example, risk propensity and relative emphasis on loss/gain are two characteristics which reflect such complex differences between these challengers. McDermott (1998) defines risk propensity as "being either risk seeking or risk averse" (p. 36); and as will be explained further in this research, relative emphasis on loss/gain is not well defined in current literature. While Lebow and Stein (1989) propose that there are four different permutations of risk propensity and relative emphasis on loss/gain, they allege that deterrence theory assumes that most challengers to deterrence are risk prone gain maximizers (taking risks to preserve or increase their gains), failing to consider that challengers may also be risk prone loss minimizers (taking risks to avoid losses), risk averse gain maximizers (avoiding risks inherent in preserving or seeking further gains), or risk averse loss minimizers (avoiding risks inherent in acting to avoid or losses) (Lebow & Stein, 1989).[1]

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1 Interestingly, Lebow and Stein do not explicitly define risk propensity or relative emphasis on loss/gain in their work; thus the definitions presented in parentheses represent the present author's synthesis of other definitions in other literature, which is explained in later analysis.

Two decades after these criticisms were first noted, a readily available framework for applying formal risk analysis[2] to deterrence based national security strategies still has not emerged. This may be, in part, because deterrence has been neglected in the national strategy dialogue (Cronin, 2007). For example, separate strategies have been put forth which advocate risk management for preventing terrorism domestically and abroad (e.g., *National Strategy for Homeland Security*, 2007), and promote deterrence of nation state and terrorist attacks (e.g., *National Strategy for Combating Terrorism*, 2006; *National Security Strategy*, 2006). The *National Strategy for Homeland Security* gives a brief overview of the current threat environment yet neglects to acknowledge that different adversaries have different characteristics. The *National Strategy for Combating Terrorism* claims "we require a range of deterrence strategies that are tailored to the situation and to the adversary," but does not offer a metric for distinguishing such situations/adversaries. Finally, the *National Security Strategy* remarks, "we are pursuing a future force that will provide tailored deterrence of both state and non-state threats," but as with the *National Strategy for Combating Terrorism,* it does not propose a framework for tailoring deterrence efforts. Thus there is no linkage between formal risk analysis and the application of deterrence to U.S. adversaries in these policies.

Analysis of risk propensity and relative emphases on loss/gain of those actors sought to be deterred by U.S. policy may increase the credibility and efficacy of deterrence based national strategy by linking risk analysis and deterrence. Berejikian (2002) implies concurrence with this thought: "risk acceptant and non-maximizing behavior is not integrated into models of deterrence, despite the fact that this is sometimes how decision makers act" (p. 172). Such linkage between risk preferences and the efficacy of deterrence is especially salient given the continued reliance upon deterrence strategies and the national security threat evolution from conventional nation-states to modern day nation states, nation state sponsors of terrorism, and terrorist organizations (Bar, 2008). As an illustration, the Cold War theory of deterrence was constructed using traditional opponents who used identical strategic logic to pursue

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2 Risk analysis in the context of this thesis refers to analysis of risk propensity and relative emphasis on loss/gain, unless otherwise specified.

predictable outcomes. However, strategic behavior is based on unique factors and every entity is distinctive. For example, contemporary adversaries are predicted to "respond to U.S. military dominance by considering unorthodox, indirect, surprising, or even 'unthinkable' methods of challenging the United States" (Lambakis et al., 2002, p. 245). 9/11 reflected a paradigm shift in logic formerly used by most U.S. adversaries: striking civilian targets reflecting economic and political power of the U.S., and using unconventional means to that end, suggested that traditional deterrence by way of military superiority was insufficient in the current strategic environment. The 9/11 perpetrators had different preferences for means of challenging U.S. superiority than did Nikita Khrushchev during the Cuban Missile Crisis, and likely had a different risk tolerance; but we did not understand Al Qaeda's preferences or risk tolerance prior to 9/11. Had we better understood those characteristics, we might have predicted that our deterrence strategies would be ineffective against Al Qaeda and that Al Qaeda would attempt the acts they did. Many threats the U.S. currently faces are from nation states such as North Korea and Iran, but these nations may pursue unconventional means against the U.S. as did Al-Qaeda.

Consequently, a strategy of deterrence against contemporary threats must account for the ways in which the U.S. and adversarial leadership assesses the nature of the strategic environment they face as they attempt to fulfill their goals, including: 1) self-assessment, and 2) assessment of the identities, capabilities, and will of immediate and potential enemies (Bar, 2008). While both traditional and modern adversaries likely use these criteria to calculate a course of action, given present threats it is especially important to understand how nation states go about this assessment of their situation, or as will be referred to in this research, the strategic environment. Evidence of such assessment may reflect an adversary's risk propensities and relative emphases on loss/gain; however, no framework for formally assessing these characteristics exists. As the threat evolves, deterrence must evolve as well. Past attempts have been made to apply risk analysis to game theoretic interpretations of deterrence, but this did not include risk propensities and relative emphases on loss/gain (e.g., Berejikian, 2002). Thus, while there is a need to reintegrate deterrence into the intellectual framework of twenty-first century

defense (Cronin, 2007), this need goes beyond the theoretical: the shortcomings in the literature suggest limitations in the United States' ability to adapt deterrence to current threats, who are arguably versatile, adaptive adversaries. September 11 was perhaps one of the most notable failures of deterrence in U.S. history; to avoid a similar incident, a different interpretation and application of deterrence may prove invaluable.

B.   RESEARCH QUESTIONS

The primary aim of this research is to examine whether risk analysis can be used to predict when deterrence is most likely to be successful against modern day nation states. To support this analysis, the following secondary questions will be explored: 1) Can the efficacy of deterrence be predicted when the U.S. Government (USG) and its adversaries have certain combinations of risk propensity and relative emphasis on loss or gain; 2) What are risk propensities and relative emphases on loss or gain of the USG during different confrontations; 3) What are the risk propensities and relative emphases on loss or gain of U.S. adversaries; 4) Does the strategic environment influence risk profiles and thus influence the efficacy of deterrence; and 5) Is prospect theory a more explanatory theory of utility than subjective expected utility in predicting deterrence efficacy?

C.   SIGNIFICANCE OF RESEARCH

1.   Significance of Research to the Literature

This thesis will serve to fill literature gaps on application of risk analysis principles to U.S. counterterrorism and national security strategy and the efficacy of deterrence as a viable U.S. counterterrorism strategy against various adversaries. This analysis will expand on the permutations of risk propensity and relative emphasis on loss/gain set forth by Lebow and Stein (1989). As discussed in the Literature Review, there currently is no rigorous body of literature methodologically applying risk analysis principles to the U.S. government and its adversaries: terrorist organizations and nation states.

The existing literature misses a vital focus of analysis: whether different risk profiles influence the decision making processes of current threats to the U.S.

Additionally, the claims that deterrence theory assumes challengers to deterrence demonstrate only one specific combination of risk propensity and relative emphasis on loss or gain are unchallenged in existing literature. This claim ignores the other possible permutations of risk propensity and relative emphasis on loss/gain. Some studies give anecdotal evidence of the risk propensity of various actors who challenged U.S. deterrence, but there is no methodical characterization of risk profiles of these actors compared with characterization of the risk profiles of the U.S. government administrations who sought to deter those actors. Deterrence literature does not apply any risk analysis principles to existing case studies with respect to risk propensity and relative emphasis on loss/gain. Thus this research will methodically assess risk profiles of the U.S. government and its adversaries in deterrence games.

Overall, this thesis will integrate three broad themes in homeland defense and security literature: deterrence strategy/theory, risk analysis, and game theory in a framework for assessing the efficacy of deterrence as a security strategy against adversaries under certain conditions and risk profiles.

2. Significance of Research to Future Research Efforts

Future research may be able to expand on the best-match security strategy model proposed herein. Other possible security strategies may be systematically analyzed in terms of risk propensity and relative emphasis on loss-gain of the government and its adversaries. These strategies include preemption, conciliation, containment, expanded deterrence, compensation-deterrence, and limited deterrence, among others. Furthermore, game theory experts may be able to judge the efficacy of these security strategies using advanced game theory mathematics. This research will not address mathematical solutions of game theory in sufficient detail; such solutions might provide more insight into the proposed deterrence efficacy model and supporting analyses.

3. Significance of Research to HLS/HLD Practitioners and Leaders Nationally

This research will offer justification for when deterrence should be used based on the U.S. government risk profile and those of its adversaries. There is debate over the

efficacy of deterrence as addressed in the Literature Review; additional theoretical support for it will increase its credibility in certain situations and assist the U.S. government in appropriately bringing it to bear against its adversaries. This research will support the Department of Homeland Security's *National Strategy for Homeland Security* (2007), the *National Strategy for Combating Terrorism* (2006), and the *National Security Strategy* (2006). This research will also support the Department of Defense's current deterrence operations joint operating concept (2006).

D.   ARGUMENT

This thesis will propose that the U.S. Government should utilize deterrence as a security strategy based on a "deterrence efficacy model." It is hypothesized that such a model, accounting for risk propensity and relative emphasis on loss/gain of the USG and its adversaries, will predict when deterrence is likely to be an effective strategy. It is further hypothesized that case studies of deterrence can be analyzed to qualitatively interpret risk profiles of the case study players. These same case studies can also be compared to existing deterrence game theory models (Berejikian), accounting for different relative emphases on loss/gain, risk propensities, and other factors. The results of these quantitative analyses will be compared to the qualitative analysis findings and support or detract from said findings. Qualitative findings supported by Berejikian analyses will be presented as combinations of risk profiles of USG and adversaries. These findings will support a framework for this deterrence efficacy model which is presented as Figure 1. The final model will evaluate the extent to which deterrence would be efficacious given each combination of government and adversary risk profile.

		Adversary			
		Risk Averse Gain Maximizer	*Risk Averse Loss Minimizer*	*Risk Prone Gain Maximizer*	*Risk Prone Loss Minimizer*
Government	*Risk Averse Gain Maximizer*	Deterrence Efficacious?	Deterrence Efficacious?	Deterrence Efficacious?	Deterrence Efficacious?
	Risk Averse Loss Minimizer	Deterrence Efficacious?	Deterrence Efficacious?	Deterrence Efficacious?	Deterrence Efficacious?
	Risk Prone Gain Maximizer	Deterrence Efficacious?	Deterrence Efficacious?	Deterrence Efficacious?	Deterrence Efficacious?
	Risk Prone Loss Minimizer	Deterrence Efficacious?	Deterrence Efficacious?	Deterrence Efficacious?	Deterrence Efficacious?

Figure 1.   Proposed Framework for Deterrence Efficacy Model based on Risk Profiles.

Throughout the course of a confrontation, evidence may indicate that certain actions are not consistent with the overall risk profile. Risk propensity and relative emphasis on loss/gain are not absolute; thus two scales used to identify various degrees of risk propensity and relative emphases on loss or gain are proposed below as Figure 2. These qualifiers may impact the expected efficacy of deterrence.

```
<-------------------/-------------------/-------------------/-------------------/------------------/-------------------/-------------->
    Considerably      Moderately       Slightly         Slightly        Moderately      Considerably
    Risk Averse       Risk Averse     Risk Averse      Risk Prone       Risk Prone       Risk Prone


<-------------------/-------------------/-------------------/-------------------/------------------/-------------------/-------------->
    Considerable       Moderate         Slight           Slight          Moderate        Considerable
  Emphasis - Gain  Emphasis – Gain  Emphasis - Gain Emphasis - Loss Emphasis – Loss Emphasis - Loss
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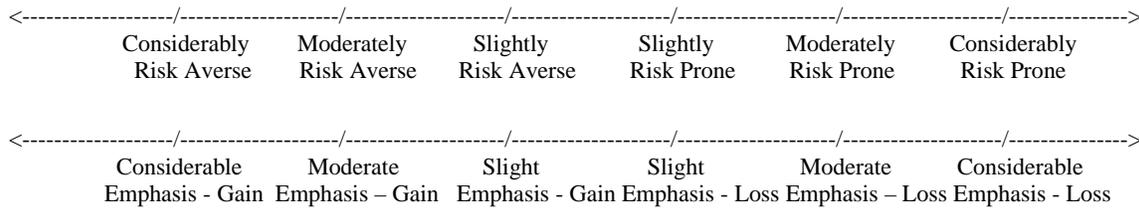
Figure 2.   Risk Propensity and Relative Emphasis on Loss/Gain Scales

In Figure 1, deterrence may be more efficacious for one combination of government risk profile and adversary risk profile than for other combinations thereof. As a hypothetical example, the best strategy for a Risk Averse Gain Maximizer government when the adversary is a Risk Averse Gain Maximizer may be deterrence, but if the adversary is a Risk Prone Loss Minimizer, that same government may benefit less from using deterrence and might benefit more from a different security strategy. Furthermore, some literature suggests that the greatest threat to deterrence comes from risk prone gain maximizers; however, it is hypothesized that this is not always true and such refutation can be demonstrated by the deterrence efficacy model and attendant methodology proposed herein.

E.   OVERVIEW OF METHODOLOGY

As discussed in the problem statement, there is disagreement over whether deterrence is efficacious. To determine whether the efficacy of deterrence against present day adversaries can be supported in the proposed framework (Figure 1), a combination of case studies and policy options analysis methodologies will be utilized. Information from both hypothetical deterrence games and actual historical deterrence case studies will be collected. The strategic environment, risk propensities and relative emphases on loss/gain of players in these case studies will be analyzed using both qualitative methods and quantitative game theory methods. These analyses will provide justification for policy recommendations as to whether deterrence will be effective in scenarios wherein the players have different risk profiles. Cronin (2007) implies such a combination of qualitative case study analysis and quantitative game theory analysis is appropriate. He claims that strategic thought before 1945 was shaped historically, but strategic thought after 1945 was shaped by science and game theory. Strategic theory was thus historically illiterate, and that was its undoing (p. 5). Furthermore, Hosoya (1968) suggests "there is often a serious danger of miscalculation when one uses historical analogies as standards of judgment because such analogies frequently overlook differences in actual conditions between the past and the present" (p. 111). Therefore, a combination of historical analysis combined with a scientific method would lend credibility to strategic policy. As this research method is intended to lend such credibility, it will synthesize these two concepts.

1.   Case Study Review

Berejikian (2002) claims that theories of politics should be "based on models of the individual consistent with empirical evidence about how individuals make decisions" (p. 167). Such empirical evidence can be found in case studies. Case study analysis of the USG and its adversaries who have challenged U.S. deterrence may glean useful information about such actors' respective risk profiles. It seems reasonable to assume that theories supporting security strategies should follow the same logic as Berejikian's argument for theories of politics if nation-states are considered unitary actors.

It is important to analyze a variety of cases when evaluating the efficacy of deterrence. Comparative case study analysis for theory development is supported by Achen and Snidal (1989) who recommend the development of contingent empirical generalizations. Generalizations which result from such case studies are empirical because they are derived from analysis of multiple cases, and are contingent because they only apply under certain conditions (p. 147). Lieberman (1995) concurs that multiple case studies must be analyzed to evaluate the success or failure of deterrence arguing that "the phenomenon of deterrence, which is temporal, dynamic, and causal, has to be tested by a longitudinal research design" (p. 2). In this method, multiple cases will be studied, and the conditions that apply will be that they are assessed strictly on the basis of qualitative estimates of risk propensity and relative emphases on loss/gain of each actor, as well as appraisals of the strategic environment. The following historical case studies will be examined using qualitative and quantitative analysis: Pearl Harbor and the Cuban Missile Crisis. Analysis of these cases will examine how these objectives of deterrence were influenced by actors' respective risk profiles and the strategic environment framing their interactions, and these analyses will offer explanations as to why deterrence was or was not successful in these cases. Each case's salience to analysis of the efficacy of deterrence is briefly explained below. In general, these cases represent a mix of deterrence successes and failures, and also a mix of confrontations between nation states of nearly equal standing, and confrontations in which one nation is considerably weaker in at least one major aspect (economically, military, etc).

a.   *Deterrence Failure: Pearl Harbor*

This case study is salient to the efficacy of deterrence because it emphasizes the risk profiles of a weaker actor (Japan) faced with two nearly equally undesirable alternative courses of action in a confrontation. The Japanese attack on Pearl Harbor is considered to be "one of the most conspicuous failures of deterrence in history" (Russett, 1967, p. 91). The Japanese were attempting to expand their influence in the 1930s and required a raw material supply chain in the Southeast Pacific to sustain their economy and military. The U.S. sought to deny benefits to Japan (deterrence by denial) by attempting to counteract its economic ambitions. Japan understood that it faced

undesirable outcomes: either retreat from spreading its influence, or go to war with the United States over the Southeast Pacific supply chain (Russett, 1967). The ultimate outcome was the surprise attack on Pearl Harbor on 7 December 1941.

b. *Deterrence Success: Cuban Missile Crisis*

The Cuban Missile Crisis demonstrates how U.S. deterrence succeeded (though very nearly failed) against another nation-state with nearly equal strategic standing, ambitions, and resources. This case study is salient to analysis of risk propensity and relative emphasis on loss/gain because it examines the dynamics of near-equal opponents. A further benefit to the study of the Cuban Missile Crisis is the opportunity to analyze a core deterrence principle of brinkmanship, a tactic of escalating in response to initial challenges. Brinkmanship is a tactic in confrontation wherein the bargaining power of the potential aggressor increases dramatically if they are is able to make probabilistic threats of aggression (Schwarz, 2004). Both the U.S. and the USSR were nearly equally strategically advantaged, and both were battling for ideological influence throughout the world; thus, they played an iterated game wherein each kept escalating and making more increasingly more aggressive threats against the other.

U.S. President Kennedy learned that the USSR was allegedly sending missiles to Cuba, and a series of diplomatic exchanges between Kennedy and Soviet Premier Nikita Khrushchev followed. Assurances were made that the USSR was not putting offensive weapons capable of reaching the U.S., and the U.S. claimed that "the gravest issues would arise" if missiles were placed in Cuba (Lebow, 1983). This veiled threat of "gravest issues" was a U.S. attempt at rational deterrence. The U.S. sought to deny benefits of the USSR's attempt to influence the strategic environment (via a blockade), and threatened to impose costs against the USSR for putting missiles in Cuba (possible military action). Although it did not initially deter the USSR from placing missiles in Cuba, deterrence did keep the USSR from continued development of nuclear capability in the Western Hemisphere and ultimately the clear and present danger to the U.S. was mitigated.

2.   **Qualitative Analysis**

   a.   A Macro View: Strategic Culture, Strategic Environment, Wills/Interests and Capabilities

Bar (2008) recommended that a strategy of deterrence must account for the ways in which the adversary leadership assesses the nature of the situation it faces as it attempts to fulfill its goals, including 1) its self-assessment, and 2) its assessment of the identity, capabilities, and wills of its immediate and potential enemies. An actor may be strategically disadvantaged, yet may choose to disregard this disadvantage and instead act in pursuit of maximizing gains. It is posited that Bar's factors effectively represent an assessment of the strategic environment in which an actor finds itself, and consequently will be used to frame the discussion of risk propensity and relative emphasis on loss/gain in the case studies.

The self-assessment aspect of a nation in conflict is likely influenced by its strategic culture. Johnston (1995) offers that strategic culture is linked to preferences; "different states have different predominant strategic preferences that are rooted in the early or formative experiences of the state, and are influenced to some degree by the philosophical, political, cultural, and cognitive characteristics of the state and its elites" (p. 34). Yost (2009) suggests that leaders "act within a framework of cultural tendencies built up through the history of a society'' during confrontations (p. 5). A different perspective is offered by Morgan (2003): "decision makers do not respond to their strategic cultures; they respond to stimuli from the strategic environment…therefore any study attempting to attempting to discover culture's effects on strategic decision making must ascertain how symbols, values, and…cultural behaviors intervene in the decision making process" (p. 8). Morgan then examines culture's role in translating preferences to organizational culture and model how culture's ideas and behavioral elements intervene in decision making as actors also consider cues from the immediate strategic environment (p. 18). Thus, both strategic history culture and particulars of the strategic environment of conflict must be considered in case study analysis. A simple way to consider strategic culture and strategic environment in conflict is that former captures how an actor traditionally responds to threats and/or confrontations, whereas the latter captures what

was going on in the world at the time, relevant to the conflict, and what were identity/capabilities/wills of the actors involved in the conflict.

In that vein, it is further proposed that the balance of interests and the balance of capabilities (Lieberman, 1995) are two key factors in assessing the strategic environment. These criteria are consistent with the discussion of capabilities and wills posited by Bar (2008). Will is influenced by interests (Lieberman, 1995, p. 5); thus, another way to analyze the will of an actor in a deterrence situation is to assess their interests at stake in the conflict. In his Soviet containment strategy, George Kennan separated what he termed vital and peripheral interests. In the case of vital interests, he considered war to be acceptable (Aggour, 2008). Lieberman (1995) emphasizes that intrinsic interests such as self preservation are generally more salient factors in decision making than are external, strategic interests such as gaining strategic territories (p. 5). Thus, in a scenario wherein an imbalance in the strategic environment results in a disadvantaged nation seeking to minimize its intrinsic losses or preserve/maximize its intrinsic gains, and the advantaged nation only wishing to minimize its strategic losses or preserve/maximize its extrinsic/strategic gains, Lieberman predicts the balance of interests will favor the disadvantaged actor. However, if the advantaged nation in this situation wishes to preserve/maximize its intrinsic interests as well, the balance of interests may not be salient: it will be more difficult for the disadvantaged actor to challenge the advantaged actor. In the latter case, the balance of capabilities may become more salient. Presumably the balance of capabilities will always favor the strategically advantaged actor.

A summary of considerations for "the calculus of tailored deterrence" can be found in Bunn (2007). Given the assertion in this research that tailoring deterrence requires analysis of risk characteristics, these same considerations will provide insight for qualitative analysis the strategic environment, risk propensity and relative emphasis on loss gain:

> 1) What are the nation's or group's values and priorities? How are these affected by its history and strategic culture? 2) What are their objectives in the particular situation? 3) What factors are likely to influence their decision-making? 4) Who makes decisions, how does the leadership think,

what is their view of the world and their experience with and view of the United States? 4) How do they calculate risks and gains? 5) What do they believe their stakes to be in particular situations (stakes may vary depending on the scenario)? 6) What is the likely credibility of U.S. deterrence options to this adversary—for both imposing costs and denying gains? 7) How risk-taking—or risk-averse—is the leadership? 8) How much latitude does the leadership have to either provoke or conciliate? 9) What are their alternative courses of action? 10) What do they believe the costs and benefits of restraint to be? Do they think they are worse off if they do not take the aggressive action? Do they see any positive benefits in not taking the action in question? 11) What do they perceive as America's answers to the questions above—for example, U.S. objectives, stakes, or risk-taking propensity? (p. 3)

Such questions are consistent with the general framework for strategic culture and strategic environment analysis (which informs risk profile analysis) laid out in Bar (2008). From this general framework, risk propensities and relative emphases on loss/gain can be examined in more detail.

b. A Micro View: Risk Propensity

Consistent with Lebow and Stein's (1989) earlier assertion that historical research must be used to examine risk propensity and relative emphasis on loss/gain, qualitative risk assessment on case studies will be performed and judgments on risk profiles made using existing models and proposed new methods. One existing model, proposed by Linnington (2004), is presented in Figure 3 and will be used to assess risk propensity and *domains* of gains or losses (as opposed to *relative emphases* on losses or gains).

Figure 3. Illustration of foreign policy options across the spectrum of domain of gains to domain of losses based upon risk propensity (From Linnington, 2004, p. 19).

Although in its original form this model was only presented for the USG, in this study it will also be used for U.S. adversaries. The model shows where different foreign policy options fall on a risk propensity continuum, ranging from risk averse to risk prone options. Interestingly, Linnington discusses various external and internal variables (e.g., domestic perception, international perception) as considerations for foreign policy risk assessment, yet the model seems to imply that risk is only expected military capability loss resulting from committing resources to conflicts of various intensities. Nonetheless, the model is a good starting point to assess risk propensities. Thus it is posited that risk propensity may be estimated from 1) evidence of actors' domain (strategic environment) with input from the Linnington (2004) model; 2) case study evidence of the likelihood of certain outcomes which had various subjective utilities to the actor (e.g., reflected actor preferences; and 3) the actors' ultimate actions during confrontations.

c. *A Micro View: Relative Emphasis on Loss or Gain*

Importantly, the Linnington model does not demonstrate *relative emphases* on loss or gain, even though the model includes *domain of losses and domain of gains*. There is little literature discussing the concept of relative emphasis on loss/gain outside of Lebow and Stein (1989). Thus, for this research, it is posited that relative emphasis on loss/gain may be estimated from 1) evidence that an actor analyzed costs and benefits of certain courses of action (COAs) during a confrontation and what the results of that analysis was; and 2) the decisions made in response to such analyses, with particular attention to evidence of escalation or status quo maintenance/de-escalation throughout such confrontations. If the actor focused on taking action (or not taking action) to avoid outcomes they did not prefer, or what was detrimental to them (e.g., costs exceed benefits), they would presumably be a loss minimizer, whereas if they focused on pursuing what was important to them, they would presumably be a gain maximizer (e.g., benefits exceed costs).

d. *Integrating Strategic Environment, Risk Propensity, and Relative Emphasis on Loss/Gain Into Bar's Framework*

The following graphic illustrates conceptually how these ideas fit together to support elicitation of various actor risk profiles and help populate the Deterrence Efficacy Model presented in Figure 1.
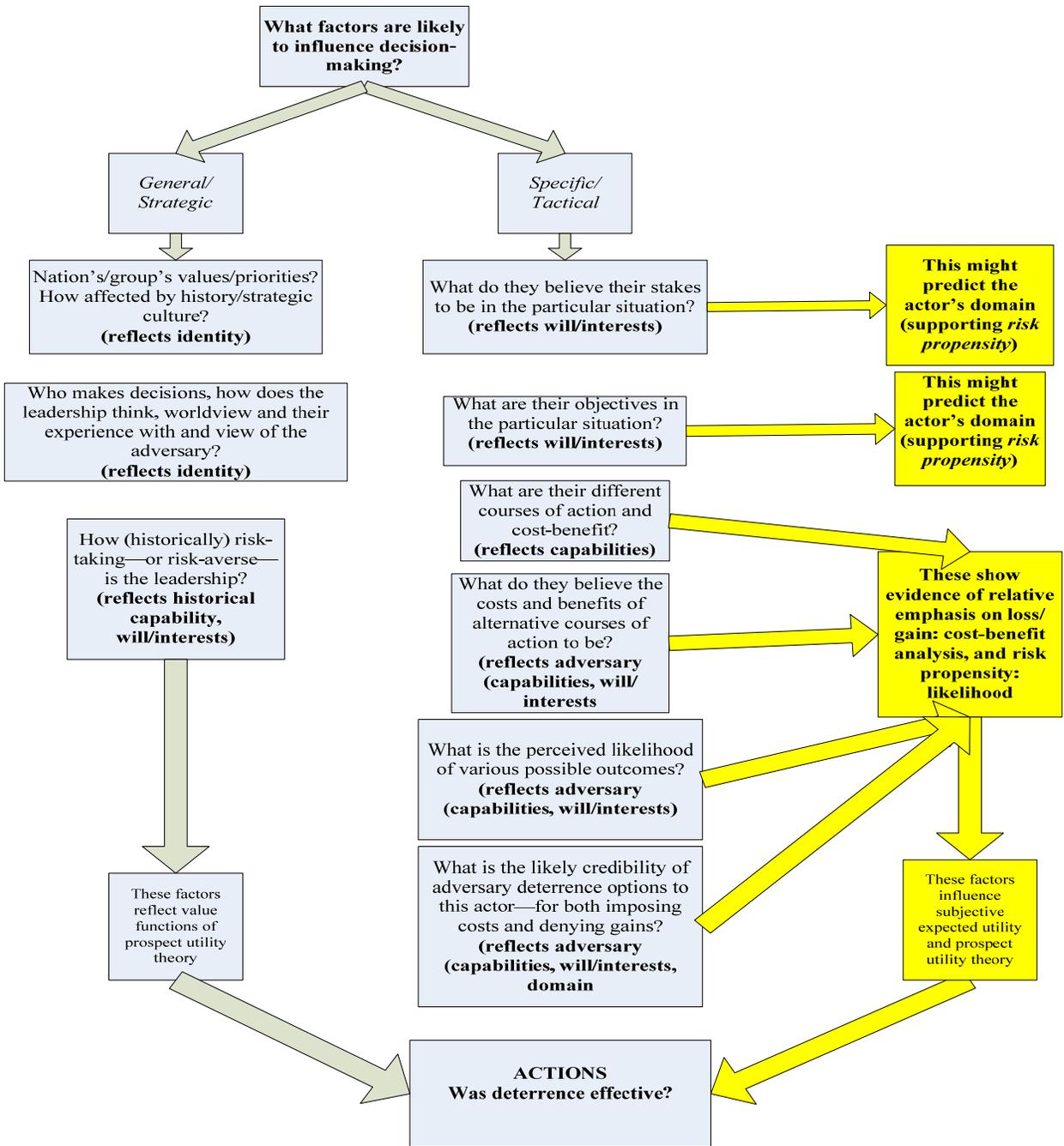
Figure 4. Case Study Elicitation Framework: Integrating Strategic Environment, Risk Propensity, and Relative Emphasis on Loss/Gain into Bar's Framework.

As can be seen in Figure 4, factors in the strategic environment (blue) are indicators of risk propensity and relative emphasis on loss/gain (yellow). Risk propensity

and relative emphasis on loss/gain thus influence utility calculations which lead the decision maker to a decision. This choice may be to challenge deterrence or to refrain from such a challenge.

General characteristics of actors (on the left in Figure 4) do not necessarily contribute directly to characterization of risk propensity and relative emphasis on loss/gain for specific situations; rather they focus on historical attributes that may contribute to a value function when prospect utility theory is applied. Prospect theory will be explained in more detail in the literature review, but for now, it can be stated that this theory requires consideration of an actor's past experiences, which influence utility calculations and thus influence present-day decision making. These general factors are more oriented toward assessment of the strategic environment framing a conflict.

The specific factors in Figure 4 reflect situational risk characteristics and imply that subjective expected utility (SEU) is the basis for how actors decide on certain courses of action (how they determine utility). However, since there is disagreement over whether SEU or prospect utility theory (PU) more accurately explains decision making, the general/strategic factors can be incorporated into the analysis to show how PU might determine whether deterrence was efficacious. Thus, figure 4 can be used to analyze case studies using either utility theory. This framework will be applied to both the U.S. (self assessment) and adversaries (assessment of identity, capabilities, and wills of potential enemies).

3.   Quantitative Analysis

Game theoretic support for qualitative analysis can support the assertion that deterrence may be more efficacious when the players have certain risk profiles. Game theory is an analytical model designed to help understand phenomena observed when decision makers interact. It treats decision makers as "players" participating in a "game" or controlled interaction with certain rules and assumptions (Osborne, 1994). Two of these assumptions are that decision makers are rational and that they simultaneously account for their opponents' anticipated behavior when choosing a course of action. Game theory has been claimed to be an appropriate tool for studying the strategic interaction between

governments and its adversaries (Sandler and Arce, 2003). Game theory assigns an expected "payoff" value to each player given certain courses of action. A payoff is the subjective value of the outcome of a course of action. It is assumed that each player wants to maximize his own payoff (Myerson, 2007). It is proposed for this research that the courses of action selected by each player may be in part determined by each player's risk propensity and emphasis on loss or gain. As a hypothetical example, the expected ideal payoff from deterring an opponent with a certain risk profile may be high for the U.S. government; whereas for an opponent with a different risk profile, the expected payoff from deterring them may be lower and therefore deterrence would be less efficacious.

Outside the context of game theory, the highest payoffs to one player would generally justify the preferred strategy for that player. However, in game theory the highest possible payoff to each player may not be the likely outcome of the game. This is because each individual payoff does not account for the assumption that the other player in the game wants to maximize his own advantage and/or minimize their opponent's advantage. Thus, the outcome of a game may mean that each player has a maximum payoff which may be less than that which they could gain without the influence of their opponent.

For the quantitative analysis the U.S. government and its adversary will be two players participating in a deterrence game. In each game the subjective utility or value gained from a course of action (COA) is either analyzed for each player. Judgments will be made on whether each player is a gain maximizer or loss minimizer given their estimates of utility and choices made in the context of conflict. For example, a nation state may rationally choose to fight a war it thinks it will probably lose if the gains of winning and/or the costs of alternative COAs are great enough (Jervis, 1989). Also, judgments on whether each player would be risk prone or risk averse when choosing different COAs will be made based on evidence of the likelihood of a successful attack and/or likelihood of defender retaliation, the utilities associated with those various outcomes, and the decisions made. For instance, if the same nation state evaluates the probability of attack failure or of defender retaliation to such attack as high, and the utility of this attacker-defender interaction favors the defender, the attacking nation state is arguably risk prone if it chooses to attack. The perceived likelihoods of various outcomes will then be quantified

and will modify the subjective utilities from cost-benefit calculations to form subjective expected utilities (SEU). SEU for each course of action will be compared to find the equilibrium solution and the ideal payoffs for the government and the adversary (these may all be different COAs or may be the same). If the equilibrium solution reflects the government deterring (aggressive) and the aggressor not attacking (nonaggressive) it may be likely that deterrence would be an effective strategy against that aggressor in that situation. Prospect utility may also be used to estimate the game outcome.

Berejikian (2002) presents several deterrence-game theory scenarios wherein the domains of loss/gain of attacker and defender are evaluated; this analysis will expand on Berejikian's scenarios to include discussion on risk propensity and relative emphases on loss/gain. Berejikian's analyses stress the importance of prospect theory in framing strategic interactions and compares deterrence games based on prospect theory to those based on subjective expected utility. The outcome of each game will show whether deterrence yields positive or negative utility to the USG when the USG and the adversary have certain risk propensities and relative emphases on loss/gain. The corollary to this finding would be that when the USG and an adversary have specific risk profiles, the USG may or may not realize the efficacy of deterrence. Finally, this analysis may offer insight as to whether prospect theory is more valuable to case study analysis than is SEU.

4. Comparing Quantitative to Qualitative

The quantitatively derived, theoretical deterrence strategy efficacies can then be compared to the qualitative case study risk profile results. Analysis of a case study wherein 1) conditions similar to those in theoretical analysis exist, and 2) the actors have risk profiles similar to those of their theoretical counterparts, will suggest whether deterrence was efficacious against an adversary within the confines of the case study. If deterrence is efficacious in the case study to nearly the same extent as it is in theoretical analysis, consistent with Cronin's (2007) assertion that a combination of qualitative case study analysis and quantitative game theory analysis is appropriate, this increases the credibility of the deterrence as an acceptable strategy for government use in similar conditions, against adversaries with similar risk profiles. This comparison will be repeated for all scenarios wherein a comparison can be drawn between 1) the case study

conditions and player risk profiles and 2) those in theoretical analyses. Evaluation of the extent to which deterrence is efficacious in each instance will be used to populate the Deterrence Efficacy Model (Figure 1). As a hypothetical example, it may be shown through quantitative/qualitative analysis that deterrence is expected to be moderately efficacious when used by a risk averse gain maximizer government against a risk averse loss minimizer adversary. Evaluation of each actor's perception of the strategic environment throughout the conflicts will be considered as well. Analysis will attempt to reconcile any discrepancies between risk propensities 1) inferred from application of the Linnington (2004) model and 2) inferred from likelihood of certain outcomes after utilities of those possible outcomes are estimated.

5. Policy Options Analysis

After the efficacy of deterrence is determined for different actor risk profiles, the same qualitative-game theoretic analysis framework supporting the Deterrence Efficacy Model will be applied to current U.S. deterrence challenges to predict whether deterrence would be efficacious in certain situations. The strategic situation confronting the United States and in varying degrees other countries in the early twenty-first century is considerably complex. Unlike one superpower nuclear adversary, the United States confronts a mix of new or emerging hostile proliferators from North Korea in Asia to Iran in the Middle East; a network of al-Qaeda-Jihadist extremists as well as possibly other non-state actors seeking nuclear weapons or other weapons of mass destruction (WMD); and a rising China with whom conflict triggered by Taiwan may be unlikely but cannot be excluded (SAIC, 2007, p. 5). Given their development of nuclear capabilities and defiance of international sanctions, the most pressing of these challenges are North Korea and Iran. The USG must evaluate the strategic environments framing these situations and how the risk propensities and relative emphases on loss/gain of each of these challengers to the U.S. will influence the efficacy of future deterrence efforts.

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II. LITERATURE REVIEW AND ANALYSIS

In the past 50 years, much has been written on various U.S. security policies and strategies. Rational deterrence theory has received particular attention, as it has been referred to as the cornerstone of those policies (Wirtz, 2003). Also, much has been written about risk in areas such as economics, the environment, national security, and most recently, homeland security and terrorism. However, there is no rigorous literature body that applies risk analysis principles to the implementation of deterrence, nor is there literature systematically assessing the risk profiles of the U.S. government and its adversaries. Finally, there is no literature linking these two concepts; that is, discussing whether risk profiles of a government and the adversary it is attempting to deter might predict the efficacy of the deterrence strategy. Thus, broad themes in the literature pertinent to this research problem include rational deterrence and risk analysis. Rational deterrence literature focuses on concepts in the theory of rational deterrence, and aspects of its implementation. Risk analysis literature focuses on different theories of utility, or the value of a course of action to a specific actor, and briefly discusses risk propensity and relative emphases on losses or gains.

A. RATIONAL DETERRENCE: HISTORY AND PRINCIPLES

1. General Theory

Deterrence occurs when an actor discourages aggression towards another actor, with the intended outcome that the former never has to respond to aggressive action by the latter (Cronin, 2007). Further explained, this discouragement involves manipulating the opponent's assessment of his interests and seeks to prevent aggressive or otherwise undesirable outcomes by convincing the opponent that the costs of those outcomes exceed their benefits (Lebow, 1983). Most research on deterrence assumes that deterrers and the deterrees are rational actors (Berejikian, 2002). It is assumed that actors are able to recognize deterrent threats and weigh with reasonable accuracy the potential benefits and costs of a course of action (Wirtz, 2003). Therefore, the theory is referred to as rational deterrence. Achen and Snidal (1989) concur that deterrence theory requires

rationality: "Actors have exogenously given preferences and choice options, and they seek to optimize preferences in light of other actors' preferences and options" (Achen and Snidal, 1989, p. 150). It is thought that deterrence works most convincingly between known adversaries who share a common estimate of each other's hostile intentions (Moran, 2002).

The Department of Defense (DoD) Deterrence Operations Joint Operating Concept adds to these definitions by noting that deterrence can affect the adversary's decision making calculus with respect to three specific objectives: 1) denying the benefits of an adversary course of action, 2) imposing costs on that course of action, and 3) encouraging adversary restraint or manipulating the perceived consequences of an adversary *not* taking the course of action sought to be deterred (DoD, 2006). Deterrence can thus either be by denial, equivalent to denying benefits to an adversary, or by punishment, equivalent to imposing costs (Bunn, 2007).

2. Historical Significance

a. *Origins of Deterrence: Theory and Practice*

The concept of deterrence extends back to Thucydides, who wrote in *Peloponnesian War* that there were many conflicts where one army maneuvered so as to convince the opponent that beginning or escalating a war would not be worth the risk (George & Smoke, 1974). Deterrence was used throughout the Thirty Years' War, into the eighteenth and nineteenth century, failed against Napoleon's army due to its overwhelming size, and was reintroduced as part of a "balance of power" concept or "mutual deterrence" whereby nation states maintained sufficient standing armies so as to render military challenge useless (George & Smoke, 1974). Deterrence also relied heavily on alliances with other countries rather than technology (George & Smoke, 1974).

The turn of the twentieth century brought about a German-Anglo naval capability arms race wherein the Germans hoped to dissuade the British from engaging in naval warfare due to the sheer size of the German fleet (George & Smoke, 1974). Air

power became salient to deterrence around the start of World War I; the Italian Douhet introduced the concept of "countervalue targets," which became synonymous with civilian populations. The Germans bombed British cities in World War I and thus targeted what the British valued: their civilians. Thus, the British might be deterred from engaging in future combat knowing that their civilians might be an enemy target.

Contemporary deterrence theory was brought to the forefront of political and military affairs after the bombings of Hiroshima and Nagasaki in the Second World War. The use of nuclear weapons facilitated a distinction between deterrence by denial and deterrence by punishment. Heretofore, it had been extremely difficult to inflict damage on civilians without first destroying military forces (George & Smoke, 1974). However, with the advent of nuclear weapons deterrence by threat of punishment became possible: an opponent could be demoralized without any military engagement. Amassing standing armies or maintaining "mutual deterrence" and thus, deterrence by denial was arguably rendered obsolete.

b.   *World War II to 9/10/01*

After the end of World War II, the U.S. found itself lacking a link between military strategy and foreign policy until a memo was cabled from Moscow (George & Smoke, 1974). It is thought that deterrence theory has its modern intellectual roots in the "X" memo sent by George Kennan, a U.S. diplomat posted in the USSR shortly after the end of World War II. In this memo, Kennan assessed the politics of the USSR and advocated for the United States to engage the USSR "with reasonable confidence upon a policy of firm containment, designed to confront the Russians with unalterable counter-force at every point where they show signs of encroaching upon the interests of a peaceful and stable world" (Kennan, 1947, p. 581). Containment advocated action in various theaters around the world to counter the spread of Soviet communism. In effect, containment could be seen as deterrence by denial: denying the spread of Soviet influence throughout susceptible post-war nations. For nearly 50 years after the end of World War II, U.S. deterrence was focused on containing the USSR. It became increasingly popular for policymakers and in academia, and was confirmed by successful

deterrence in Berlin (between 1948 and 1961), the Taiwan Straits (1954, 1958), and in other instances where the U.S. challenged Soviet interests (Westad, 2000). These confrontations were explained in terms of the theory.

More recently, deterrence has evolved from deterring single nation-state actors such as the USSR, to deterring multiple threats (terrorism, nation states, state sponsors of terrorism). During the Cold War, the U.S. focused primarily on deterrence by threat of punishment as it balanced the Soviet threat with the threat of mutually assured destruction (MAD) (Bunn, 2007). The U.S. could not deny the Soviets their weapons; but it could assure the Soviet government that the benefits of a first strike would not outweigh the costs of retaliation; at a minimum, the U.S. would respond in kind.

3. Post-9/11 Significance

Post 9/11, more recent emphasis has been on both deterrence by punishment and deterrence by denial: denying benefits sought by the opposition (counter-proliferation efforts), and deterrence by punishment (invasion, regime change) (Bunn, 2007). However, in recent years, many national security policy scholars and practitioners have questioned whether deterrence remains a relevant, reliable and realistic national security concept in the twenty-first century (Chilton, 2009, p. 31). A 2002 RAND report asserted, "deterrence is both too limiting and too naïve to be applicable to the war on terrorism (Fisher, 2007, p. 1). The Bush administration (2001-2008) believed that deterrence was of limited effectiveness: it was less likely to succeed against states which were willing to take risks and gamble with the lives of their citizens, and ineffective against terrorism. Consequently, the Bush administration favored preemption or prevention rather than deterrence (Wirtz, 2003). Cronin (2007) points out that since 1990 the United States and the United Kingdom have both been much readier to fight wars; they are no longer "self-deterred". The wars themselves are limited wars, but the objectives are not those of limited wars. The effect has been to marginalize deterrence in the debate on strategy (p. 5).

Alternatively, many commentators and researchers maintain that deterrence remains a viable and utilizable tool in U.S. policymakers' arsenal to combat terrorism

(Fisher, 2007); it is arguably a viable tool to combat modern nation state threats. It has been suggested that deterrence theory is applicable to many of the twenty-first century threats the United States will face, but how the theory is put into practice, or "operationalized," needs to be advanced (Chilton, 2009, p. 31).

As deterrence theory is operationalized, many fine points must be considered. One insight is that a number of the "general" deterrence lessons the U.S. learned in the Cold War may, in retrospect, have been specific to the kind of deterrence relationship the U.S. had with the Soviet Union (Chilton, 2009, p. 32). For instance, the United States and the Soviet Union each recognized that in an armed conflict between them, the impact on each side's vital interests would be high and symmetrical (i.e., the survival of both nations and their respective political systems and ideologies would be at stake). Wirtz (2003) suggests that deterrence was viable against the USSR because it was perceived that attackers would have something to lose. However, in the twenty-first century, the United States could face a crisis or conflict in which our opponents perceive they have a greater interest in the outcome than does the United States. This circumstance has the potential to undermine the credibility of U.S. deterrent threats, especially if opponents have the capability to inflict harm on U.S. allies and/or interests that they believe exceeds our stake in the conflict (Chilton, 2009, p. 33).

Cronin (2007) supports the thought that many of our enemies have more at stake than we do, and will therefore play for higher stakes than we will (p. 14). There is also an asymmetry of scruple; our enemies are willing to inflict and absorb greater costs than we are. This reality forces us to revise the concept of proportionality, which is integral to the system of deterrence. Another core concept of deterrence, attribution, is also becoming problematic as a result of the growing threat of terrorism with weapons of mass destruction (Cronin, 2007, p. 14).

It follows from the observation that U.S. deterrence of the USSR was unique in that various competitors have different identities, interests, perceptions, and decision-making processes, and we may seek to deter each competitor from taking specific actions under varied circumstances (Chilton, 2009, p. 34). Thus, assessing the risk propensities

and relative emphases on loss/gain of various actors, as discussed further in the literature review of risk, is important to understand if deterrence is to be efficacious.

4. Key Deterrence Concepts

Before risk analysis can be applied to rational deterrence theory, key concepts of deterrence must be explained. Such concepts include variables in deterrence, stability, credibility, signaling, resolve and restraint, escalation, and negotiation.

a. *Decision Calculus and Variables*

Chilton (2009) elaborates on the concept of deterrence calculus: deterrence is ultimately about decisively influencing decision making. Achieving such decisive influence requires altering or reinforcing decision makers' perceptions of key factors they must weigh in deciding whether to act counter to U.S. vital interests or to exercise restraint. This "decision calculus" consists of four primary variables: the perceived 1) benefits and 2) costs of taking the action we seek to deter, and the perceived 3) benefits and 4) costs of continued restraint. Thus, successful deterrence is not solely a function of ensuring that foreign decision makers believe the costs of a given course of action will outweigh the benefits, as it is often described. Rather, such decision makers weigh the perceived benefits and costs of a given course of action *in the context of* their perception of how they will fare if they *do not* act (Chilton, 2009, p. 34).

b. *Stability*

Stability is often observed in deterrence relationships when both opponents can deliver credible threats (Berejikian, 2002). Furthermore, deterrence is believed to work most convincingly between known adversaries who share a common estimate of each other's hostile intentions (Moran, 2002). However, there are some dangers associated with stability. The first danger of stability in deterrence that if one party feels itself to be so vulnerable to a disarming pre-emptive strike by the other it might try to get its own blow in first. The second danger, the converse, is if one party believes it had so much superiority that by a first strike it could either neutralize the

other's retaliatory capability or seize an overwhelming advantage for later stages of conflict. Both perceived strength and perceived weakness are thus potentially destabilizing (Cronin, 2007).

c. Credibility and Signaling

Deterrence threats may range from credible to highly incredible (Berejikian, 2002, p. 167). Threat credibility may depend in part about the deterree's perception of the deterrer's hidden costs; the lower the deterrer's hidden costs, the more credible the threat (Berejikian, 2002, p.167). Cronin (2007) claims that "deterrence…cannot work unless both sides are convinced of the credibility of the threat" (p. 26). The importance of the credibility of government deterrence policy is emphasized again by both Bunn and Gerson. Bunn (2007) reported that "credibility has long been viewed as a key aspect of deterrence: to deter, the adversary must perceive the ally as having both the capability and the will to…impose costs or deny benefits" (p. 5), while Gerson (2007) noted that "signaling our intention to withhold force is just as important as signaling our willingness to use force because our adversaries must be sure that we will not strike them if they meet our demands" (p. 3). However, the U.S. may have lost some credibility as it tends to be self-deterred, and reveals its true intentions after bluffing the threat of force (Bunn, 2007).

Credibility of threats may be in part a function of the participants' risk profiles, more specifically risk propensity. Berejikian (2002) argues that when participants in a deterrence game are risk-averse, or less likely to take risks, deterrence threats will have greater credibility to a deterree even if the deterrer does not have the will and/or capability to actually execute the threat of aggression (p. 175). Conversely, participants which are risk-prone or willing to take risks find deterrent threats less credible, and are willing to challenge deterrence even when the costs exceed the benefits (Berejikian, 2002, p. 175).

Furthermore, the impact of ambiguity on deterrence success is likely to be a function of the target decision makers' propensity to take risks in pursuit of gains or to avoid an expected loss. Risk-averse decision makers may see ambiguity about an

enemy's response as increasing the risk associated with the action they are contemplating, thus such ambiguity tends to enhance deterrence. The deterrence impact of U.S. ambiguity about our response to an attack by a *risk-acceptant* opponent, however, might be quite different. Risk-acceptant decision makers might well interpret such ambiguity as a sign of weakness and as an opportunity to exploit rather than as a risk to be avoided. Our deterrence strategies and operations need to take our potential opponent's risk-taking propensity into account (Chilton, 2009, p. 32).

d.   Resolve and Restraint

Myerson (2007) discusses two key concepts in deterrence: resolve and restraint. To be effective, a deterrent strategy requires that a potential aggressor give credibility to the defender's policy of retaliation when that policy requires retaliation; thus resolve is important. Resolve requires that the defender make good on threats of retaliation even when aggression may be costly (p. 10). Without resolve, threats of force will have little meaning. Resolve may even require deployment of a "tripwire" or signs of aggression, to emphasize a deterrer's point (Berejikian, 2002, p. 169). Restraint is equally important: in certain situations a defender may benefit from not acting aggressively when his policy requires him not to do so. Again, this increases the credibility of deterrence. If a defender were to attack without provocation despite assurances to the contrary, future promises of withholding aggression will have low credibility and thus the defender's deterrent strategy would be ineffective (p. 10). Strategies of restraint may be accompanied by reassurance: "in some circumstances, strategies of reassurance, which attempt to reduce the incentives initiators have to use force, may be far more effective in deterrence in avoiding war" (Lebow & Stein, 1989, p. 214).

e.   Escalation and Negotiation

Escalation is an increase in conflict that changes the qualitative nature of relations between the parties in conflict (Zartman, 2005, p. 4). A participant in a conflict will either escalate in response to its own previous actions or in response to its opponent's actions (Zartman, 2005, p. 165). Whereas escalation is generally intended to

continue conflict, negotiation is the opposite strategy: intended to end conflict. However, escalation may be used as a means to bring about negotiation: by increasing the stakes, one participant may convince the other to sue for peace (Zartman, 2005, p. 166). Two variations of escalation are intransitive escalation and transitive escalation. Intransitive escalation, or threats of escalation in a conflict, may be used to influence the opponent's decision-making calculus insofar as he would reassess the cost-benefit of continuing hostilities. Thus, an opponent may be deterred from future hostilities by threats of escalation. Conversely, transitive escalation is manifested in actions (Zartman, 2005). Such actions may deter an opponent from hostilities, though because the opponent experienced the aggression rather than received a threat thereof. Finally, deterring escalation while proactively pursuing objectives that may harm an opponent's perceived vital interests poses a different, more difficult kind of deterrence challenge. As Thomas Schelling noted, such circumstances may require a deterrence strategy that pairs promises of restraint with resolve via threats of severe cost-imposition (Chilton, 2009, p. 33).

5.   Summary

In sum, while deterrence is a time tested theory and has been applied in many conflicts, there is skepticism over the usefulness of rational deterrence theory for current and future U.S. policy. Furthermore, there is no consensus over whether rational deterrence is an efficacious strategy against adversaries with certain risk profiles, despite the possibility that such characterization might identify ideal opportunities to use deterrence as a security strategy and despite the fact that most of the deterrence concepts introduced above can be shown to influence risk characteristics. This may be because the literature contains no methodological risk analysis of governments and its adversaries to support deterrence. The literature on deterrence theory is plentiful, but when it does not account for risk profiles of government and their adversaries in a systematic fashion and in context of the strategic environment of conflict, it misses opportunities to strengthen the credibility and utility of deterrence in various situations.

B.   RISK ANALYSIS PRINCIPLES AND APPLICATION

1.   General

Risk analysis and management for homeland security and national security has received particular attention in recent years. Starr (2003) gets directly to this point when he claims that in areas of public safety, comparative benefit/cost/risk analysis of all options should provide the judgmental base for decision making (p. 3). Webster defines risk as "possibility of loss, injury; someone or something that creates or suggests a hazard; the change of loss or the perils to the subject matter of an insurance contract, also, the degree of probability of such loss" ("risk," n.d.). More specifically, the Department of Homeland Security defines risk as the potential for an unwanted outcome resulting from an incident, event, or occurrence, as determined by its likelihood and the associated consequences, where likelihood is a combination of threats of attack and vulnerabilities to attack (Department of Homeland Security, 2008). Threats are natural or man-made occurrences, individuals, entities, or actions that have or indicate the potential to harm life, information, operations, the environment and/or property, and vulnerabilities are physical features or operational attributes that render an entity open to exploitation or susceptible to a given hazard (Department of Homeland Security, 2008).

The Department of Defense defines risk differently: force management risk is the challenge of sustaining personnel, infrastructure, and equipment; operational risk is the challenge of deterring or defeating near-term threats; future challenges risk is the challenge of dissuading, deterring, defeating longer-term threats; and institutional risk is the challenge of improving efficiency (Government Accountability Office, 2005). The definitions of operational and future challenges risk are more closely aligned with DHS concept of risk than are those of force management and institutional risk. DoD frames risks in terms of challenges, whereas DHS frames risks in terms of possible losses; however, since both departments are engaged in deterrence efforts, it is proposed that these ideas may be integrated thusly into a joint vision of deterrence risk: "Deterrence risk analysis and management is interpreting the different attitudes towards risk of both the U.S. and various near and long term threats to the U.S., analyzing potential losses

which these threats could inflict, and managing the challenges associated with deterring, dissuading, and/or defeating these threats to avoid the potential losses."

To the extent that this definition is appropriate, application of deterrence strategies requires assessment of the U.S. and its adversary's respective risk profiles. If an adversary is willing to accept certain consequences and understands the likelihood that those consequences will occur, it may influence that adversary's decision making process. Risk propensity and relative emphasis on loss or gain are two aspects of risk pertinent to deterrence. Often the discussion of these two aspects of risk is framed using the subject of utility: the value or worth of a course of action. Two theories of utility arise in the literature: subjective expected utility and prospect utility.

2. Utility

a. *Subjective Expected Utility (SEU)*

Subjective expected utility (SEU) is the value to an actor of the consequences of a course of action, which is then modified by a subjective expected probability of that outcome occurring (Karni, 2005).

$$\text{SEU} = p(u), \text{ where } p = \text{subjective probability, } u = \text{subjective utility (Eq. 1)}$$

Theories of rational choice assume that actors maximize expected utility and that SEU will vary depending on actors' risk propensity and relative emphasis on loss or gain (Lebow & Stein, 1989). Consistent with this, rational deterrence theory can be interpreted as though actors are seeking to maximize their SEU (Jervis, 1989). Therefore, rational deterrence theory must account for different risk propensities and relative emphases on loss/gain because rational deterrence theory is a rational choice theory. Indeed, Lebow and Stein (1989) argue that the risk propensity of challengers and their relative weighting of loss and gain are empirical questions that can be answered by careful historical research (p. 211). Relating SEU to the Department of Homeland Security (DHS) security risk equation,

$$\text{Risk} = \text{Threat x Vulnerability x Consequence (Eq. 2)}$$

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where risk is the expected loss, threat is the probability an adversary will attack, vulnerability is the probability the attack will succeed, and consequence is the outcome of the attack (Department of Homeland Security, 2008). SEU may be thought of as a risk or expected loss, where the subjective probability equates to Threat x Vulnerability, and the subjective utility equates to Consequence. When Equation 2 is combined with Equation 1, the following is produced:

$$\text{SEU (or Risk)} = p \text{ (or Threat x Vulnerability)} \times u \text{ (or Consequence) (Eq. 3)}$$

This relates SEU to the standard DHS risk calculation methodology and suggests that study of utility is similar to analyzing risk.

With SEU, the subjective utility of a course of action is relative to a net asset position (Berejikian, 2002). Preferences are assumed to be consistent. SEU assumes that an actor does not prefer a course of action because of its utility; rather that course of action has utility because the actor prefers it (Davis, 1983). Furthermore, preferences among courses of action are determined by at least two separate factors: 1) strength of preference for the consequences under certainty, and 2) attitude toward risk (Schoemaker, 1982). The former may be construed as relative emphasis on loss or gain, and the latter reflects risk propensity when outcomes are not necessarily certain.

While SEU has been accepted as a standard utility model for many years, Jervis (1989) claimed that if SEU theories are to be further developed, they must account for consistency of behavior and individual psychology (p. 207). Prospect utility theory attempts to account for such factors.

b. *Prospect Utility (PU)*

Prospect utility (PU) takes a slightly different approach than SEU: the values of outcomes are not relative to a net asset position. Instead, they are relative to a neutral reference point (Berejikian, 2002). See Figure 5 for a depiction of the prospect utility value function.
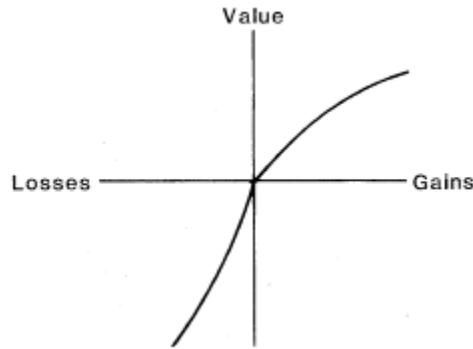
Figure 5.   Value function for prospect theory (From Tversky, 1981, p. 454)

In this depiction, the intersection of the x and y-axes represents where the player neither gains nor loses, and thus there is no utility or value to a course of action. This intersection is a reference point. The different curvatures on opposite sides of the y-axis suggest that players operating in the domain of losses associate more value with a certain decrease in losses than players operating in the domain of gains associate with a comparable increase in gains. This can be expressed:

$$\textbf{Value}_{\textbf{domain of loss}} \textbf{ of Delta (losses)} > \textbf{Value}_{\textbf{domain of gain}} \textbf{ of Delta (gains) (Eq. 4)}$$
$$\textbf{where Delta (losses) = Delta (gains)}$$

Prospect theory suggests that it is logical to assume that the actor, if operating in the domain of losses, will take higher risks to return to the reference point than those operating in the domain of gains will take to ensure comparable gains. Thus, those operating in the domain of losses are risk prone, and those operating in the domain of gains are risk averse. This is reflected by the nonlinearity in Figure 5, which contrasts with implied linearity of the gain-loss relationship posited by SEU, and is and is also reflected by the equation:

$$\textbf{PU = (decision weight) (p) (u) (Eq. 5)}^{3}$$

---

3 The decision weight is a function of probability (p), which modifies the utility (u), adding non-linearity to the Prospect Utility function.

In addition to accounting for risk propensity and relative emphasis on loss/gain as SEU requires, analysis of utility per prospect theory requires consideration of actor's biases given their past experiences (Berejikian, 2002). These considerations may support formulation of the "decision weight" in Equation 5 above. This is supported by Lieberman (1995) who argues that challengers learn from past defeats wherein they did not show sufficient resolve, and thus believe they should adopt more resolve in future crises (p. 30). Indeed, Tversky's (1981) discussion of PU as an alternative to SEU proposes that "another property of the value function is that the response to losses is more extreme than the response to gains" (p. 454). Berejikian (2002) also reflects this belief when he proposes that a "state's motivation will be explained by its level of risk acceptance" and that losses have a greater subjective effect than an equivalent gain (p. 168). Given this, Lebow and Stein's (1989) claim that the true challengers to deterrence are risk prone loss minimizers would make sense (p. 210). If loss influences decision making more than proportional gain, this would play to the decision-making process of those who want to minimize loss, who would then take more risk in challenging the deterrer to return to a reference point. However, a difference of opinion is suggested by Schkade (2002) who believes "loss aversion may not reflect an accurate anticipation of the experienced utility of gains and losses" (p. 70). Additionally, Juliusson (2003) poses an interesting point. The concept of sunk cost, or the costs incurred from a failing enterprise, is thought to be considered more heavily by loss minimizers than gain maximizers. Thus it does not seem loss aversion domains desire for gain in this case. People may thus fail to ignore prior investments because they are mo remotivated to pursuit the goal to minimize losses than to maximize gains (Juliusson, 2003). However, some experimental data demonstrated that sunk cost more often factored into a decision whether to continue with that enterprise in a "gain frame" wherein a player is expected to gain. In contrast, sunk cost was factored into fewer decisions as to whether to continue with such a failing enterprise when in a "loss frame" wherein the same player is expected to lose (Juliusson, 2003).

These authors put the risk prone versus risk averse dynamic in context of gains and losses, which may prove helpful to this analysis' specific focus on risk

propensity and relative emphasis on loss/gain. The specific focus of risk analysis for this research is proposed by Lebow and Stein (1989): determining risk propensity, or whether an actor is risk-prone or risk-averse; and determining relative emphasis on loss or gain, or whether an actor prefers to maximize gains or minimize losses.

Overall, the literature on this specific aspect of risk analysis shows that different actors determine utility and risks differently. However, there is no general consensus on whether preference for minimizing losses is more prevalent than is preference for gain maximizing in decision making. This suggests that prospect utility is not fully justified as an acceptable substitute for subjective expected utility, even though some recent literature has promoted the validity of the former over the latter: PU is purportedly the "leading alternative to expected utility as a theory of choice under conditions of risk" (Berejikian, 2002). The literature also misses a potentially useful application of these utility analyses: how these different utility and risk interpretations may influence decision making processes of the U.S. and its adversaries, and the extent to which they influence the efficacy of deterrence. Risk propensity and relative emphasis on loss/gain of different actors may be interpreted differently depending on which theory of utility is used, but first the concepts of risk propensity and relative emphasis on loss/gain must be elucidated.

3.   Risk Propensity and Domain

McDermott (1998) defines risk propensity as "being either risk seeking or risk averse" (p. 36). Risk propensity can be framed in terms of subjective expected utility (SEU) or prospect utility (PU). Schoemaker (1982) claims that a central tenet of SEU theory is that if a gamble is less (or more) preferred than its expected monetary value for sure, the preference for such a gamble is said to reflect risk aversion (or risk-seeking) (p. 533). The implication here is that the actor's risk propensity (preference and thus tolerance for uncertainty) is a function of the both 1) the probability that gamble equaling or exceeding the expected sure value, and also of 2) the actor's ultimate actions. To explain, if there is low probability that a gamble will equal or exceed its expected value, the actor is risk averse if he avoids it; but he is risk prone if he takes it. Similarly, if there

is a high probability that a gamble will equal or exceed its expected value, the actor is highly risk averse if he does not take it; but it is difficult to assess risk propensity if he does take it, a limitation of this approach.

In contrast to SEU, when making a decision under prospect theory, actors go through two phases: the editing phase and the evaluation phase (Linnington, 2004). In the editing phase, the actor identifies available courses of action and consequences of those actions, and determines whether the consequences would place them in the domain of gains or domain of losses relative to a reference point (Linnington, 2004, p. 17). One view on risk propensity is that it is a function of the actor's domain; domain is whether an action takes place from a frame of gains or from a frame of losses (McDermott, 1998, p. 37). In the Linnington model of risk propensity (Figure 3), domain is defined thusly: "the state in which the actor resides, that of losses or gains. If the actor feels he is in a position of relative strength, he is in the domain of gains, and conversely, if his position is weak, he is in the domain of losses" (Linnington, 2004, p. 16).

In the evaluation phase, a decision maker selects a course of action to produce the outcome with the highest expected utility, based on a value function (comparable to the decision weighting function in Equation 5). The value function in prospect theory means that utility will be underweighted in the domain of gains because there is little incentive to move from the status quo (risk aversion); conversely, utility is overweighted in the domain of losses because there is much incentive to achieve a better status quo and return to a stable reference point (risk proneness). The value function and weighting function thus both consider risk propensity (Linnington, 2004). In other words, in the domain of gains where one is risk averse, consequences have less subjective utility than do those in the domain of losses where one is risk prone. Consistent with prospect theory, the Linnington model seems to suggest that those operating in the "domain of losses" or from a position of weakness will engage in riskier actions (conventional military options and unconventional warfare) to return to the risk-neutral reference point between diplomatic measures and political/military intervention. Conversely, those operating in the "domain of gains" or a position of strength will engage in less risky actions (no action, economic sanctions) to continue to maximize gains. Huth et al. (1993) offer some insight into risk

propensity: it "reflects the fact that different individuals may choose differently because of their attitudes toward options with probabilistic outcomes. For example, assume that there are two alternatives with the same expected value. A risk-acceptant actor will prefer the alternative with a high payoff but a low probability of receiving that payoff, whereas a risk- averse actor will prefer to receive a lower payoff with a higher level of certainty" (p. 610).

Linnington and McDermott both concur that prospect theory predicts that decision makers are risk prone or acceptant when in the domain of losses and risk averse when in the domain of gains. However, both domain and risk propensity must be examined on a case-by-case basis due to their inherent subjectivity (McDermott, 1998, pp. 37–38). Risk propensity of various actors who choose one course of action from among many may be evaluated relative to the other available courses of action (McDermott, 1998, p. 42). It is also thought that risk propensity of an actor may change depending on how the expected outcomes changes relative to a reference point (Farnham, 1995, p. 38). For example, if outcomes will put an actor in the domain of losses, whereas they were in the domain of gains prior, their risk propensity will predictably change from risk-aversion to risk-proneness.

Given this research and analysis, it is posited that risk propensity may be estimated from 1) evidence of actors' domain (historical and current strategic environment) with initial input from the Linnington (2004) model; 2) case study evidence of the likelihood of certain outcomes which had different utilities to the actor (e.g., reflected actor preferences or dislikes); and 3) the actors' ultimate actions during confrontations.

4.   Relative Emphasis on Loss or Gain

The Linnington model does not allow differentiation between the two different options for relative emphasis on loss or gain, as Lebow (1989) suggests analysis of deterrence should do. The model does not suggest what each actor actually emphasizes: loss or gain? If an actor is in the domain of losses, or a weak position, this does not mean that actor prefers to focus on losses rather than gains; it simply means that is the position

in which they find themselves due to circumstances. Also, Tversky (1981) suggests that domain only predicts risk propensity; there is no discussion of relative emphasis on loss/gain.

There is some literature that approximates the concept of relative emphases on loss/gain. Rather than defining this core concept, Houghton (2009) offers a partially satisfactory explanation which examines one possible permutation of risk propensity and relative emphasis on loss/gain. Per Houghton, risk-prone gain maximizers are those who "attempt to expand their territory at the expense of others, but they will be constrained from doing so when the costs outweigh the benefits" (p. 227). There are two possible ways to interpret this assertion and each interpretation leads to similar tentative conclusions, although one is less satisfying than the other. The first interpretation has two parts: that 1) expanding one's territory at the expense of others is an aggressive action and thus reflects risk proneness (per Linnington, this action might fall in the domain of losses under political-military actions), and that 2) emphasis on gain maximization is a function of the probability that benefit realized from territorial expansion will exceed any costs. It cannot be known with certainty whether costs of a certain course of action will exceed benefits; thus probability must be considered. Thus one tentative conclusion of this interpretation is that relative emphasis on loss/gain is in a part a function of the probability of favorable utility. However, part 1) is problematic because aggressive actions are not necessarily risky if the probability that costs will outweigh benefits is low. Thus it is difficult to justify how aggressive actions (e.g., territorial expansion) by themselves constitute a measure of actor risk propensity. This is one challenge with the Linnington scale. Also, part 2) implies that emphasis on loss or gain is conditional upon probability of favorable utility; however, Davis (1983) argues that choices have utility because an actor prefers them; they are not preferred because they have utility. In other words, utility is the dependent variable; however Houghton presents it as an independent variable (albeit modified by probability). Thus this interpretation is not completely satisfactory, although it does at least acknowledge that cost-benefit analysis is salient.

The alternative interpretation of Houghton's example actually contributes more to the discussion of risk propensity rather than relative emphasis on loss/gain. This

interpretation posits that expansion of territory is an attempt to maximize gains, which reflects the utility of that action and hence the preferences of the aggressor. Presumably territorial expansion will create benefits which outweigh the costs of expansion and thus have some utility a gain maximizing aggressor. However, in order for the aggressor to qualify as risk prone, there must be a high probability that the costs of territorial expansion will exceed the benefits. Thus one tentative conclusion that can be drawn from this analysis is that risk propensity is in part a function of the probability of favorable utility. This supports the earlier Linnington assertion of the evaluation phase of decision making. Houghton does not explicitly discuss probabilities; thus in either interpretation his explanation of the risk prone gain maximizer permutation is incomplete.

Given the challenges with conclusively defining relative emphasis on loss/gain from the Houghton work, more research must be analyzed. Some researchers discuss "loss minimization" and "gain maximization" in terms of decisions to continue/escalate or discontinue/deescalate a course of action. For example, Karlsson (2002) proposes that those who minimize loss are more prone to escalate or continue with a certain course of action whereas those who maximize gains are less so (p. 311). This explanation aligns with domain of loss/gain as presented in Linnington (2004) and Tversky (1981). Taliaferro (1997) concurs: "aversion to perceived losses will cause perseverance in peripheral wars for longer than a standard cost-benefit analysis would suggest" (p. 7). Ergo, those actors in the domain of losses are risk prone and are likely to escalate, whereas those in the domain of gains are risk averse and thus avoid escalation. Unlike the Linnington model, this explanation suggests that the domains of gain/loss correlate to actor preferences because Karlsson's language emphasizes a predilection for action and decision making (e.g., the language "prone to ... "). Therefore, it is hypothesized that a characteristic of actors who emphasize loss (minimization) is that they tend to continue/escalate a conflict; whereas a characteristic of actors who emphasize gain (maximization) is that they tend to maintain the status quo or even de-escalate.

Given these various individually incomplete concepts of relative emphasis on loss/gain, it is posited that relative emphasis on loss/gain may be estimated from 1) evidence that an actor analyzed costs and benefits of certain courses of action (COAs)

during a confrontation and what the results of that analysis were; and 2) the decisions made in response to such analyses, with particular attention to evidence of escalation or status quo maintenance/de-escalation throughout such confrontations. The rational process of decision making implies the performance of a cost/benefit assessment, which provides an insight to the likely consequences of a proposed action (Starr, 2003).

5.   Applicability of Risk Analysis to Rational Deterrence

While there is an abundance of literature analyzing rational deterrence theory as basis for U.S. security strategies, one work which notionally incorporates risk analysis with rational deterrence is Lebow and Stein's *Rational Deterrence Theory: I Think, Therefore I Deter* (1989). These authors posit that utility can be calculated differently by different rational actors; consequently, deterrence theory must account for various manifestations of utility calculation. Given today's multiple nation state threats, it may be more difficult to ascertain the internal issues and motivations of U.S. adversaries than during the Cold War when the U.S. was engaged in analysis of the Soviet motives and risk attitudes, and thus of Soviet decision making calculus.

In their paper, Lebow and Stein (1989) claim that deterrence theory assumes challengers to deterrence demonstrate only one specific combination of risk propensity and relative emphasis on loss or gain: they are gain maximizing risk prone actors. However, this assumption ignores the other three permutations of risk propensity and relative emphasis on loss/gain: that challengers are risk prone loss minimizers, risk averse gain maximizers, or risk averse loss minimizers. Thus, it is suggested that such an assumption may not account for the fact that adversaries with different values and means-ends beliefs will arrive at different conclusions for action, and, as Cronin (2007) claimed, may be willing to absorb greater costs than we are, though such adversaries arrived logically at those conclusions. George and Smoke (1974) concur: "the assumption that the opponent's approach to risk calculation and risk acceptance is the same as one's own will lead to possible serious miscalculations of his intentions" (p. 489). Given the historical use of deterrence against nation-states, examples may show that significant challenges to deterrence resulted when the challenger was other than a risk prone gain maximizer. For

example, Khrushchev may have been a risk prone loss minimizer (Lebow & Stein, 1989); yet he severely tested U.S. deterrence during the Cold War.

The literature suggests risk analysis may be more rigorously applied to rational deterrence, expanding on Lebow and Stein's (1989) notional idea. The strategic environment in which two adversaries find themselves may be an important consideration for predicting the outcome of the deterrence policy used in that conflict. It is possible that the strategic environment may influence relative emphases on loss/gain, or at a minimum, influence the domain of loss or gain in which an actor finds itself. The concept of strategic environment is similar to the concept of domain of loss/gain proposed by Linnington (2004). Moreover, the strategic environment requires knowledge of the organization's competitiveness, threats to the organization's success, and the organization's competitors (Michelson et al., n.d.) Other researchers agree; Jervis (1989) suggests the external environment is paramount in foreign policy and security decision making (p. 204). Lieberman (1995) supports this view that the strategic environment is salient: he champions evaluating individual deterrence case studies in strategic context and advocated for analysis of opponent capabilities and interests. Lieberman emphasized the difference between intrinsic and strategic interests, the example being that someone fighting for land believed to be part of their natural homeland would have an intrinsic interest, whereas someone fighting for that land to simply gain additional resources would have a strategic interest. Similarly, in his Soviet containment strategy, George Kennan separated what he termed vital and peripheral interests. In the case of vital interests, he considered war to be acceptable (Aggour, 2008).

Finally, Berejikian (2002) supports this view as well, claiming that a state's assessment of the status quo is an empirical question and documenting the context of a confrontation requires evidence of the state's actual conditions and a reconstruction of decision maker perceptions (p. 173). For example, if the U.S. has the strategic advantage in terms of nuclear capability, an adversary would have to account for their own disadvantage during any cost/benefit analysis. However, it has been suggested that Western thinking about nuclear strategy in the twenty-first century is misguided because it wrongly assumes that the strategic advantage of the West enables it to deter aggression

(Cronin, 2007). Cronin elaborates further: the overarching assumption of operational concepts like the revolution in military affairs and network-centric warfare is that technology shapes strategy; that friction has been removed from the battlefield; and that the possession of superiority in weapons systems will deliver success (Cronin, 2007, p. 5). However, as far back as 1967, Russett predicted that military superiority was not a sufficient condition for deterrence on its face (p. 92). Consistent with the line of reasoning thus far in this literature review/analysis, if adversary risk propensities and relative emphases on loss/gain are not considered when evaluating the costs/benefits of military capability, one with superior capability may overestimate the efficacy of that capability against the adversary. Thus, high level assessment of the strategic environment may not be sufficient on its own to predict the efficacy of deterrence. Further, adversary capability and will to challenge the U.S. may be a function of the strategic environment; conversely, the environment may be a product of adversary capability and will to challenge the U.S. An example of the latter is that with the impending expiration of START (Strategic Arms Reduction Treaty) in December 2009, the USSR may have no impetus to continue reducing nuclear stockpiles and may in fact increase their warhead count, shifting the strategic balance and raising the stakes in nuclear deterrence.

As previously discussed, risk profiles can be framed in terms of utility, or the worth of a goal or desired end state. Recent literature suggests that different actors calculate utility differently based on their risk profiles, thus deterrence policies may need to be tailored based on the values, perceptions, and risk preferences of our adversaries (Bunn, 2007). A strategy of deterrence against current threats must also account for the ways in which the adversary leadership assesses the nature of its environment as it attempts to fulfill its goals (Bar, 2008). Taken together, these points suggest that an analysis of oneself and one's adversary should be done to produce rigorous risk profiles which would suggest the extent to which deterrence would be effective in a confrontation between the two. This analysis should account for both a "macro view" of the strategic environment, and a "micro view" of risk profiles. For example, the U.S. might assess that its adversary has less capability and will to attack than itself, and that the adversary has minimal support from

allies, whereas the U.S. has a lot. Therefore, the benefits to the U.S. of deterrence are high and those to the adversary are low, and the costs to the U.S. of that same action are low and those to the adversary are high. This would suggest deterrence would be effective against this adversary as deterrence attempts to convince the adversary that costs of aggression exceed rewards. Such analysis uses subjective expected utility as the standard for utility; however, analysis on the basis of prospect utility might yield different results.

Moreover, historical case studies may demonstrate whether different adversaries challenged U.S. deterrence regardless of the balance of costs and benefits, therefore suggesting variable adversary risk propensity and relative emphasis on loss versus gain. The costs to an adversary may not be as significant as those same costs would be to the U.S.; this may reflect different preferences and tolerance for risk. This notion is supported by Cronin (2007), who claims that our enemies are willing to absorb greater costs than we are (p. 14). An attacker would also have to be risk prone to challenge a defender if the costs exceeded the benefits to that attacker and the probability of the outcome resulting in conferment of such excessive costs was high. Thus, it is possible that our enemies are often risk prone. Furthermore, Berejikian (2002) has championed prospect theory as a foundation for deterrence theory which reflects "laboratory evidence suggesting decision makers systematically violate the strict behavioral expectations of rationality." Berejikian also claims that research on decision making shows decisions reflect learning and personal biases in addition to calculated costs/benefits (p. 166). Thus, if a decision maker considers history and how the outcomes of different conflicts were shaped, and those outcomes often did not favor the decision maker, that knowledge would be a consideration in the decision maker's calculus during present and future crises. The decision maker learns from his experiences, and his preferences may change, possibly skewing the linear cost benefit calculation of subjective expected utility (Jervis, 1989, p. 206). These points seem consistent with the notion of different risk profiles proposed by Lebow and Stein (1989). Even when a cost/benefit analysis is performed given these criteria, deterrence may not be efficacious because different actors calculate utility and risk differently. Jervis (1989) emphasizes this thusly: if each person is rational, but has different values and means-ends beliefs, then behavior will be idiosyncratic. Finally, this line of thought suggests prospect

theory may be more revealing than subjective expected utility in influencing deterrence. A framework for evaluating the strategic environment and the risk profiles of different actors to predict the efficacy of deterrence must therefore account for both utility theories, considering what Berejikian (2002) asserted: "research on cognition and decision-making demonstrates that individual choices are as much a function of consistent heuristics and biases as they are the result of calculated costs and benefits" (p. 166).

6. Quantitative Risk Analysis: Game Theory

a. General

A game theoretic approach to case study analysis can show that deterrence may be more efficacious when adversaries have certain risk profiles. Game theory is an analytical model designed to help understand phenomena observed when decision makers interact. It treats decision makers as "players" participating in a "game" or controlled interaction with certain rules and assumptions (Osborne, 1994). Two of these assumptions are that decision makers are rational and that they simultaneously account for their opponents' anticipated behavior when choosing a course of action. Game theory has been claimed to be an appropriate tool for studying the strategic interaction between governments and terrorists (Sandler & Arce, 2003). Some fundamentals of game theory and classic games that illustrate those fundamentals are discussed in the following sections.

b. Payoffs

Game theory assigns an expected "payoff" value to each player given certain courses of action. A payoff is the subjective value of the outcome of a course of action. It is assumed that each player wants to maximize his own payoff (Myerson, 2007). Outside the context of game theory, the highest payoffs to one player would generally justify the preferred strategy for that player. However, in game theory the highest possible payoff to each player may not be the outcome of the game. This is because each individual payoff does not account for the assumption that the other player in the game wants to maximize his own advantage and/or minimize their opponent's

advantage. Thus, the outcome of a game may mean that each player has a payoff which may be less than that which they could gain without the influence of their opponent.

c.   *Zero-Sum Games*

Games may be zero-sum, wherein one player's gain V is their opponent's loss–V for every possible outcome, or they may be non-zero sum, where this condition does not necessarily hold for each possible outcome in the game. Games may be played among two or more participants (players), and must have at minimum either a pure strategy Nash Equilibrium or a mixed strategy Nash equilibrium (explained later) as long as they are finite and non-cooperative games (Ordeshook, 1986).[4] Figure 6 is an example of a zero-sum game, whereas Figure 7 is an example of a non-zero-sum game.

		B's platform		
		Favor X	*Favor Y*	*Dodge issue*
	Favor X	45%	50%	40%
A's platform	Favor Y	60%	55%	50%
	Dodge issue	45%	55%	40%

Figure 6.   Zero-sum game (From Davis, 1983, p. 16)

In Figure 6, A and B represent players in a voting game. A and B are political party leaders faced with three possible strategies for their election platform: favoring state X's position over a conflict with state Y, favoring state Y's position, or abstaining (dodge issue). The payoff values are expressed in percentages and reflect those of A; since this is a zero-sum game, B's payoff values for each outcome = 1-A's outcomes. For example, if A favors X and B also favors X, A's payoff shown above is

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4 Finite games are games wherein the players have finite courses of action to choose from, and non-cooperative means that there are no third-party enforcement of contracts: any agreement the players make among themselves must be self enforcing.

45%, and B's payoff is thus 1-45% = 55%. To solve this game, it must be found which strategy yields the best payoff to player A given player B's intention to minimize A's advantage. In zero-sum games, this also means B will try to maximize his advantage. The Nash equilibrium solution is that A favors Y and B abstains, thus resulting in a 50% vote to A and a 50% vote to B. Neither candidate may unilaterally benefit (i.e., change strategy and hope to improve their standing without their opponent also changing strategy) if the equilibrium outcome is A favoring Y and B abstaining.

d. *Nash Equilibrium*

If in a two person game: 1) an attacker takes a course of action representing their best possible outcome given the opponent's (defender) intention to also achieve their own best possible outcome, 2) the defender takes a course of action which would result in their best possible outcome given the attacker's intention to also achieve their own best possible outcome, and 3) these outcomes occur simultaneously, the result of the game is the Nash equilibrium. The Nash equilibrium means that no one player may unilaterally benefit and thus would not be tempted to change strategy; it is a stable outcome (Davis, 1983). However, not all games have a pure strategy Nash equilibrium. In games with pure equilibria, a pure strategy may be used to obtain the value of the game with *certainty*; however, in games without pure equilibria, a mixed strategy must be to obtain the value of the game *on average* (Davis, 1983). Pure equilibria may exist in either zero-sum or non-zero-sum games.

e. *Minimax Theorem (Solving a Two-Person, Zero-Sum Game)*

The minimax theorem, proposed by Von Neumann, states that all 2-person, zero-sum games can be treated as though they have pure equilibrium points. There is a value V in game, such that player A will not settle for anything less than V. Also, A's opponent B can prevent A from getting a higher payoff than V. B is motivated to limit A's attainment of V because in zero-sum games, A's gain is B's equivalent loss (Davis, 1983).

In zero-sum games, player A assumes B wants to minimize A's gain. Also, A wants to maximize his own gain. Therefore, the "minimax" value for A is the value which is both lowest in its row (satisfying B) and highest in its column (satisfying A). Comparable procedures must be followed by player B. Player B assumes player A wants to minimize B's maximum gain. Also, B wants maximize own gain. Therefore, the "maximin" value for B is the value which is both highest in the row (satisfying B) and lowest in the column (satisfying A). If these two values are in the same quadrant in a 2-person, zero-sum game, that quadrant is the pure strategy Nash equilibrium and thus the game solution. Returning to Figure 6 above, the minimax for A was 50% (favor Y) because it was lowest in its row and highest in its column; the maximin for A was 50% (abstain) because it was highest in its row and lowest in its column.

In Figure 6, the minimax solution is also the Nash equilibrium; however, this is only a coincidence. The minimax theorem cannot be applied to non-zero sum games with the same confidence that it will result in a Nash equilibrium as it can be to zero-sum games. This can be seen in the game Battle of the Sexes (see Figure 9). In this game, a search for a minimax results in none; however, pure Nash equilibria do exist.

f.   *Non-Zero-Sum Game with Pure Strategy Nash Equilibria*

As an example of a non-zero game with a pure strategy equilibrium, consider the Prisoner's Dilemma, a classic illustration of how a pure strategy Nash equilibrium solution is derived.

		Prisoner B	
		Silence	*Betrayal*
Prisoner A	Silence	(1/2 , *1/2*)	(10 , *0*)
	Betrayal	(0 , *10*)	(5 , 5)

Figure 7.   Prisoner's Dilemma (After Davis, 1983, p. 109)

In this game, two prisoners are locked in separate cells for a suspected crime. They have no way to communicate with each other. If they both stay silent, they

will each receive a 6-month sentence. If one stays silent but the other betrays his silent accomplice, the silent prisoner will receive a 10-year sentence, while the betrayer will be set free. If they both betray each other, each will receive a 5-year sentence.

The optimal outcome for the game would be for each to stay silent and thus unintentionally cooperate. The best outcome for each individual prisoner without their opponent's influence would be for them to betray the other who remains silent. However, the dilemma is that neither can be sure that if they unilaterally remain silent, their accomplice will not also betray them. Therefore, each is tempted to betray with the hope that their accomplice will stay silent and thus, they as the betrayer, will go free. If both act on this hope, then the outcome is that both receive 5-year sentences. Each prisoner is tempted to maximize their own self-interest by betraying the other, but by both doing so, they actually end up worse off than if they had both stayed silent. Thus, the Nash equilibrium solution is that both remain silent (5, *5*): in order to benefit from changing this course of action (by remaining silent), the opponent must change his course of action as well (also remain silent). Neither prisoner can unilaterally benefit from a departure from the equilibrium solution. For this reason, without communication with their accomplice, neither is tempted to (Davis, 1983).

g. *Games with Mixed Strategy Nash Equilibria*

Both zero-sum and non-zero sum games may have mixed strategy Nash equilibria, although they are less reliable in non-zero sum games because they assume players are playing to maximize their own advantage, not necessarily minimize their opponent's advantage as in zero-sum games (Davis, 1983; Brams, 2004). A strategy that prescribes the selection of a pure strategy by means of a random device is a mixed strategy (Davis, 1983). In other words, if a strategy is chosen a certain percentage of the time, it will yield the value of the game on average. A mixed strategy may be used when no pure strategy is an option, or it may be used to solve games wherein multiple pure strategy equilibria exist.

Mixed strategies are chosen so that one will give the same average payoff regardless of what the opponent's course of action is (Davis, 1983). Figure 8 is a hypothetical zero-sum game with no pure strategy equilibrium:

		Your Opponent	
		C	D
You	A	15	10
	B	5	20

Figure 8.   Hypothetical Zero-Sum Game with no pure strategy Nash Equilibrium (After Davis, 1983, p. 40).

Assume you play strategy A with probability p, and you play strategy B with probability 1-p. Similarly, assume your opponent plays strategy C with probability q, and plays strategy D with probability 1-q. Your average payoff if your opponent plays C should equal your average payoff if your opponent plays D. Similarly, your opponent's average payoff should be the same whether you choose option A or B. Thus, some algebra concludes that you should play strategy A 75% of the time and play B 25% of the time; your opponent should play strategy C 50% of the time and play D 50% of the time.

The payoff for you and your opponent is now 12.5 each. If you chose a pure strategy of always playing A, and your opponent plays D, you get 10, which is less than 12.5. Similarly, if you play a pure strategy of B, and your opponent plays C, you get 5 which is also less than 12.5. If in the former case your opponent played C, you would do better than 12.5, and in the latter case your opponent played D, you would also do better than 12.5. Since your ability to gain the maximum payoff depends on your opponent's strategy, and if they choose some strategies you will actually end up with your worst possible outcome, you are better off in the long run using a mixed strategy because then it does not matter which course of action your opponent takes.

h.   Games with Multiple Pure Strategy Nash Equilibria which Must be Solved by Mixed Strategies

Consider the Battle of the Sexes, a classic illustration of how a mixed strategy Nash equilibrium solution must be derived to solve a game with multiple pure strategy equilibria.

		Husband	
		Fights	Ballet
Wife	Fights	(2 , 3)	(1 , 1)
	Ballet	(1 , 1)	(3 , 2)

Figure 9.   Battle of the Sexes

In this case, the payoffs reflect the players' preferences. Each gains maximum utility from going to their preferred event (wife prefers ballet, husband prefers fights) when they are also accompanied by their spouse. The wife would prefer going to the fights with her husband more than she would prefer going alone to the ballet. Similarly, the husband would prefer going to the ballet with his wife more than he would prefer going alone to the fights. Thus, there are two pure Nash equilibria: (fights, fights), and (ballet, ballet). Neither husband nor wife has any incentive to deviate from these two outcomes. However, the game does not have a solution because it does not know which equilibrium would occur, and the game must thus be solved by a mixed strategy. If the wife advocates attending fights p% of the time and attending the ballet (1-p)% of the time, whereas the husband advocates attending the fights q% of the time and attending the ballet (1-q)% of the time, their strategies are:

$$p = 2/3$$
$$1\text{-} p = 1/3$$
$$q = 1/3$$
$$1 - q = 2/3$$

Thus, the wife should advocate attending the fights 2/3 of the time, and advocate attending the ballet 1/3 of the time. The husband should advocate attending the fights 1/3 of the time, and advocate attending the ballet 2/3 of the time. The average

payoff for both is 5/3, which is a better outcome than if they attend separate events. Each could do better by picking their preferred event, but then there are still two solutions possible. If the wife takes a pure strategy and always advocates her greater preference (the ballet), but her husband wants to go to the fights instead, she risks a lower payoff than if she advocated her lesser preference or if she played a mixed strategy of choosing the ballet less than 50% of the time. She would grudgingly accompany her husband to the fights, but at least would gain some enjoyment from being with her husband, whereas if she went the ballet alone, she would enjoy it less. By using a mixed strategy, the wife may ensure that on average, she receives the value of the game. The wife's average payoff is 1 for choosing Fight 2/3, and it is 2/3 for choosing Ballet 1/3 of the time (2/3 + 1 = 5/3, the average total game payoff for wife and for husband).

7. Berejikian Approach to Domain of Gains/Losses and Examples of Deterrence Games

Berejikian (2002) discusses the efficacy of deterrence dependent upon framing (domain of loss or domain of gains). He asserts that prospect theory and domain framing can explain why deterrence succeeds and fails. The traditional depiction of a deterrence game (which relies upon traditional subjective expected utility models) suggests that deterrence should not work, but history demonstrates that it does work (p. 168). Berejikian claims that deterrence theory modeled upon SEU does not explain how challengers with inferior capabilities are nonetheless undeterred and fight superior defenders. He then suggests that an explanation is that dissatisfaction with the status quo (implying strategic environment or domain of loss) offsets 'perceptions of insufficient capability' (p. 169). Thus, inferior challengers who are highly dissatisfied with their environment and thus in a losses frame (domain of loss), will still challenge deterrence, but traditional deterrence does not predict/explain this.

Berejikian summarizes: "deterrence is more likely to be effective when both states are in a gains frame, and less likely to be effective when one or both are in a losses frame" (p. 173). He then presents analysis using 2 by 2 non-zero sum deterrence games to show different payoffs and different outcomes (deterrence is or is not successful) when

the competitors are in different frames. This is consistent with the earlier assertion that the strategic environment influences the efficacy of deterrence.

In Figure 10, a slight variation on one of Berejikian's rational deterrence games is presented.

		Adversary	
		Cooperate (accept status quo)	Defect (challenge status quo)
U.S. (Status quo state)	Cooperate (enjoy status quo)	(3 , *-1*)	(-1 , *2*)
	Defect (deter adversary)	(4 , *-2*)	(-2 , *-3*)

Figure 10.   Unilateral Deterrence (After Berejikian, 2002, p. 177)

In Figure 10, prospect utility theory has the U.S. in a gains frame (thus, predictably risk averse) and the adversary is in a losses frame (dissatisfied with the status quo and predictably risk prone). There are two pure strategy Nash equilibria in this game: (defect, *cooperate*), and (cooperate, *defect*). Under SEU, both the U.S. and the adversary are ordinarily tempted to defect, leaving the end result (aggression) worst for both. However, in this specific variation since the U.S. is risk averse, it will likely not deter because even though it would gain through such action, it may also lose (depending on the adversary action). The U.S. would not be willing to take this risk. Conversely, since the adversary is risk prone, it is more likely to defect (challenging deterrence), thereby putting the game in the upper right quadrant. Now the U.S. may be forced into a losses frame, changing its risk propensity. It must now choose between two undesirable courses of action (continue to cooperate or execute its deterrent threat). Thus deterrence has failed because the U.S. had to execute its threat, which was challenged in the first place. Prospect theory explains that framing is the reason deterrence failed; SEU does not

account for this phenomenon. Berejikian presents several other modifications on this game that will be examined in the quantitative case study analysis section of this research and will be compared to qualitative analysis of case study actor risk propensity/relative emphasis on loss or gain.

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III.   CASE STUDY ANALYSIS: METHODOLOGY APPLICATION

A.   CASE STUDY OVERVIEW

1.   Pearl Harbor

The Japanese attack on Pearl Harbor demonstrated how U.S. military superiority failed to deter Japan from attacking on U.S. soil. The attack on Pearl Harbor is considered to be "one of the most conspicuous failures of deterrence in history" (Russett, 1967, p. 91). Therefore, it warrants analysis. This case study is salient to analysis of risk propensity and relative emphasis on loss/gain because it emphasizes the risk profiles of a weaker actor (Japan) faced with two nearly equally undesirable alternative courses of action in a confrontation.

The Japanese were attempting to expand their influence in the 1930s and required a raw-material supply chain in the Southeast Pacific to sustain their economy and military. Japan understood that it faced undesirable outcomes: either retreat from spreading its influence, or go to war with the United States over the Southeast Pacific supply chain (Russett, 1967). Thus, they chose to launch a pre-emptive attack on the U.S., thereby defeating deterrence. The U.S. attempted to deny benefits (deterrence by denial) to Japan by imposing increasingly severe economic sanction against it, hoping this would have a "sobering effect" (Hosoya, 1968, p. 100) on Japan and thus deter its aggressive advances in the Southeast Pacific. However, these sanctions had a different effect than was intended. Analysis of this case will examine how these objectives of deterrence were influenced by the U.S. and Japan's respective risk profiles and the strategic environment framing their interactions, and this analysis will shed light on why deterrence was or was not successful.

2.   Cuban Missile Crisis

The Cuban Missile Crisis demonstrates how U.S. deterrence nearly failed against another nation state with nearly equal strategic standing, ambitions, and resources. This case study is salient to analysis of risk propensity and relative emphasis on loss/gain because it examines the dynamics of near-equal opponents.

U.S. President Kennedy learned that the USSR was allegedly sending missiles to Cuba, and a series of diplomatic exchanges between Kennedy and Soviet Premier Khrushchev followed. Assurances were made that the USSR was not putting offensive weapons capable of reaching the U.S., and the U.S. claimed that "the gravest issues would arise" if missiles were placed in Cuba (Lebow, 1983). This veiled threat of "gravest issues" was a U.S. attempt at rational deterrence. The U.S. hoped to deter missile placement in Cuba and was attempting to discourage the USSR with the hope it never had to face the aggressive action of a missile launch on the U.S. homeland. Unbeknownst to Kennedy at the time, Khrushchev was indeed sending missiles to Cuba. After further diplomatic exchanges, threats, and a U.S.-imposed blockade of Cuba, ultimately, the outcome of this interaction was that the U.S. successfully deterred the USSR from using its missiles, persuaded it to remove the missiles, and de-escalated this conflict. The U.S. sought to deny benefits of the USSR's attempt to rectify the strategic balance (deterrence by denial) and threatened to impose costs (deterrence by threat of punishment) against the USSR for putting missiles in Cuba; the ultimate outcome was the eventual restraint of the USSR's intentions as it finally withdrew the missiles.

Although it did not initially deter the USSR from placing missiles in Cuba, deterrence did keep the USSR from continued development of nuclear capability in the Western Hemisphere. It will be helpful for future use of deterrence to examine in detail the risk profiles of both the U.S. and the USSR. As with Pearl Harbor, further analysis will produce insights into the Cuban Missile Crisis actor risk propensities and relative emphases on loss/gain and the strategic environment framing their confrontation, and how these factors influenced the outcome of the deterrence strategy utilized by the U.S. Furthermore, the literature on this confrontation emphasizes brinkmanship: the strategy of escalating in response to initial challenges. Brinkmanship is a tactic in confrontation wherein the bargaining power of the potential aggressor increases dramatically if they are able to make probabilistic threats of aggression (Schwarz, 2004). Brinkmanship may reflect risk propensity and may shed light on whether an actor who utilizes this strategy emphasizes loss or gain. Both the U.S. and the USSR were nearly equally strategically

advantaged, and both were battling for ideological influence throughout the world; thus, they played an iterated game wherein each kept escalating and making increasingly more aggressive threats against each other.

B. QUALITATIVE RISK ANALYSIS OF CASE STUDIES: ESTIMATING RISK PROFILES USING STRATEGIC ENVIRONMENT, RISK PROPENSITY AND RELATIVE EMPHASIS ON LOSS OR GAIN

1. Primer on U.S. Strategic Culture: Values, Priorities, Preferences, Decision Making, and Risk Propensity

As these case studies involve U.S. deterrence, in order to examine the efficacy of U.S. deterrence in the context of the case study elicitation framework (Figure 4) the general strategic background and culture of the U.S. must first be elucidated. These factors may lend insight to prospect utility theory analysis of U.S. decision making without looking at case study specifics for cost benefit and likelihood analyses. Moran (2002) provides a passionate historical assessment:

> For the United States above all, a propensity to wait was a well-established element of foreign policy long before the Cold War turned patience into a strategy. Faced with a world on fire, the United States has generally preferred to be pushed, rather than to jump into the flames. It was agonizingly slow to enter both World Wars, despite the enormity of interests at stake, waiting in the latter case until most of Europe and much of Asia were almost literally in ashes before committing itself; and even then only in the wake of a direct Japanese attack that the American public persists to this day in regarding as a surprise. A willingness to deter threats and postpone confrontation, rather than to force the issue by simply taking the bull by the horns, may well be the most natural stance for a nation that seems perennially disposed to believe time is on its side. (p. 3)

This assessment suggests the U.S. values careful deliberations, is generally risk averse (per Linnington model), prefers to avoid conflict but is decisive and overwhelming when deciding to engage, and has a favorable balance of capabilities, but not necessarily favorable in the balance of interests. Despite Moran's insistence that the U.S. has had large interests in stake, these interests likely became more strategic than intrinsic as time passed, especially as the U.S. expanded throughout the nineteenth and early twentieth century in both geographic span and economic/political/military influence. An overall

historical consensus on U.S. strategic culture is present in existing research; some components of Figure 4 can be elucidated from a historical U.S. strategic culture review.

The U.S. had no intrinsic impetus to immediately involve itself in World War I; perhaps somewhat intrinsic interests in entering World War II (after Pearl Harbor, an attack on U.S. soil), but only reluctantly entered each conflict. But, after 9/11, Moran argues:

> If that stance [a willingness to deter threats and postpone confrontation] is now being called into question, it is because the underlying confidence on which it has been based has been eroded by recent events. (p. 3)

This confidence likely stems from the Cold War legacy mutual assured destruction: a form of deterrence stability wherein the U.S. and USSR knew they could each annihilate each other, and thus were similarly deterred from a first strike. Moran continues:

> Its [deterrence's] application to more diffuse threat environments, such as has prevailed since the Soviet Union's demise, is less precise, but still reasonable, particularly for a country like the United States, whose military posture combines enormous strength with a force structure intended, as far as possible, to minimize the leverage gained by early success. Even an aggressor unmoved by the threat of massive retaliation in the long run—because he believes his initial victories will change things so dramatically that the threat will be neutralized—may nevertheless stay his hand if he can be persuaded that the time available to make his crucial opening move will be too short. (p. 2)

Such "aggressors unmoved by the treat of massive retaliation" include modern adversaries may not have as much to lose as did the USSR during the Cold War, for example. However, modern adversaries may perceive their intrinsic interests threatened by globalization and fragmentation (Moghaddam, 2008). The balance of interests thus likely favors these modern adversaries of the U.S., who feel they are fighting for intrinsic interests.

However, there is some thought supporting the notion that, given modern unconventional threats, the U.S. has more intrinsic interests at stake. Nere (2009) argues:

The U.S. national interest is, in fact, for the United States to conduct foreign policy in the interest of its citizens, and the state relative to other states. What is more, promoting its ideology, as democracy's existence in the world is vital to the future of the ideology—as well as the United States. (p. 1)

Thus from this perspective it behooves the U.S., for its own survival, to spread democracy. This may represent a fundamental difference between intrinsic interests of weaker nation (retention of territory) and intrinsic interests of stronger nations (ensuring their economic/political/military advantage through promotion of similar forms of governance). Regardless, per the Lieberman (1995) notion of intrinsic interests as defined by self preservation as opposed to seeking strategic territories, it is posited that for purposes of analyzing case studies of conflict between the U.S. and traditional nation states, the U.S. overall falls into the former category. This is given its expansionist tendencies throughout its history (i.e., Manifest Destiny) but no true challenges to its actual existence given favorable geography.

Despite this unfavorable balance of interests, SAIC's (2006b) estimation of the U.S. preference for direct military action reflects U.S. favorable balance of military capabilities. Art (2003) concurs: "the United States possesses a margin of power over other states, especially military power, one that is unparalleled in modern history" (p. 2). Skuta (2006) emphasizes technological prowess as a contributing factor to American strategic culture development. These balances of interests and capabilities both reflect and have shaped the general U.S. domain of gains throughout its existence. The U.S. has generally had the luxury of time and patience in strategic affairs. SAIC (2006b) supports this view: "American culture was shaped by free security and imbued with exceptionalism" (p. 4). The free security refers to a result of the environment in which the U.S. matured: relatively weak neighbors in Canada and Mexico, and the absence of European power politics with continuous war as manifestation thereof; the exceptionalism refers to the view that war was an exception to the status quo rather than part of it (p. 6). Skuta (2006) concurs with this assertion of "free security": some of the particularly noteworthy influences on U.S. strategic culture include fortuitous geography. Abundant natural resources, room for expansion, and strategic advantage of natural protective borders on both east and west (p. 3) contributed to America's privileged

development as a nation. Skuta (2006) also emphasizes exceptionalism in American culture: "an identity safe from invasion or meddling by foreign powers" (p. 3). Given this separation from Europe and friendly borders, the American historical experience that "war is episodic, waged abroad…and that there is not a constant, high level of menace in the external world" (Skuta, 2006, p. 4) suggests a domain of gains; the U.S. has been in a position of strength and advantage for most of its existence.

Given its balance of capabilities and domain of gains, the U.S. tends to use its favorable balance of capabilities to "transform the international system in the service of liberal democratic ideals" (SAIC, 2006b, p. 6). This suggests the U.S. has traditionally favored gain maximization over loss minimization; gains to be won from expanding democracy. This goal is difficult to define as a strategic interest or an intrinsic interest; since the U.S. is not pursuing land or defending its own from direct attack, it may first be thought of as a strategic interest. However, when one considers the argument that spreading democracy is inherently in the U.S. intrinsic interest because it promotes peace (Art, 2003), this complicates the discussion. Regardless, this characterization of gain maximization assumes the benefits of spreading democracy at least equal the costs, if not exceed them. Given the U.S. capability advantage and recent shift towards intrinsic interests from solely strategic interests, it is predictable that benefits of spreading democracy would exceed cost. The efficacy of U.S. economic and political advantages in promoting democracy must also be considered; these courses of action would be indicative of a more risk averse character (per Linnington model).

In terms of America's credibility and signaling, the U.S. has created precedent that it prefers direct, overwhelming force to immediately overwhelm adversaries. This complements the externally held notion that the U.S. has a low tolerance for casualties, and will fight for strategic goals rather than intrinsic goals (SAIC, 2006b). In every military action since the end of the Cold War, scholars have found evidence of American adversaries questioning U.S. resolve to accept casualties (Horst, 2004). Thus, the overall outside perception of the U.S. is it is risk-averse, though with a superior balance of capabilities. Supposedly several foreign agents including Slobodan Milosevic and Mohamed Farah Aideed believed the balance of capabilities overwhelmingly favored the

U.S., but the balance of interests favored them. Saddam Hussein is quoted thusly: "America is an effete and indolent society no longer willing to tolerate combat casualties" (Horst, 2004).

The U.S. risk aversion may be due to its historical domain of gains and lack of intrinsic interests. This reflects a dichotomy which has developed over time. Because America has rejected European power politics and the notion that war is an extension of political strategy, Americans tend to view war as discrete events reflecting the failure of policy and strategy (SAIC, 2006b). Thus Americans want war to be a last resort, over quickly, with minimal losses, and thus rely on technology and other qualitative advantages to secure quick, overwhelming victory in conflict. Johnston (1995) concurs: the U.S. tends to exhibit a "fundamental belief that warfare was an aberration in human relations" (p. 32). Skuta (2006) emphasizes the "conventional perception that the American experience with war [is] more a deviation from the norm: … military actions [are] viewed as abnormal episodes from something defined as *peacetime*" (p. 4).

Thus, the overall U.S. strategic culture is that of a favorable balance of capabilities, risk aversion, unfavorable balance of interests, in the domain of gains, and preference for maximizing gains. These characteristics result in reluctance for conflict but the ability and will to engage and win if necessary, although some recent conflicts have been for secondary and even tertiary interests (SAIC, 2006b). The notion that "the American national historical experience produced 'modes of thought and action with respect to force' " (Johnston, 1995, p. 36) supports the assertion that the U.S. will engage to win once entering a conflict.

These strategic profile, culture, and history of the U.S. may have implications for the efficacy of U.S. deterrence as will be analyzed in the specific case studies of Pearl Harbor and the Cuban Missile Crisis. Morgan (2003) argues that "decision makers do not respond to their strategic cultures; they respond to stimuli from the strategic environment…therefore any study attempting to attempting to discover culture's effects on strategic decision making must ascertain how symbols, values, and…cultural behaviors intervene in the decision making process" (p. 8). He then goes on to examine culture's role in translating preferences to organizational culture and model how culture's

ideas and behavioral elements intervene in decision making as actors also consider cues from the immediate strategic environment (p. 18). Thus, considering both strategic history/culture and particulars of the strategic environment of conflict must be considered in case study analysis. Furthermore, certain specific aspects may have implications for current unconventional challenges to deterrence. For example, Skuta (2006) argues "America's great wars have been all-out wars against adversaries, to be treated as criminals and pursued until their total destruction…"; furthermore Skuta claims that the consequences of American strategic culture to wit: "1) the 'American way of war' for fighting and ending conflicts quickly, 2) the ability to handle more than one conflict at a time, and 3) a perceived disinclination to long term strategic outlook" (p. 13) may be exploited by modern unconventional adversaries.

2.   Pearl Harbor Qualitative Analysis

a.   *Japanese Strategic Culture*

Japanese strategic culture was examined in detail by Morgan (2003). He developed various hypotheses, notably 1) when faced with threat, Japanese leadership will be hesitant to effect certain responses for fear of angering subordinates who disagree with their policies; 2) relatedly, bureaucratic inertia make it difficult to develop creative responses to threats; 3) strategies will often change throughout the course of a conflict in response to constituent government groups' different demands, thus making it difficult for Japan as a prospective subject of deterrence to communicate with the deterrer; and 4) Japanese leadership is nonassertive and also expresses policies inconsistent with leadership personal preferences, again making it difficult to communicate with an adversary. Berger (1993) supports these views; he argues that Japanese society is characterized by a "combination of extraordinary group loyalty and lack of central control," and "policy is made on the basis of mutual accommodations between institutions which command individual loyalties" (p. 125). Berger argues further for a "political culture prone to inertia" (p. 125).

There is some evidence in studies of individual Japanese psychology to suggest why Japanese collective decision making exhibits these tendencies. The

psychology literature suggests that Japanese are low in self-disclosure, are communicatively apprehensive, and have collectivist orientation (Miyahara, n.d.) These characteristics are reinforced by Singhal and Nagao (1993): Japanese culture exhibits collectivism and is influenced by Confucian ethics to wit: respect for authority, withholding dissent. Furthermore, Japanese culture does not prefer dissent as evidenced by a specific characteristic: high uncertainty avoidance. This means that Japanese decision makers are unlikely to tolerate dissenting views within the group (Vitel et al., 1993). These characteristics of Japanese individuals combined with the nuances of Japanese decision making suggest that Japanese decision making reflects its leadership's personal idiosyncrasies. These idiosyncrasies are risk averse tendencies (avoiding risk of internal conflicts.) and by preferences for minimizing losses (reflecting personal preferences for minimizing internal losses in face/political capital, as opposed to voicing personal dissent and working to formulate unified policy focusing on external gains). These internally driven tendencies and behaviors resulting from their strategic culture might suggest that Japan's foreign policy would be characterized by risk aversion and loss minimization. Furthermore, Ford (n.d.) argues that Japan traditionally did not place high value on learning about their adversaries. In context of the case study elicitation framework (Figure 4), this means that worldview and experience with the adversary would be deficient to inform decision making.

b.   *The Strategic Environment Prior to Pearl Harbor*

Japan began expanding their military and economic interests into China and the Southeast Asia islands (Dutch Indies) in late 1930s. Since the U.S. had economic interests in China at the time, Japan's expansionism infringed upon U.S. investments and thus the U.S. attitude toward Japan stiffened (Hosoya, 1968). As Japan was highly economically dependent upon the U.S., some in the U.S. administration believed economic sanctions would curb Japan's expansionism and remove the threat to U.S. investments in China (Hosoya, 1968). Japan was also militarily inferior to the U.S. Japan and the U.S. engaged in protracted diplomacy between 1937 and 1941, with the U.S. threatening economic sanctions and the Japanese in turn modifying their policies toward the U.S.

(1)   Japan Self Assessment and Analysis

(a)   Identity. The Japanese government prior to Pearl Harbor viewed itself as destined to take over parts of Eastern Asia as evidenced in their 3 November 1938 manifesto "New Order in East Asia." Hosoya (1968) recalls the Japanese Government's position:

> Japan desires to build up a stabilized Far East by cooperating with the Chinese people who have awakened to the need of self-determination as an Oriental race. ... History shows that Japan, Manchukuo and China are so related to each other that they must bind themselves closely together in a common mission for the establishment of peace and order in the Far East by displaying their own individuality. ... Japan sees the necessity of effecting a fundamental revision in this situation and desires to establish a new peace fabric in the Far East on the basis of justice. ... The world knows that Japan is earnestly determined to fight it out with communism. What the Comintern intends to do is bolshevization of the Far East and disturbance of world peace.... Japan is determined also to cooperate in the reestablishment of world order guided by a common view of the world. What the world at present needs badly is the establishment of peace on a fair balance of power. There is no denying the fact that various principles in the past have forced the maintenance of the status quo marked by an unbalanced state. That the international treaty such as the covenant of the League of Nations has lost its prestige is fundamentally due to this irrationality. (p. 113)

Thus the Japanese felt aggrieved by the status quo and desired to change it. They had some intrinsic stake in this endeavor: they feared the spread of Soviet Communism, but also denied the effectiveness of the League of Nations which had been established after the end of the First World War to encourage international cooperation. They arguably perceived themselves as the catalyst of revising the geopolitical and social order in China, Korea, and other Asian countries and hence that was their primary objective. Japan believed from the historical precedent of Germany's defeat in WWI that security through empire and self-sufficiency was necessary (Taliaferro, 1997).

(b)   Will as a function of interests. From a neutral point of view, consistent with Lieberman's (1995) emphasis that intrinsic interests such as self preservation are generally more salient in decision making than are external, strategic interests such as gaining strategic territories (p. 5), the Japanese concept of an East Asian

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New Order and their resulting economic expansion reflected strategic interests rather than intrinsic interests. Japan was not under threat against their intrinsic geography or other interests; rather their East Asia New Order reflected externally focused ambitions. Consequently, it would seem likely that their will to engage in hostilities to achieve such extrinsic goals would be less than that of an opponent with self preservation in mind. From one perspective, Japan's reliance on U.S. oil exports reflected an intrinsic interest of sorts, but the impetus which exacerbated this reliance was Japan's strategic ambitions, which required severing their economic independence on a militarily superior power and exploiting a weaker source of resource, e.g., the Dutch Indies in the Southeast Pacific. Certainly, the Japanese government possessed the intent to see through this plan; however, doing so would rely on more realistic criteria: resources. Japan recognized that victory in future wars would depend on economic mobility and since Japan lacked resources, it was vulnerable to exploitation (Taliaferro, 1997).

(c) Capabilities. Japanese leadership recognized its economic dependence upon the U.S.: a Japanese Foreign Office memorandum stated that "Japan must end as quickly as possible the present high level of economic dependence on the U.S. and press on for a policy to establish an economic system which would not be endangered by the U.S. attitude" (Hosoya, 1968, p. 103). Given that Japan was incapable of producing even 10% of its own petroleum needs and imported roughly 70% of those needs from the U.S. (Hosoya, 1968, p. 104), this acknowledgement was timely. As U.S. hard line sentiment for strengthening the severity of economic sanctions against Japan increased in July 1940, the Japanese evaluation of inferior economic resources was magnified: the Japanese administration nearly simultaneously developed policy regarding "steps to be taken against the United States embargo on petroleum and scrap iron to Japan" and policy regarding their Southeast Pacific advances towards French Indo-China and the Dutch Indies (Hosoya, 1968, p. 107). The Japanese began to realize the inevitability of invading the islands to gain economic resources as U.S. pressure increased; thus the balance of capabilities became even more salient. Thus their will/interests in achieving these aims certainly increased, but since the original impetus to

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improve their economic virility originated from an externally oriented strategic expansionist plan, arguably their national motivation was not as salient as that of a country under attack.

The Japanese did not perceive themselves as militarily inferior to the U.S.; their military leadership planning estimates did not acknowledge any military inferiority in terms of strategy, weaponry or manpower. The limiting factor was the military's reliance on petroleum; thus economics weakened military strength. Japanese Premier Tojo argued in 1941, "I do not think we have sufficient strength, so far as resources are concerned, to support war. Both the army and the navy can resort to force, but we do not have materials for war on both land and sea" (Taliaferro, 1997, p. 19). However, Russett (1967) argues that military superiority by a defender (in this case the U.S.) is not generally a sufficient condition for deterring a potential attack (Japan).

In sum, Japan viewed itself as expansionist but for extrinsic, strategic gains and with limited resources.

c.   *Japan-Specific Factors*

(1)   Risk Propensity

(a)   Domain. Japan was arguably in a domain of losses prior to Pearl Harbor. Their occupation of and subsequent war with China in the 1930s caused great economic troubles for the Japanese (Taliaferro, 1997). Japan's limited access to intrinsic resources to replenish their expenditures resulted in increased reliance on the West, further pushing them into the domain of loss.

Per the Linnington model, the Japanese government moved from a position of moderate domain of gains to a domain of losses throughout the evolution of international turmoil leading up to Pearl Harbor. They were already engaged in military conflict with China prior to their attempted expansion into the Dutch East Indies, suggesting a starting position in the domain of losses. With respect to their subsequent push for access to Dutch East Indies resources, their initial attempts began with coercive diplomacy with the governments of the East Indies and later attempts evolved to military aggression to secure said resources (Taliaferro, 1997).

Japan did engage in some diplomacy with the U.S.; in November 1938 Japan told the U.S. that "some violations of U.S. interests in China were unavoidable despite Japan's intentions to respect such interests" (Hosoya, 1968, p. 98). Japanese diplomatic measures in response to the U.S. abrogation of the 1911 Japan-U.S. Treaty of Commerce were optimistic in nature, the administration sought to improve relations with the U.S. despite the abrogation by advocating protection of U.S. citizens and interests in China (Hosoya, 1968). Perhaps Japan felt they were in the domain of gains with respect to their political relationship with the U.S., but in the domain of losses with respect to their economic standing. Regardless, they moved toward the domain of losses with respect to U.S. relationships in 1939 when they began developing a contingency plan for war preparation in the even that U.S. foreign policy changed to Japanese detriment. Given their continued military involvement with China and their increasingly pessimistic diplomacy with the U.S., arguably Japan was in the domain of loss per Linnington's model prior to Pearl Harbor.

Per prospect theory, Japan would evaluate their standing relative to a reference point. According to Taliaferro (1997), that reference point was their envisioned status as leader of the New East Asian Order (p. 11). This would keep Soviet influence at bay and allow access to resources. However, the U.S. perceived the reference point as return to the status quo in East Asia prior to the South Manchuria Incident in 1931 and the subsequent Japanese invasion of China. In response the Japanese believed that "it would be impossible to apply pre-war standards and principles in unaltered form to present and future situations in Asia" (Hosoya, 1968, p. 98).

As Japan continued to consider options for gaining access to economic resources into the turn of the decade, they increasingly realized the urgency of the situation and arguably slipped deeper toward the domain of losses. In January 1940 the 1911 treaty formally expired and the U.S. and Japan entered a non-treaty period of relations. Though no sanctions were immediately imposed on Japan by the U.S., this lack of legal apparatus against doing so exacerbated Japan's domain of loss. Japan's imbalance of capabilities required that they "end as quickly as possible the present high level of economic dependence on the U.S." (Hosoya, 1968, p. 103). The Japanese navy

employed a "tripwire" strategy in May 1940 to occupy oil fields in Borneo at risk of provoking hostilities with the U.S. (Taliaferro, 1997). The report that followed from those exercises emphasized that Japan's efforts to continue a war [referring to military advances in the East Indies and China] without a secure petroleum supply would be futile after four months assuming U.S. exports were cut off, and even if the Dutch East Indies supply were secured, it would be by itself insufficient to support their military campaign (Taliaferro, 1997). Furthermore, the "ABCD" military alliance (America-Britain-China-Dutch) which existed among these nations for mutual military support threatened Japan and the Japanese perceived this alliance as "encirclement against them [Japan] in the Southern Pacific Ocean" (Russett, 1967, p. 95). This alliance further pushed Japan toward the domain of losses.

Overall, as U.S. economic sanctions against Japan increased in severity prior to Pearl Harbor, and Japan's resources continued to be depleted through conflict with China and in the Dutch East Indies, they moved farther and farther towards the domain of losses from their envisioned reference point. Thus, analysis of Japan's domain prior to Pearl Harbor predicts considerable risk proneness as their overall risk propensity.

(b) Likelihood of Certain Outcomes. At key several junctions in the evolution of the conflict between Japan and China, and Japan's aggravation of the U.S. through its expansionism into the Dutch East Indies, the Japanese assessed the likelihood of various possible outcomes resulting from certain courses of action (COAs). Japanese assessment of the probabilities that certain outcomes would occur will give indication of their risk propensity (risk averse or risk prone) based on the cost benefit analysis of those courses of action which will be discussed in the subsequent analysis of Japanese government relative emphasis on loss or gain.

Russett (1967) argues that when decision makers receive information, they may distort the meaning of that information to the extent that they conclude probabilities of certain outcomes differ considerably from those which other observers might conclude given the same information. Russett presented a simply method to determine how a potential attacker made a decision to attack: the utility of war (W) resulting from an attack multiplied by the probability the defender would retaliate (s), plus the utility of

successful attack (A) without defender response multiplied by the probability of that occurrence (essentially 1-probabilty of defender retaliation) would have to exceed the utility of peace (P-attacker restraint). There is no probability attached to P because that would be completely under the attacker's control. In other words,

$$W (s) + A (1-s) > P (Eq. 6)$$

Thus, the subjective Japanese probabilities of war with the U.S., and by subtraction the subjective probabilities of non-response by the U.S., must be considered.

Overall, the Japanese estimated a high priority of increased U.S. economic sanctions and outright embargo of critical material (scrap iron and petroleum) if the Japanese advanced into French Indo-China (Hosoya, 1968). Furthermore, Japan considered the likelihood of U.S. declaring war against them as high if they attacked the Dutch East Indies to gain access to resources (Russett, 1967, p. 94; Taliaferro, 1997, p. 15). U.S. statements to this effect certainly helped the Japanese estimation of this likelihood:

> If Japan attempted to seize oil supplies by force in the Netherlands East Indies, the Dutch would, without the shadow of a doubt, resist, the British would immediately come to their assistance, and, in view of our [U.S.] policy of assisting Great Britain, an exceedingly serious situation would immediately result.

The Japanese perceived Franklin Roosevelt's "war warning" as unequivocal, though some inference was made (Russett, 1967). Correspondence between embassies further supported this perception; a cable on Dec 3, 1941 stated,

> Judging from all indications, we feel that some joint military action between Great Britain and the United States, with or without a declaration of war, is a definite certainty in the event of [Japanese] occupation of Thailand (Russett, 1967, p. 96)

Japan also estimated a high likelihood that U.S. failure to defend its interests in the Indies would diminish its influence in China and the Philippines (Russett, 1967). Thus, given Japanese estimates of probabilities Equation 6 (albeit without utilities W, A and P) became

$$W (S) + A (s) > P \text{ (Eq. 7)}$$

where $s = 1\text{-}S$, and $S >> s$.

It must be acknowledged that while the Japanese believed a high likelihood of U.S. aggression in response to Japanese refusal to discontinue their expansionism, they believed the likelihood that the U.S. would fight a protracted war was minimal. Japan believed in U.S. "softness" (Russett, 1967, p. 99); a pre-emptive strike against the U.S. (vis-à-vis the Pearl Harbor attack) would embroil the U.S. in a war they were not prepared to continue beyond initial hostilities. Taliaferro (1997), in contrast to Hosoya, suggests that Japan believed any war with the U.S. had a high probability of becoming a protracted conflict, and Japan also believed in a low likelihood that they could win a prolonged conflict with the U.S. Specifically, Japan predicted high likelihood that a war could not last beyond four months without securing oil from the Dutch East Indies (assuming a total U.S. embargo on petroleum exports), and a low likelihood of continuing a war beyond one year even with a Indies supply secured (Taliaferro, 1997). As it seems unlikely that a war with the U.S. would become protracted if the U.S. lacked the will to protract it, a possible explanation for this difference of opinion on Japanese calculations is that perhaps Japan thought that U.S. leadership would want to prolong a war initiated by Japanese pre-emptive hostilities, but the U.S. public would not support that decision indefinitely and thus the U.S. will to engage in prolonged aggression would be weak; the U.S. government would thus be unable to sustain. Furthermore, Japan believed a high probability of an undesirable alternative to war with the U.S. if they avoided a pre-emptive strike: gradual exhaustion through economic deprivation (Taliaferro, 1997), though they also believed a low likelihood of a negotiated peace following a quick pre-emptive strike (despite that the utility of negotiations immediately after a pre-emptive strike with positive results for Japan surely appealed to the Japanese leadership).

Part of Japan's impetus in continuing to seek raw material access in the Indies after repeated U.S. objection was to be able to support a sustained engagement with the U.S., once the U.S. inevitably declared war after the pre-emptive strike. However, consistent with the earlier assertion that the Japanese strategic culture did not emphasize learning about the opponent, the progression of WWII demonstrated American resolve to protract a war as necessary to achieve victory.

There are some specific decision points leading up to Pearl Harbor at which Japan estimated probabilities of certain outcomes. In June 1940 Japan's economic and military strength was sapped after several years of conflict with China, and the U.S. had just demanded a return to the East Asian status quo prior to Japan's invasion of China. In response, the Japanese government developed policy which sought alliances with German and Italy, known as the Tripartite Pact. Behind this strategic decision to align with Germany were significant assumptions of probabilities that certain events would follow. Japan assumed a high likelihood that their navy could defeat what was left of the Dutch navy defending the Indies; assumed a high probability that the U.S. and Britain were no great threat and would be deterred from action by a German-Japanese alliance (despite the thought that this move would irritate the U.S.), and that Germany would invade Britain soon. The U.S. would then shift focus to Europe and away from the Southeast Pacific, leaving the Japanese to pursue their goals of a New East Asian order (Taliaferro, 1997).

In late 1940 and early 1941, as the U.S.-Japan relationship deteriorated, Japanese leadership continued to assert a high likelihood of U.S. disapproval at Japanese use of force to gain resources from the Indies (Taliaferro, 1997). Japan also considered attacking the USSR in response to German impending invasion of the USSR, in order to eliminate the Soviet threat. The Japanese considered it highly likely that the U.S. would refrain from aggressive action if the Soviets were defeated (Taliaferro, 1997), but if Germany and the Japanese failed to defeat the USSR, it was highly probable that the U.S. would then enter conflict. In mid-1941, Japan realized their southward advance into French Indochina held a high probability of further U.S. economic sanctions against

them, and possibly war (Taliaferro, 1997). They also believed a low probability of negotiations with the U.S. that would bear any fruit at the point in the confrontation (Taliaferro, 1997).

In September and October of 1941, Japanese leadership convened to discuss strategies for simultaneously preparing for war with the U.S. but also continuing attempts at negotiations. However, Japan believed there was a low likelihood that a pre-emptive military strike against the U.S. would weaken American resolve, and believed a high likelihood that any war with the U.S. would be protracted (Taliaferro, 1997). Japan did, however, believe in a high likelihood that a pre-emptive attack would succeed in destroying U.S. existing offensive capabilities in the Pacific due to Pearl Harbor's vulnerability (Russett, 1967).

In summary, key decision points and Japanese probability estimates of the outcomes of various courses of action available to them at those points throughout the confrontation leading up to Pearl Harbor are:

Secure resources from Dutch East Indies: Japan believed in a high likelihood of the U.S. disapproval, and ultimately the U.S. declaring war against them, if they attacked the Dutch East Indies to gain access to resources. Relatedly, Japan believed in a high likelihood that U.S. failure to defend its interests in the Indies would diminish U.S. influence in China and the Philippines.

Enter the Tripartite Act: Japan believed in a high likelihood that their navy could defeat what was left of the Dutch navy defending the Indies; they assumed a high probability that the U.S. and Britain were no great threat and would be deterred from action by a German-Japanese alliance (despite the thought that this move would irritate the U.S.), and they believed that that Germany would invade Britain soon. The U.S. would then shift focus to Europe and away from the Southeast Pacific to Japan's benefit. Furthermore, Japan believed it highly likely that the U.S. would refrain from aggressive action if the Soviets were defeated but if Germany and the Japanese failed to defeat the USSR, it was highly probable that the U.S. would then enter conflict.

Invade French Indochina: Japan believed in a high probability of increased U.S. economic sanctions and outright embargo of critical material (scrap iron and petroleum) if the Japanese advanced into French Indo-China.

Execute a pre-emptive strike against U.S.: Japan believed in a high probability of gradual exhaustion through economic deprivation if they avoided a pre-emptive strike against the U.S., an undesirable alternative to war with the U.S. However, while Japan believed in a high probability that a pre-emptive attack would be successful tactically, they believed in a low likelihood of a negotiated peace following a quick pre-emptive strike against the U.S. Also, Japan believed in a low likelihood that a pre-emptive military strike against the U.S. would weaken American resolve.

To conclude with any confidence from this analysis that Japan was risk prone, the utilities and cost-benefit calculations associated with these decision point courses of action and predicted outcomes must be examined. Ostensibly, if Equation 7 has the balance in favor of peace but Japan went to war anyway, they are risk prone. If aggressive actions had negative utility and high likelihood, and Japan undertook them, then this confirms Japan's risk proneness. However, if those same low utility actions had a low likelihood, Japan could be characterized as risk averse, although with less confidence[5] than a risk prone judgment. Analysis of the cost-benefits at these decision points and the ultimate decisions made should also shed light on Japanese preferences for emphasizing loss or gain.

(2)   Relative Emphasis on Loss or Gain

(a)   Preferences (Emphasis on Loss or Gain) and Cost/Benefit Analysis of Alternatives. Overall, Japan preferred to emphasize minimizing losses. They were economically vulnerable as evidenced by their shortage of natural resources and reliance on the U.S. exports; furthermore they were surrounded by Chinese and Soviet influences. Their overall strategy of achieving a New East Asian Order was an effort to reduce the country's economic vulnerability (Taliaferro, 1997). The preponderance of their courses of action leading up to Pearl Harbor reflected this desire to minimize losses and avoid situations with negative utility (benefits < costs). Russett (1967) emphasizes Japan's "disincentives" or areas of potential losses: loss of China; exhaustion of fuel supplied and loss of possibility of future self-sustainable military action; military defeat by the U.S.

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5 If a course of action has negative utility, but there is a low probability that this negative utility will occur, then it is difficult to evaluate an actor's propensity for loss. It is easier to characterize risk propensity when there is a higher likelihood that something will have negative utility, or a low likelihood that something will have positive utility because this demonstrates attitude toward loss. If there is no loss, then attitude cannot easily be defined.

Utilities and preferences are presented for each of the major decision points for which Japan estimated probability are explained as follows.

With respect to securing resources from Dutch East Indies, Japan emphasized gain maximization as they attempted to secure petroleum supply and other resources from Dutch East Indies; they pursued a COA which ostensibly had benefit to them. The immediate effect of this benefit was supporting their military preparations in pursuit of their ultimate goal, the new East Asian Order.

The Japanese arguably analyzed the costs and benefits of continuing to pressure the East Indies for access to resources despite successive U.S. actions intended to deter Japan from doing so. The U.S. warned Japan in May 1940 not to "take any provocative actions against the European colonies in Southeast Asia (Taliaferro, 1997) in response to German invasion of Norway, Denmark and neighboring nations. Furthermore, Roosevelt ordered naval buildup in Hawaii, the U.S. ambassador in Tokyo warned the Japanese, and the U.S. listed oil and scrap iron as items which could not exported to Japan without prior approval (Taliaferro, 1997). Despite these efforts to dissuade from Japan, they obviously determined that the benefits of continuing to provoke the European interests the Southeast Pacific in pursuit of resources outweighed the potential costs of angering the U.S. and its allies (Russett, 1967). Japan directed interest "to the oil resources of the Netherlands East Indies as a substitute for U.S. oil" (Hosoya, 1968, p. 104) in response to the possibility of U.S. sanctions. This pursuit of positive utility reflected intransitive escalation in pursuit of gain maximization, thus challenging the hypothesis that gain maximizers prefer de-escalation.

Japan repeatedly emphasized loss in their assessment of an alternative COA: restraint from invading the Indies and gaining access to resources. Japan's War Ministry emphasized, it cannot be denied that the empire's material strength would be insufficient for a long war. While we have munitions sufficient to defeat the enemy within a period of at least two years, by the end of the second year…our economic capabilities would be strained (Taliaferro, 1997, p. 19).bring all of downIt thus seems that the costs of restraining from invading the Indies exceeded the benefits of restraint. Japan

attached low utility to restraint from invading the Indies (Russett, 1967); Hosoya (1968) concurs: the Japanese Foreign Office in 1939 claimed that:

> Japan must end as quickly as possible the present high level of economic dependence on the U.S. and press on for a policy to establish an economic system which would not be endangered by the U.S. attitude. (p. 103)

With respect to entering the Tripartite Act, Japan emphasized loss minimization in pursuing the Tripartite Alliance with Germany and Italy. The immediate effect of this was to cut their losses received from U.S. interference in their advances in the Southeast Pacific.

Japan arguably preferred such an alliance for its deterrent effect against the U.S.; the benefits of such an alliance exceeded the potential costs of angering the U.S. and the U.S. stepping up their deterrence and threats. Japan wanted to "resolve the…China Incident [the conflict in China] without provoking a military confrontation with the United States" (Taliaferro, 1997, p. 13). Thus they viewed provoking a military confrontation with the U.S. as having negative utility and thus did not prefer such a confrontation. The positive utility of resolving their quagmire in China, which was economically and military taxing, was the worth the risk of aligning with the Nazis. Japan believed such an alliance would enhance their position against the U.S. and result in a moderation of the U.S. hard-line attitude toward Japan (Hosoya, 1968).

Japanese leadership emphasized the loss to be minimized by such an alliance thusly:

> Only a firm attitude…can prevent war with the United States…If we do not conclude an alliance…, and if, as a result, the worst happens and we become involved in a war with the United States, our national economy will suffer. *In order to avoid these difficulties* [author's emphasis], it would not be totally impossible to ally with Britain and the United States. (Taliaferro, 1997, p. 14)

This predilection toward action to avoid negative utility is indicative of the loss minimization preference.

With respect to the alternative COA, not aligning with Germany and Italy, Japan believed that the costs of war with the U.S., if they did not deter U.S. aggression by

aligning with Germany and Italy, exceeded any possible benefit. The Japanese Navy Vice Chief of Staff argued, "We cannot expect a victory [against the U.S.] such as we achieved in the Russo-Japanese War. Even if we win, considerable losses can certainly be expected" (Taliaferro, 1997, p. 14).

This COA would have effectively amounted to intransitive escalation-qualitatively changing the nature of the U.S.-Japanese relationship by implied threats of force. The intended deterrent effect against the U.S. signaled that attempts to interfere with Japanese interests might result in German, Japanese, or Italian (or a combination thereof) aggression in response. This qualification is consistent with the prediction that loss minimizers tend to escalate.

With respect to invading French Indochina, Japan emphasized loss minimization in launching this invasion; their immediate goal was to settle a conflict which drained their economic and military resources. With western supply routes through Indochina bolstering the Chinese resolve and prolonging the war (Taliaferro, 1997), this created negative utility to the Japanese efforts. Japan wanted to avoid these current losses, thus they invaded in 1940 despite the various warnings issued and deterrent action by the U.S. (referred to in the cost benefit analysis of securing resources from the Dutch East Indies). Thus, it is inferred that the Japanese estimated the benefits of invading Indochina (minimizing Japanese losses incurred in the current conflict by halting arms shipments into China) outweighed the potential costs of U.S. economic sanctions and outright embargo of critical material (scrap iron and petroleum). Hosoya (1968) believed that "the best southern policy for Japan was the one in which Japan could establish its control over Indochina…as to insure the obtaining of essential products, without resorting to force and thereby minimizing U.S. opposition" (p. 108). Thus securing resources from Indochina without aggression would have had ideal utility, but ultimately Japan had to settle for less utility and invaded when negotiations broke down. Invading Indochina would have constituted escalation-an aggressive act changing the nature of U.S.-Japanese relationship in that the U.S.' economic interests in Indochina would have been directly threatened. This is consistent with loss minimization.

With respect to executing a pre-emptive strike against the U.S., U.S. protection of their interests in Southeast Asia presented negative utility to Japan as it hindered their efforts to achieve their ultimate goal of a New East Asian Order. Thus, as U.S.-Japanese relations declined into 1941, Japan calculated that launching a pre-emptive attack on the U.S. served the goal of minimizing loss. They would be taking pre-emptive action to mitigate a negative situation if they attacked the U.S. first. As discussed in the analysis of Japan's risk propensity for executing a pre-emptive attack against the U.S., this tactic posed a more desirable alternative then protracted war, especially if negotiations could begin soon thereafter while Japan had the upper hand. Japan believed that Pearl Harbor was quite vulnerable (Russett, 1967) and its destruction would severely hamper existing U.S. offensive capabilities in the Pacific Ocean in order to allow unimpeded Japanese expansion into the Dutch East Indies. This would in turn put Japan in a position to defend for longer when the inevitable U.S. attack was launched (Russett, 1967). This potential benefit was surely the more attractive. The utility of escalation was evident to the Japanese, albeit the "least negative" utility given the alternatives.

The costs of the alternative COA (not launching a pre-emptive strike) would be gradual exhaustion due to increasing economic dependency on the U.S. and draining of resources due to non-resolution of the China situation. The positive utility of a possible weakened U.S. resolve after a pre-emptive strike was certainly attractive to Japan. The other alternative to a pre-emptive strike was a protracted war, whose costs exceeded benefits as Japan could not sustain itself for long.

Additionally, one element of Japanese strategy throughout the confrontation leading up to Pearl Harbor was seeking a nonaggression pact with the USSR. This course of action serves to reinforce the argument that Japan's preference was loss minimization. Examining Japan's three stated goals of this nonaggression pact: 1) Japan hoped this would prevent a possible rapprochement between the U.S. and the USSR (Taliaferro, 1997). Such a rapprochement would surely have negative utility to Japan; thus they sought to avoid (minimize) loss. 2) Japan hoped a Japanese-Soviet non aggression pact would discourage future Chinese resistance against the Japanese (Taliaferro, 1997). Since the ongoing conflict was creating negative utility to Japan

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(economic and military expenditures) with no resolution in sight, resolving the China incident would minimize future loss. Finally, 3) Japan wanted to pursue the "southern advance" (invade the Indies) without fear of a USSR attack in the north (Taliaferro, 1997). Achieving a nonaggression pact with the USSR would avoid Soviet invasion; such an invasion would create a loss to Japan. This strategy is more indicative of de-escalation, thought to be characteristic of gain maximizers.

Finally, one other point warrants analysis to reinforce the argument that Japan preferred loss minimization. In October 1939, Japan prepared a policy document which emphasized loss. Several months earlier, the U.S. had announced its intention to abrogate the 1911 Japanese-U.S. treaty of commerce which had governed the two nations' economic relationship for decades. Japan's subsequent "Proposed Policy Measures towards the United States" argued:

> If the Government finds itself unable to fulfill its desire of concluding a new treaty on the basis of the principle of reciprocity, Japan has no choice but to accept a generalized, temporary agreement even if it fails to specifically affirm the principle of non-discriminatory treatment. (Hosoya, 1968, p. 101)

Thus, the Japanese acknowledged that some loss may be inevitable and must be accepted throughout negotiations with the U.S.

In summary, Japan emphasized loss minimization rather than gain maximization as they escalated at most of their key decision points in order to avoid undesirable outcomes, or those with benefits less than costs (negative utility). Taliaferro (1997) argues that potential losses and gains include territory, military capabilities, economic resources, reputation, and credibility (p. 4); Japan stood to lose military and economic capabilities if they failed to secure resources from the Dutch East Indies and resolve the ongoing challenges with China. They stood to lose their reputation and credibility if they failed to attain their vision of the New East Asian order.

(b)   Probabilities and Utilities: SEU or Prospect Theory? Together, the probabilities of possible outcomes of Japanese COAs at the decision points identified in this analysis, and the utilities of those outcomes represent estimates of subjective

expected utility to the Japanese. The Japanese were considerable loss minimizers as evidenced by their consistent framing of choices in terms of loss and actions to avoid loss, but if the probability of negative utility from any of their COAs chosen to minimize loss was high, and they nonetheless executed that COA, they were certainly risk prone as well. If they chose not to pursue those COAs with potential for positive utility but with low likelihood of that positive utility occurring, they were arguably risk averse. Figure 11 summarizes the possible courses of action Japan considered at key decision points leading up to Pearl Harbor, the probabilities (P: high or low) and utilities (U: positive or negative) of the possible outcomes of certain COAs, and the resulting risk propensities they displayed as a result. The possible outcomes of restraint assume Japan would have restrained from the course of action in the first column of the Figure 11. Overall, as predicted earlier, Japan was predominantly risk prone throughout their confrontation with the U.S.

Decision Point COA	Possible Outcomes	P	U	Possible Outcome of Restraint	P	U	Decision	Risk Propensity	Reason
Aggressively attempt to secure resources from Dutch East Indies	U.S. displeasure and possible aggression	High	-	Failure to secure resources necessary to resolve China incident and continue expansionist agenda	High	-	**Aggressively attempt to secure resources from Dutch East Indies**	Slightly Risk prone	High probability of negative utility (U.S. aggression)
	Securing vital resources	High	+						
Enter the Tripartite Act	Japanese navy would defeat Dutch navy, U.S. would be deterred from further interference, U.S. would then shift focus to Europe and away from the Southeast Pacific to Japan's benefit	High	+	War with U.S.	High	-	**Enter the Tripartite Act**	Unknown	High probability of benefit: how can risk propensity be judged if not much to lose?
Invade French Indochina	Minimizing Japanese losses incurred in the current conflict by halting arms shipments into China	High	+	Non-resolution of China incident (With western supply routes through Indochina bolstering the Chinese resolve and prolonging the war (Taliaferro, 1997), this created negative utility to the Japanese efforts.)	High	-	**Invade French Indochina**	Slightly Risk prone	High probability of increased U.S. economic sanctions
	Increased U.S. economic sanctions and outright embargo of critical material (scrap iron and petroleum)	High	-						
Execute a pre-emptive strike against U.S.	Successful attack would severely hamper existing U.S. offensive capabilities in the Pacific Ocean in order to allow unimpeded Japanese expansion into the Dutch East Indies. This would in turn put Japan in a position to defend for longer when the inevitable U.S. attack was launched (Russett, 1967).	Medium	+	Gradual exhaustion due to increasing economic dependency on the U.S. and draining of resources due to non-resolution of the China situation.	High	-	**Execute a pre-emptive strike against U.S.**	Moderately Risk prone	Low/Medium probability of positive utility
	Weakened U.S. resolve	Low	+						

Figure 11.   Analysis of Key Decision Points, COAs, Probabilities, Utilities, and Ultimate Risk Propensities of Japan leading up to Pearl Harbor.

Standard subjective expected utilities of the courses of action Japan chose (aggressively pursuing East Indies resources, aligning with Germany, invading Indochina, and ultimately attacking the U.S. pre-emptively) all left Japan with high probabilities of negative utility, thus SEU should have predicted they would not take these courses of action. However, as Japan was in the domain of loss as established earlier, prospect theory would predict their willingness to take greater risks and overvalue the utility of predicted outcomes. Their emphasis on loss minimization, with minimal exceptions, belied a tendency to escalate. The majority of their decisions reflected escalation as they invaded sovereign territories, allied with fascist powers, and attacked the U.S. Though at some points they did offer to negotiate with the U.S. (risk averse per Linnington model and suggestive of de-escalation), they simultaneously advanced their expansionist strategies and prepared for what some in the Japanese administration deemed inevitable war with the U.S. Thus it seems prospect utility theory explains Japan's decisions and actions in defiance of U.S. deterrence better than does SEU.

d.   *Overall Analysis of Japan's Risk Profile and Implications for Rational Deterrence*

Overall, Japan viewed itself as expansionist but for extrinsic, strategic gains and with an inferior balance of capabilities to wit: their limited organic resources. Their will to carry out expansionist agenda seemed as though it should be less strong than that of a nation defending its intrinsic interests. Various Japanese leader reservations about their inferior balance of capabilities throughout the developments prior to Pearl Harbor, in addition to their strategic (vice intrinsic) interests, suggested Japan should have had a questionable unified national will. However, ultimately the Japanese did ultimately defy U.S. deterrence and attacked Pearl Harbor, thus there is little question of their will to undertake this tactical action. Such revelation requires differentiation between will to conduct certain strategic plans vs. will to conduct specific tactical actions. This point suggests that national will to pursue strategic interests is not a significant factor in predicting the efficacy of deterrence against specific actions. Japan may have been less willing to pursue their expansionist agenda (as evidenced by their ultimate capitulation after Hiroshima/Nagasaki), but perfectly willing to attack Pearl

Harbor, a discrete, short term event. This has implications for the efficacy of deterrence against current threats: if adversary actions are discrete events, as opposed to sustained engagements, then the strategic will of determined adversaries is insignificant. Especially since terrorists such as Al-Qaeda envision a 400 year plan" to change the strategic environment, and deterrence focuses on deterring acts of terrorism. Capabilities are also less significant since terrorist actions, whether sponsored by nation states or not, are the tools of the capability-inferior and do not require much.

Throughout their confrontation with the U.S. prior to Pearl Harbor, Japan was a risk prone loss minimizer. Despite the prediction from analysis of Japanese strategic culture that risk aversion would be reflected in the decision making, risk proneness actually dominated. A possible explanation for this is that collectively, the Japanese government preferred taking risks even though its individual members displayed risk aversion vis-à-vis preferences of avoiding internal confrontation. Given the Japanese mentality of withholding dissent and collectivist thought, once the proposition of going to war was submitted, it is unlikely that serious objections and debate would have ensued; thus despite risk averse individual tendencies, the groups dynamics inherent in Japanese culture would have prevailed. Also, this was likely due to their position in the domain of loss and relative emphasis on loss minimization; prospect theory predicts that those in the domain of loss are more likely to take risks (Tversky, 1981) Japan pursued various courses of action at specific key decision points, the preponderance of which had with possible outcomes with high probabilities of negative utility or low probabilities of positive utility. Japan's resources dwindled as these decision points came and went, and the balance of capabilities shifted further to Japan's increasing disadvantage and further from their reference point (establishment of New East Asian Order) and Japan consequently moved further into the domain of losses. Interestingly, Japan's loss minimization supports Lebow and Stein's (1989) assertion that not all challengers to deterrence are risk prone gain maximizers. Prospect theory seems to explain their tendency to act contrary to what standard expected utility calculations would predict;

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since they were dissatisfied with the status quo, in the domain of loss, they took gambles in the hope that some gain would come out of them, despite high likelihood of negative utility.

These findings support some specific points of prospect theory: that "another property of the value function [of the prospect utility equation] is that the response to losses is more extreme than the response to gains" (Tversky, 1981, p. 454). Japan took great risks because they perceived themselves in a position of loss relative to their envisioned reference point: the establishment of the New East Asian Order. Berejikian (2002) argued that "losses have a greater subjective effect than do equivalent gains" (p. 168); Japan framed its decisions mostly in terms of loss and this framing thus influenced its actions in spite of objective utility/probability calculations. However, these findings also suggest that those who *prefer loss minimization* (acting or not acting to avoid outcomes with negative utility) will act contrary to what SEU predicts. They will escalate despite the high probability of bad outcomes.

3. Cuban Missile Crisis Qualitative Analysis

a. USSR Strategic Culture

USSR strategic culture was examined in detail by RAND (1977). They suggested a framework in which Soviet culture could be evaluated: (1) unique aspects of the Soviet strategic position, especially the preponderance of conventional (non-nuclear) forces the Soviet Union has generally enjoyed in regions it is heavily committed to defend; (2) historical legacies, especially from WWII; (3) Marxist-Leninist modes of analyzing the strategic balance and the world "correlation of forces"; (4) the Soviet economic and technical base, especially its inferiority to that of its primary strategic competitor; (5) the "high politics" of leadership succession and resource allocation, broadly defined; and (6) the "low politics" of bureaucratic and professional interests and the effect of institutional arrangements on problem formulation and policy output (p. 8).

Before this analyzing the Soviet strategic culture via this framework, it is worth noting that there has traditionally existed in the USSR a dichotomy between the academic emphasis on deterrence and the military emphasis on efficient war fighting.

There have been some in Soviet history who believe nuclear war is unwinnable and thus prefer deterrence; conversely there are those, predominantly in the military, who stress war fighting capability (RAND, 1977). Some Soviets have attempted to blend these seemingly distinct notions; after all, what could be more effective deterrent than a strong war fighting capability (RAND, 1977)? However, these synthesis proponents seem to represent the minority. Thus if Khrushchev subscribed to the second theory, he would prioritize the buildup of offensive capability in Cuba over threats from the U.S. Based on his actions, it seems reasonable to conclude that he preferred emphasis on war fighting superiority. One school of thought believes the USSR favors the "immediate political utility of a favorable balance of forces rather than the conceptual esoterica of intrawar conflict theory" (RAND, 1977, p. 22). Again, the USSR has preferred to focus on military buildup rater than political and academic debate. This notion is supported by SAIC (2006a): "by early modern times (1600–1700) military power became the chief institutional foundation of Russian statehood." SAIC contends that this foundation has continued into present times.

The USSR's apparent disregard for game theoretic analysis of conflict is posited by RAND as well. The general risk propensity of USSR decision makers, then, can be preliminarily deduced as risk prone. Without thorough analysis of the ramifications of various courses of action, this suggests proclivity to take risks or even act under uncertainty, an arguably even more risky strategy. In other words, the likelihood of negative utility of a course of action (the "big picture") might not even be considered if only the military effectiveness of that COA dominates decision maker discussions. Thus, without knowledge of risks the decision makers would be acting irresponsibly. However, a different perspective on historical Soviet risk propensity is inferred from SAIC (2006a). He contends that "Russian strategic leadership has been…notably risk averse at the level of action and operations" (p. 7). Furthermore, "despite embracing and effecting in their force building a plausible theory of victory in nuclear war, Soviet leaders recognized that large scale use of nuclear weapons could probably sweep away the battlefield for mass warfare and destroy their homeland. This

appreciation certainly reinforced their aversion to risk of confrontation" (SAIC, 2006a, p. 9). Taken together, these characterizations suggest a neutral Soviet risk propensity, neither particularly risk prone nor risk averse.

With respect to the unique aspects of the Soviet strategic position, Soviet conventional forces have traditionally been more than sufficient to defend the USSR strategic interests (RAND, 1977). They had not needed to seriously consider the intricacies of limited nuclear warfare. Thus, their domain of gains and favorable balance of capabilities in this respect, especially on the Eurasian continent, did not warrant effort to analyze such intricacies. SAIC (2006a) adds: "Russian strategic and military cultures have from earliest times prized and exploited a resource in which Russia was rich: masses of military manpower" (p. 5). This supports a historically favorable balance of USSR conventional military capabilities.

With respect to historical legacies, the Soviet thought process resulting from having suffered through World War II was that other countries' promises were not to be trusted. Germany's renege of the German-Soviet Non-Aggression Pact surely was remembered by Soviet war veterans and the political leadership. Thus the Soviets believed,

> History has taught the Soviet Union to depend mainly upon itself in ensuring its security…the Soviet people will hardly believe that a potential aggressor will use humane methods of warfare, and will strike only at military objectives, etc. The experience of the last war, especially its aerial bombardments and in particular the combat use of the first atomic bombs, is all proof to the contrary. That is why the Soviet Union attaches importance to making as invulnerable as possible not only its nuclear-rocket deterrent but also its cities and vital centers, that is, creating a reliable defense system for the greatest number of people…When the security of a state is based on mutual deterrence with the aid of powerful nuclear rockets it is directly dependent on the goodwill and designs of the other side, which is a highly subjective and indefinite factor. (RAND, 1977, p. 28)

This revelation captures the betrayal the USSR felt from the previous conflict and underlies their distrust of promises and by inference, their disregard of threats, thus suggesting they would respond poorly to adversarial deterrence efforts

(threats, promises of nonaggression, escalatory measures, etc). Furthermore, the Soviet culture focuses on past defeats prior to World War II: Russian children learn that their country was complicit in starting World War I due to their mobilization in response to Serbian defeat at the hands of Austria-Hungary; and even this action emphasizes loss—they did so because they were embarrassed by Austria-Hungary in the Bosnia annexation crisis (Lebow, 1983).

This further supports the notion that Soviet leadership would be risk prone and approach decision making under complete uncertainty; without faith in the promises or threats of adversary, these variables are excluded from the decision making calculus and thus probabilities of certain outcomes are trivialized if at all considered. This attitude also suggests an emphasis on loss; focusing on the detrimental effects of previous conflicts as motivation to increase a certain defense posture, rather than focusing on the potential gains to their society which would result from their projection of strength. Perhaps this distrust of promises stemmed in part from a communist belief in the unreliability of capitalist statements; indeed other communist nations (China, Albania, and Cuba, to name a few) challenged the reliability of verbal assurances from capitalist nations (Lebow, 1983). The Soviet fear of U.S. mobilization towards the capability of "first strike doctrine" (Kahan, 1972, p. 565) additionally supports this attitude, as do further U.S. statements to similar effect: Kennedy's claim in 1962 that "in some circumstances we must be prepared to use nuclear weapons at the start [of a conflict]" (Kahan, 1972, p. 565).

Finally, the Soviet strategic culture has been dominated by military professionals seeking to influence policy decisions. There has been a prevailing preference for Soviet military commanders to err on the side of militarily-effective tactics when presented with the option to consider nuances of limited nuclear war (RAND, 1977). Thus, consensus building would default to this preference for simplifying options; indeed, RAND (1977) argues that if Soviet leadership is "only marginally concerned with the fine points of operational doctrine and force posture, it seems reasonable that they would tend to adapt themselves to the thinking of military professionals on these matters" (p. 34). While the Soviet military has not staged an overt coup of decision making—

"despite the enormous importance of the military as an institutional base and legitimizing symbol of Russian statehood and power, there is little tradition of direct or active military intervention in Russian politics" (SAIC, 2006a, p. 4), they have nonetheless been able to influence policy making vis-à-vis the nature of their advice to civilian policymakers. As RAND (1977) puts it, "military organizations can insinuate their preferences into the crisis decisions of the political leadership by the character of the professional-technical advice they offer" (p. 35).

In sum, these proclivities in Soviet strategic culture suggest that the USSR's foreign policy would (1) be characterized by an overall neutral/slightly risk prone risk propensity, (2) be developed and executed from a domain of gain but bordering on the domain of loss, and (3) emphasize loss minimization. Furthermore, military efficiency would likely be an overriding concern as opposed to debates over deterrent/game theoretical implications during crisis deliberations.

b. *The Strategic Environment Prior to the Cuban Missile Crisis*

The U.S. and USSR vied for strategic influence throughout the world beginning with the conclusion of World War II. A military arms buildup ensued with both sides vying for strategic primacy. As a consequence of the arms race and the worldwide competition to spread capitalist democratic and communist influence, respectively, the U.S. and USSR were involved in a timeline of escalating events. These events warrant elaboration in order to demonstrate the strategic backdrop against which U.S. attempted to deter the USSR.

In 1958 the Cuban government of Fulgencio Bautista succumbed to communist-inspired rebels led by Fidel Castro, who implemented a communist government. In 1960, the USSR shot down a U.S. aerial reconnaissance flight over Soviet airspace, capturing the pilot and exacerbating tensions. In April of 1961, the U.S. led the Bay of Pigs invasion, attempting to overthrow the communist Castro regime in Cuba. This invasion failed and as a consequence, the U.S. administration faced great embarrassment and the USSR perceived the U.S. as irresolute in conflict (Lebow, 1983); however, the USSR fear of another invasion was increased and Khrushchev even

confessed to Kennedy in writing that the Bay of Pigs attempt was justification for placing missiles in Cuba (Kahan, 1972). In June of 1961, the Vienna Summit was held wherein Khrushchev threatened to undermine the post-WWII treaty laying out conditions for the governance of Berlin, claiming he would sign a separate peace treaty with East Germany (Absher, 2009). That same month, a U.S. national intelligence estimate (NIE) predicted that the USSR possessed 50-100 intercontinental ballistic missiles, though this estimate was later discredited; many fewer missiles were believed to exist (Absher, 2009). Later, in September 1961, the U.S. would conclude that the alleged "missile gap" or U.S. strategic missile inferiority was untrue; by U.S. intelligence calculations the U.S. was strategically superior to the USSR and U.S. government officials delivered a speech to the effect that the USSR had been bluffing (Absher, 2009). The missile gap theory had been emphasized during the 1960 U.S. Presidential campaign (Kahan, 1972). Despite the discovery of the falsity of that theory, the U.S. continued its defense spending; it tripled the rate of Polaris submarine construction and doubled the production of Minuteman rockets (Kahan, 1972).

The escalatory pattern continued when Kennedy, presumably in response to Soviet threats and weapons development, delivered a speech citing U.S. reservist activations, an increase in U.S. nuclear forces, and an increase in conventional military forces in West Germany (Absher, 2009). Shortly thereafter, the Berlin Wall was erected in August 1961, dividing East and West Germany through Berlin. The USSR followed this provocative act with an equally if not more provocative deed: resumption of nuclear testing in contravention of their earlier commitments at the Vienna Summit (Absher, 2009). Hoping to redeem itself after the Bay of Pigs, the U.S. government began planning Operation MONGOOSE, another covert overthrow of the Cuban government (Absher, 2009).

Meanwhile, the USSR decided in spring of 1962 to put missiles in Cuba. In May 1962, USSR officials met with Castro to get his consent, and subsequently the Soviet government finalized the order to ship the missiles which were delivered in a surge in later July 1962 (Absher, 2009). In a failed attempt at conciliation, the U.S. publicly expressed interest in discussing nuclear testing bans, whereafter the USSR

continued to test nuclear bombs (Absher, 2009). That same month, U.S. reconnaissance detected missiles in Cuba, though did not determine them to be offensive weapons (Absher, 2009). Arguably demonstrating resolve, the Soviets revealed to the U.S. in September 1962 their intent to supply arms to Cuba (Absher, 2009). However, this statement was tempered by the claim that the Soviets would never put *offensive* missiles into Cuba. This promise was repeated several times through different channels (Lebow, 1983). Kennedy warned the Soviets against doing so, and claimed that the "gravest issues would arise if the U.S. discovered evidence of "offensive ground-to-ground missiles" (Absher, 1960; Lebow, 1983). Despite the U.S. warnings, the USSR continued construction of offensive missiles launch sites in Cuba in September 1962. After some debate over the efficacy of reconnaissance flights over Cuba, the U.S. ultimately launched several flights which were unsuccessful in locating offensive missiles, but ultimately a flight on 14 October 1962 confirmed their presence (Absher, 2009), at which point the U.S. had evidence of the nuclear threat posed and of Soviet duplicity. This discovery unbeknownst to the Soviet government, Soviet diplomats again assured Kennedy that the USSR would not place offensive nuclear missiles in Cuba (Absher, 2009).

In response to this threat, the U.S. initiated a naval blockade of Cuba. Kennedy delivered a speech on 22 October 1962 confirming U.S. knowledge of offensive missiles in Cuba, and prepared for military invasion of Cuba. Several vessels bound for Cuba turned around in response to the blockade. As tensions continued to mount, a Soviet functionary attempted to negotiate a deal with an American television executive: if the U.S. would guarantee not to invade Cuba, the USSR would agree to withdraw the missiles (Absher, 2009). The very next day, Khrushchev himself delivered a radio address asking additional terms on the original offer; that the U.S. withdraw missiles from Turkey. The U.S. government decided to disregard the second request and responded to the first (Absher, 2009). Finally, on 28 October 1962, Khrushchev announced the USSR would withdraw their missiles from Cuba, signaling a capitulation in the confrontation.

Unlike the Japanese dilemma prior to Pearl Harbor, the Soviets were not economically dependent on the U.S. However, as Japan envisioned their ideological New East Asian Order, the primary motivation for the USSR throughout the Cold War was to counter U.S. strategic influence in the world and spread their own ideology. It is also worth noting the political environment in which this escalatory cycle occurred: the Congressional elections of 1962. Much of the U.S. government's public statements were communicated through private channels to the Soviet government and thus reinforced; particular emphasis was placed on convincing the USSR that Kennedy's statement concerning Cuba and U.S.-Soviet relations were not empty campaign rhetoric; they were instead sincere (Lebow, 1983).

(1)   USSR Self Assessment and Analysis

(a)   Identity. The USSR wanted to "support revolutions around the globe in the name of international communism" (Pfister, 2005, p. 17) throughout the Cold War. Khrushchev had "an ideological mindset that believed history was on the side of socialism and communism, and that capitalism and constitutional democracy were weak and would ultimately be defeated by communism and the Soviet Union" (Absher, 2009). Thus the perceived inevitably of communism conquering the rest of the world was surely an identity which motivated the USSR to challenge U.S. influence and their deterrence.

(b)   Will as a function of Interests. While prior to Pearl Harbor the Japanese envisioned a New East Asian Order, their most immediate incentives for defying U.S. deterrence were economic in nature. In contrast, the Soviet interests in spreading their influence were arguably more strategic and ideological-to spread the influence of Communism and redress the strategic nuclear balance with the U.S. According to some accounts, the strategic balance was more salient to the USSR during the years leading up to the Cuban Missile Crisis than was the grander scheme to spread Communism (Pfister, 2005). The USSR had a strong interest and motivation to redress the balance of strategic forces (Kahan, 1972).

Consistent with Lieberman's (1995) emphasis that intrinsic interests such as self preservation are generally more salient in decision making than are external,

strategic interests such as gaining strategic territories, the USSR ambition to equalize the strategic balance with the U.S. reflected strategic interests rather than intrinsic interests, although arguably to a lesser degree than Japanese interests. To explain, while Japan faced the loss of economic security necessary to achieve their strategic ambitions of the new order, the USSR faced the loss of strategic equality which had implications for their status quo: the USSR government feared the U.S. was developing first strike nuclear capabilities and indeed made statements that were likely interpreted by the USSR to mean that the U.S. was intent on executing said capabilities (Kahan, 1972). In other words, the consequences of failure would have mean Japan reverted to their status quo, whereas failure to equal the U.S. strategically would have meant inferior war fighting capability and thus a threat to the survival of the Soviet status quo.

Thus unlike Japan, the USSR conceivably felt under threat against their intrinsic geography and interests given their concern over U.S. nuclear first strike capability development, irrespective of their concurrently held, strategically focused external ambition of spreading communism. Consequently, it would seem likely that Soviet will to engage in hostilities in defiance of U.S. deterrence efforts would be quite high, though not as high as an actor directly threatened with aggression on its own territory. Indeed, Soviet fears were greatly exacerbated by U.S. strategic superiority (Kahan, 1972). Another way to consider this claim that the USSR was not intrinsically threatened in the pure sense of Lieberman's framework is to consider the following hypothesis: had the USSR not engaged in efforts to expand communist influence, there would have presumably been less need for the U.S. to continue developing nuclear weapons and make threatening statements. This would have relieved some threat against the USSR homeland. Soviet strategic ambitions, in an indirect way, brought about an intrinsic threat on themselves.

(c)   Capabilities. Though conventionally superior on their home soil, and in regions they have been heavily committed to defend (RAND, 1977), the Soviets were strategically (nuclear) inferior to the U.S. prior to the dawn of the Cuban Missile Crisis (Kahan, 1972). USSR motivation for putting missiles into Cuba was presumed a response "to their needs to redress the strategic balance" and a solution "to compensate

for Soviet strategic inferiority" (Lebow, 1983, p. 453; Kahan, 1972, p. 567). This inferiority was the subject of Soviet political debate in the 1950's and 1960's (RAND, 1977). With the exposure of the falsity of the missile gap theory via as U.S. National Intelligence Estimate (Absher, 2009), the USSR's strategic inferiority was revealed to the U.S. Horelick (1964) offers more detailed insights into the USSR nuclear capabilities:

> From the start, the bulk of the USSR's strategic nuclear capability has been effective only out to ranges of about 2000-2500 miles. The Soviet Union acquired a very potent nuclear capability against Western Europe…but the Soviet heavy bomber and ICBM force—that is, the long-range weapons required to reach the United States-did not attain the strength levels that Western observers anticipated they would reach in the 1960's. Inflated beliefs in the West, actively promoted by misleading and deceptive Soviet claims, that the Soviet Union was rapidly acquiring a large intercontinental strike tended, until the fall of 1961, to deprive continued and even growing U.S. strategic superiority of much of its *political* value. (p. 374)

The Soviets were conventionally inferior in the Western hemisphere (Kahan, 1983). Thus while American nuclear power neutralized the USSR's, U.S. conventional superiority also cancelled the USSR's conventional capabilities (Kahan, 1972). The U.S. was additionally planning to improve their existing nonnuclear capabilities, threatening to deprive the USSR of their longstanding superiority in that area (Kahan, 1972, p. 567). USSR fears of nuclear conflict were exacerbated by U.S. strategic superiority (Kahan, 1972), and combined with U.S. conventional superiority in aggregate, the USSR capabilities for war fighting were left wanting. Kahan (1972) believed that not only was U.S. strategic superiority a significant deciding factor in influencing Soviet behavior, "the overwhelming U.S. conventional superiority in that area added to Khrushchev's apprehensions and contributed greatly to the Soviet decision to acquiesce" (p. 580).

In sum, the USSR viewed itself as destined to expand their ideology around the world, so assuredly expansionist but for extrinsic, strategic goals, albeit less extrinsic and more intrinsic than Japan's intentions, and with sufficient resources but with a quantitatively inferior balance of capabilities.

c. USSR specific factors

(1) Risk Propensity

(a) Domain. The USSR was arguably approaching a domain of losses prior to the Cuban Missile Crisis. Horelick (1964) sums it up thusly:

> It had become evident, since at least the second half of 1961, that the forward momentum of the Soviet Union in international affairs had largely exhausted itself without yielding the gains which the Soviet leaders had anticipated and the West had feared since the mid-1950s. These expectations had been fed by mounting evidence of the growing military, scientific, technological, and economic power of the Soviet Union vis-à-vis the West. Some of this evidence was real enough, but much of it, particularly in the realm of strategic power, was illusory. (p. 376)

The USSR had some economic difficulties to deal with internally, particularly some failed agriculture reforms (Lebow, 1983), but was not desperate for resources as was Japan prior to Pearl Harbor. Politically, the USSR used diplomacy throughout the confrontation in the years leading up to the missile crisis, but at the same time were testing nuclear weapons. Per the Linnington (2004) model, diplomacy reflects domain of gains, but military action reflects a shift into the domain of losses. It can be assumed that preparing for hostilities means a nation feels it is on the precipice of entering the domain of loss. The USSR diplomatic correspondence with the U.S. reflected a Soviet predisposition to caution; they sought to convince the U.S. of good intentions:

> The Soviet statements, both public and private, appeared to indicate Soviet recognition of the nature and the gravity of the American warning. They can only be interpreted as assurances to Kennedy that Moscow understood and respected American strategic and political interests. (Lebow, 1983, p. 433)

Credibility and signaling, two key deterrence concepts, were utilized here by the USSR: they sought to convince the U.S. of their credibility to wit: they would not provoke by placing weapons in Cuba, and they clearly signaled this intent via diplomatic correspondence. Internal politics and foreign politics exogenous to the USSR-U.S. relationship may have played a role in the overall USSR domain leading up to the missile crisis. Lebow (1983) claims that many international crises can "readily be traced to grave

foreign and domestic threats that leaders believed could only be overcome by aggressive foreign policy" (p. 451). Domestically, there was some infighting over the adequacy of Soviet strategic expenditures in the 1950s (RAND, 1977), putting the Soviet government in the proximity of domain of loss in terms of military strategy. Lebow (1983) further argues that the USSR risked its relationship with China by deescalating prior to the missile crisis, and a serious conflict within Soviet leadership ranks would have resulted as well (p. 455). Horelick (1964) seconds this notion of a deteriorating relationship; "the Chinese Communist attack on Khrushchev centered precisely on the unfavorable trend in the cold war which the Chinese attributed to Khrushchev's faulty and overcautious leadership" (p. 377).

The building of the Berlin Wall is difficult to place within the general framework of the Linnington (2004) model of domains. The overall classification of options in the domain of losses is "political/military intervention" (p. 19), thus political actions could be construed as reflected domain of loss, yet none of Linnington's more specific examples are strictly political in nature. Building a wall dividing a major city is arguably a measure intended to have certain political effect. It is thought that this represented an attempt to keep people from fleeing East Berlin to West Berlin (Lebow, 1983); thus the USSR must have feared a loss in their efforts to spread communist ideology. Additionally, the East Germans faced the loss of labor and knowledge, something the Soviets may have feared would negate their ability to control East Germany. A political objective of the USSR was to "reduce the refugee flow to tolerable proportions" (Director of Central Intelligence, 1961, p. 1) Thus in terms of their envisioned future state of widespread communist influence, the Berlin issue would have represented a tactical setback and reflected proximity to the domain of losses.

Militarily, the USSR was certainly in the domain of loss (independent of the Linnington scale). As established earlier, they were conventionally and strategically inferior to the U.S. prior to the Cuban missile crisis. Traditionally the USSR had been conventionally superior to the U.S., counterbalancing the U.S. nuclear advantage to an extent (Kahan, 1972), but the exposure of the temporary myth of the missile gap made the overall military domain of loss transparent. The USSR faced a "sizeable and growing

U.S. strategic missile force" (Kahan, 1972, p. 565). This nuclear gap was especially salient given their strategic culture view point of war fighting effectiveness at the expense of game theoretic and intrawar deterrence analysis (RAND, 1977). This salience contributed to their overall military domain of loss. RAND also suggests,

> In the historical context of Soviet strategic inferiority, however, it becomes apparent that the operational meaning of such statements [that war is likely, surprise can be decisive, and nuclear war can be won] during the 1950s and early 1960s was that nuclear war could be lost, that the soft and miniscule Soviet deterrent was vulnerable to pre-emptive attack, and that such a posture increased the likelihood of war. (p. 25)

Thus the USSR recognized its shortcomings in the overall military balance.

As the USSR moved to close this exposed gap, they moved further toward the domain of losses with respect to U.S. relationships prior to the missile crisis. Soviet progress in developing a contingency plan for war preparation in the event that U.S. foreign policy changed to immediately threaten Soviet sovereignty was evidence of this shift. By the time they actually deployed missiles to Cuba, the USSR was most certainly on the brink of being in the domain of loss; their diplomatic means simply a ruse to dissuade the U.S. of their true intentions. Politically, they moved further towards the domain of loss as world reaction to the exposure of the presence of offensive missiles in Cuba was generally favorable to the United States (Absher, 2009).

Unlike Japan, which challenged U.S. deterrence already in the domain of loss (having been at war with China and economically desperate), the USSR was not in the domain of losses per Linnington, but was teetering on the precipice. Politically and militarily, this was most evident. Furthermore, Western Europe's prosperity and growing political unity (Horelick, 1964) meant the USSR was not keeping pace. Per prospect theory, the USSR would evaluate their standing relative to a reference point. This reference point was surely one in which they would be positioned to ensure the spread of communism over as much of the world as possible. In Vienna, Kennedy urged Khrushchev to agree to respect the political status quo in the Third World (Lebow, 1983); something Khrushchev claimed was not possible. The USSR also wanted an effective deterrent against U.S. attacks and more narrowly, the USSR wanted presence in the

Western hemisphere and a deterrent against a U.S. invasion of Cuba. The USSR was not at any of those reference points prior to the missile crisis; thus, analysis of the USSR's domain prior to the Cuban Missile Crisis predicts slight to moderate risk proneness as their overall risk propensity. Slight to moderate risk proneness is predicted by the close proximity to the domain of loss per Linnington (2004) and domain of loss in specific areas (political, economic, and military) independent of Linnington.

(b)   Likelihood of Certain Outcomes. At key junctions in the escalation of events involving the USSR and the U.S., the USSR assessed the likelihood of various possible outcomes resulting from certain courses of action (COAs). Soviet assessment of the probabilities that certain outcomes would occur will give indication of their risk propensity (risk averse or risk prone) when combined with the cost benefit analysis of those courses of action. This latter concept will be discussed in the subsequent analysis of USSR relative emphasis on loss or gain and utility calculations.

Using the Russett (1967) framework for calculating whether the utility x probability of U.S. aggression against Cuba, added to the utility x probability of U.S. nonaggression, would exceed the utility of peace (withdrawal of missiles),

$$W (s) + A (1\text{-}s) > P \text{ (Eq. 8)}$$

it can be predicted that the subjective USSR probabilities of war with the U.S. in response to missile emplacement and possible subsequent launch were high, and thus the possibilities the U.S. would not respond aggressively were low. Probabilities of war continued to be high after the missiles were discovered by the U.S., and thus probabilities of U.S. inaction were low. Thus since the USSR ultimately withdrew the missiles, the utility of peace must have exceeded the utility x probability of war with the U.S. combined with the utility x probability of Soviet aggression without U.S. response. There are two main decision junctions for which there is evidence of USSR estimation of outcome probabilities: (1) deciding whether to place missiles in Cuba, and (2) deciding whether to withdrawal the missiles after U.S. discovery.

(i)   Junction 1: Deliberation over placing missiles in Cuba

The Soviets appeared to estimate a high probability of U.S. retaliation if missiles were to be placed in Cuba. Their official statements indicated their recognition of the nature and gravity of the U.S. warnings (Lebow, 1983). However, their ultimate actions of placing the missiles despite assurances to the contrary suggest two possible explanations: (1) the USSR government in reality did not believe a high probability of U.S. aggression, or (2) they did believe a high probability but were not concerned; the costs of U.S. aggression may not have outweighed the perceived benefits of emplacing in Cuba nuclear missiles capable of destroying U.S. cities. The probability and utility of alternative courses of action may have seemed less desirable as well. The second possible explanation will require elaboration in later analysis.

To the first possible explanation, there are some who are convinced the USSR thought a low likelihood of U.S. aggression in response to offensive missile emplacement. Lebow (1983) suggested "the entire scheme [of negotiating issues in Germany, China and Formosa] rested on the ability of the Soviets to install their missiles in Cuba without the missiles being detected by the Americans" (p. 435). This school of thought suggested that the U.S. would actually be grateful to the USSR for presenting an opportunity to negotiate various political issues. Additionally, George and Smoke (1974) believed the USSR underestimated U.S. resolve and thus predicted low likelihood of U.S. aggression: "clearly, this misestimate of their opponent could only strengthen their belief that the missile deployment would not entail excessive risks" (p. 465). According to the Executive Committee (EXCOM) of the U.S. National Security Council, Khrushchev allegedly believed the American people were too timid to risk nuclear war and too concerned with legalisms, and would only protest upon discovery (Lebow, 1983, p. 448).

Additionally, Horelick (1964) offers that the USSR's perception of U.S. will to engage in military action against Cuba was negligible given past experiences with withdrawal from the Bay of Pigs conflict. Also, the U.S. appeared to accept increasing Soviet involvement in Cuban affairs (p. 380). As the USSR continued to ship military supplies to Cuba, they may have believed the U.S. was uncertain as to what to make of the increase in covert shipments; but the USSR resolved this in favor of assuming U.S.

acceptance (Horelick, 1964, p. 380). Despite Kennedy's statements to the effect that the U.S. would take action given the presence of offensive weapons, even absent an overt act using those missiles, the USSR allegedly believed high probability that the U.S. would restrict such action to diplomacy (Horelick, 1964, p. 381). The U.S. might even have become "accustomed" to the presence of missiles in Cuba over time (Horelick, 1964, p. 381). Finally, the USSR believed that the U.S. would feel obligated to consult with NATO and the Organization of American States (OAS) to determine what course of action to take in response to missile discovery, and that would be a burdensome process, so the USSR felt confident in the probability that unilateral U.S. response would not occur (Horelick, 1964, p. 383).

However, Khrushchev wrote in his memoirs, "we shipped our weapons to Cuba precisely for the prevention of aggression against her" (Lebow, 1983, p. 436). This indicates that the USSR did indeed predict a high probability of U.S. invasion and aggressive action regardless of the provocation a missile discovery would cause. In other words, Khrushchev may have predicted an invasion of Cuba would occur even without missile discovery, and thus deployed missiles to deter this undesirable event. If he assumed high probability of aggression without provocation, it seems reasonable to assert that Khrushchev also assumed high probability of U.S. aggression with provocation, possibly even a higher probability than without provocation. Intuitive as this may appear, it resonates with the assertion that "Kremlin leaders began to fear that the U.S. was moving, as it had in the mid-1950s, toward a first-strike doctrine or at least was acquiring a substantial counterforce capability which could endanger the Soviet deterrent" (Kahan, 1972, p. 565). Furthermore, the statements that "in some circumstances we must be prepared to use nuclear weapons at the start" and U.S. Secretary of Defense McNamara's "no-cities" doctrine calling for attacking only military targets (Kahan, 1972, p. 565) surely convinced the USSR of a high probability of U.S. action against Soviet interests; if the U.S. appeared to be mobilizing for an unprovoked attack on Cuba, surely provocation would mean similar or even higher certainty of a U.S. attack. Finally, the Bay of Pigs

incident convinced Khrushchev of a high probability of U.S. attack on Cuba, it "forced him to emplace missiles on the island" (Kahan, 1972, p. 570). Horelick (1964) supports this:

> It must have appeared to Khrushchev, then, that the United States had not only been prepared to attack Cuba *despite* the presence of Soviet weapons, but precisely *because* the weapons had been brought in. (p. 368)

In addition to estimating the probability of U.S. action in response to missile discovery, the USSR also had to consider the probabilities that the U.S. would actually detect the missiles. To this point, Haas (2001) offers some insights. Khrushchev arguably believed a high probability the U.S. would indeed detect the missile shipments to Cuba; it was the largest amphibious deployment in USSR history, and took place so close to the U.S. (Haas, 2001). Additionally, the USSR estimated a high probability of U.S. discovery once the missiles were emplaced in Cuba and site construction began; the USSR knew that U.S. spy planes regularly overflew Cuba; the USSR knew the technical quality of reconnaissance from those planes, and Khrushchev both emplaced surface to air missiles on Cuba and simultaneously endeavored to convince Kennedy to discontinue reconnaissance overflights (Haas, 2001). Thus, overall the USSR predicted a high likelihood of U.S. discovery of their emplaced missiles. This could only support their predictions of U.S. aggression.

Lebow (1983) offers a convincing argument in favor of USSR estimates of high probability of U.S. aggression: he examines an analysis of the ambivalent U.S. commitment to action if missiles were discovered. Allison argues that Kennedy's public statements should have demonstrated resolve to the USSR and thus convinced the USSR of high likelihood of U.S. aggression; however the USSR could have also interpreted these statements as empty political rhetoric timed with the American election cycle (Lebow, 1983, p. 444). However, Lebow then argues that since the Kennedy administration reiterated their position via private channels to the Khrushchev administration, that should have sufficed as evidence of the U.S.'s resolve and thus the USSR should have been convinced of the high probability of U.S. aggression in response to missile discovery.

Furthermore, Lebow (1983) suggests that the USSR should have estimated a high probability of U.S. retaliation given previous U.S. failures, especially at the Bay of Pigs, in contrast to Horelick's (1964) earlier suggestion that the Bay of Pigs failure should have meant low probability of U.S. aggression. Prospect theory predicts that those in the domain of losses will take greater risks than those in the domain of gains. The Bay of Pigs failure could certainly be construed as a tactical fiasco for the U.S. and thus their resolve to succeed in future engagements would be greater, increasing the likelihood of aggressive action upon missile discovery. The U.S. would want to demonstrate their resolve after failure at the Bay of Pigs by pushing for aggressive action. The U.S. had also demonstrated success in foreign policy throughout Europe during the Cold War; "during the course of the Berlin campaign and probably by the end of 1961, the Soviet leaders became sufficiently convinced of quality of the West's will to resist" (Lebow, 1983, p. 449). Finally, particularly noteworthy is a USSR report issued in 1960 acknowledging that two conditions most likely to provoke a U.S. attack on Cuba would either be an invasion of Guantanamo by the Cubans, or an attempt by the USSR to place nuclear missiles in Cuba (Haas, 2001, p. 256). This report was held in high esteem by the USSR as a reliable estimate of probabilities. Thus, the preponderance of evidence shows the USSR did indeed perceive a high probability of U.S. aggressive action in response to missile discovery.

The USSR estimated probabilities that emplacing missiles within Cuba would have other consequences in addition to provoking U.S. aggressive action. One possibility was a high probability that placing nuclear missiles 90 miles off of U.S. land would encourage the U.S. to reconsider their missile bases (in Turkey, Italy and England) which were capable of reaching the USSR (Kahan, 1972). There was also a probability that missiles in Cuba would convince the U.S. to renegotiate terms governing Berlin (Kahan, 1972). Finally, Khrushchev may have believed a reasonable probability that missiles in Cuba would spread Soviet influence throughout Latin America (Kahan, 1972). The Soviet optimism for probabilities of favorable outcomes is elucidated by Horelick's assertion:

But they [the USSR] probably anticipated that the emplacement of strategic missiles in Cuba and their acceptance by the United States would contribute *in some degree* (present author's emphasis) to the solution of a whole range of military-political problems confronting the Soviet Union and would alter the environment of the cold war in such a manner as to promote new opportunities for political gain. (p. 377)

Thus the USSR arguably predicted a reasonable (medium) likelihood of resolution of other issues in addition to a high probability of a U.S. invasion of Cuba.

Given the evidence that the USSR did indeed perceive a high probability of aggressive U.S. action in response to emplaced missile discovery, it seems more likely now that this did not initially deter the USSR from nonetheless emplacing the missiles. Thus, probabilities of alternatives (e.g., not placing missiles) must also be considered.

As to the second possible explanation of Soviet actions, in addition to estimating the probabilities of the consequences of putting offensive missiles in Cuba, the USSR also considered the probabilities of the consequences of alternative COAs. Particularly, the USSR believed a high probability of losing face with China if they discontinued their Cuban missile emplacement and site construction, and also internal Soviet political relationships would suffer (Lebow, 1983, p. 455). Additionally, the USSR feared a high probability they would be unable to keep political leverage in their future dealings with the U.S. and maintain their worldwide image as leader of communism (Kahan, 1972) if they failed to act assertively. In order to analyze how these estimates influenced the efficacy of deterrence, costs and benefits of the outcomes of each alternative course of action must be analyzed, and then modified by probabilities of those outcomes. Further analysis of costs and benefits of alternative courses of action will be discussed in Preferences (relative emphasis on loss/gain) below.

(ii)   Junction 2: Deliberation over whether to withdraw missiles. As the escalation continued after U.S. discovery of USSR offensive missile emplacement in Cuba, the Soviets presumed a high probability they could get assurances that the U.S. would not attack Cuba only if they agreed to withdraw the missiles (Horelick, 1964). However, given the earlier beliefs that generally the U.S. was planning to invade Cuba regardless of provocation, this estimate was tempered to a medium probability of a U.S.

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non-invasion pledge. The USSR also arguably assumed a high probability that the U.S. would attack them in response to a missile launch from Cuba; Kennedy promised "it shall be the policy of this nation to regard any nuclear missile launched from Cuba against any nation in the Western Hemisphere as an attack by the Soviet Union on the United States requiring a full retaliatory response upon the Soviet Union" (Horelick, 1964, p. 370). The USSR response to Kennedy's promise reflected Soviet concern that the U.S. might strike pre-emptively to prevent the strategic missiles from falling under Castro's control (Horelick, 1964, p. 370). Additionally, U.S. actions supported their words: U.S. overt mobilization of various armed forces elements to southern Florida (Absher, 2009) supported estimates of high probability of U.S. attack.

There were some developments indicating that the probability of U.S. aggressive action would wane. The implementation of the U.S. naval quarantine (implemented before Cuban missile sites were fully constructed and operational) reduced the Soviet estimation of U.S. likelihood of aggressive action. It weakened the USSR's position in the conflict, however, and subsequent U.S. success in gaining OAS approval of the quarantine surely increased the USSR estimate of probability of future U.S. aggressive action. Khrushchev believed the probability of war with the U.S. was virtually certain unless he removed the missiles (Haas, 2001). Finally, it is worth suggesting that the USSR strategic culture of distrusting cooperative intrawar strategies and their preference for strategic self reliance (RAND, 1977) surely exacerbated estimates of high likelihood of U.S. aggression. Thus overall the USSR perceived a high likelihood of U.S. aggressive action after discovery of the missile emplacement. In retrospect, Khrushchev's statements in December 1962 validated this Soviet estimate of probabilities: he took his decision to withdraw Soviet missiles from Cuba after receiving word that a U.S. attack was imminent (Horelick, 1964, p. 387). Regardless of the veracity of the U.S. intent to attack, the perception was that the situation was untenable due to high likelihood of an attack on Cuba. Overt escalation in U.S. military readiness vis-à-vis deployment of B-47 aircraft to auxiliary airfields (Horelick, 1964, p. 387) certainly contributed to Soviet estimates as well.

In summary, key decision points and USSR probability estimates of the outcomes of various courses of action available to them at those points are:

Place missiles in Cuba: The USSR believed in a high likelihood of U.S. aggressive action, if they placed offensive missiles in Cuba. U.S. statements, both public and private, to the effect that action would be necessary if such missiles were discovered, supported this probability estimate. Further, prospect theory/sunk costs predicted that U.S. failures in previous conflicts would make them more likely to engage in hostilities. The USSR also believed a medium probability that missile emplacement would resolve other potential political issues.

Remove missiles from Cuba upon U.S. discovery: The USSR believed in a high likelihood of U.S. aggressive action if they did not withdraw the missiles form Cuba. Though initial statements and actions by the U.S. did not initially deter the USSR from placing missiles, subsequent U.S. actions and statements ultimately convinced the USSR of high probability of aggression. However, the USSR believed in a high probability of U.S. invasion regardless of missile removal, thus their overall estimate was medium.

To conclude with any confidence from this analysis that the USSR was risk prone or risk averse, the utilities and cost-benefit calculations associated with these decision point courses of action and predicted outcomes must be examined. Ostensibly, if Russet's equation has the balance in favor of peace but USSR went defied U.S. deterrence and kept the missiles in Cuba or used them anyway, they are risk prone. If continued defiance of U.S. deterrence had negative utility and high likelihood, and the USSR continued to defy nonetheless, then this would confirm the USSR as risk prone. However, if those same negative utility actions had a low likelihood, and the USSR defied deterrence, the USSR could be characterized as risk averse, although with less confidence[6] than a risk prone judgment. Analysis of the cost-benefits at these decision points and the ultimate decisions made should also shed light on USSR preferences for emphasizing loss or gain.

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[6] If a course of action has negative utility but there is a low probability that this negative utility will occur, then it is difficult to evaluate an actor's propensity for loss. It is easier to characterize risk propensity when there is a higher likelihood that something will have negative utility, or a low likelihood that something will have positive utility because this demonstrates attitude towards loss. If there is no loss, then attitude cannot easily be defined.

(2)	Relative Emphasis on Loss or Gain

(a)	Preferences (Emphasis on Loss or Gain) and Cost/Benefit Analysis of Alternatives. Overall, the USSR preferred to emphasize minimizing losses. They were militarily inferior to the U.S. and the preponderance of their courses of action leading up to the Cuban Missile Crisis reflected a desire to minimize losses and avoid situations with negative utility (benefits < costs). The disincentives which the USSR acted to avoid included a potential U.S. assault on Cuba (Lebow, 1983; Kahan, 1972), a potential U.S. nuclear first-strike (Kahan, 1972); loss of political leverage in future dealing with the U.S. (Kahan, 1972); endangering relations with Castro (Lebow, 1983), loss of prestige and influence within the "communist camp" especially with China (Lebow, 1983, p. 437), mass exodus of millions of East Germans into West Germany (Lebow, 1983), internal political strife (Lebow, 1983; Kahan, 1972), a continued strategic inferiority (Lebow, 1983; Kahan, 1972),

There is some indication that the USSR wanted to maximize gains; some analysts have speculated that Khrushchev's objectives behind the Cuban missile emplacement were to negotiate a removal of U.S. missiles in Turkey, a U.S. withdrawal from other foreign military bases threatening the U.S., and U.S. capitulation in Berlin (Lebow, 1983). All of these negotiations, if successful to the USSR would have resulted in positive outcomes for the USSR; yet this theory is not supported by any evidence (Lebow, 1983). Furthermore, assuming the theory is true, it makes sense to consider negotiation to removal U.S. missiles from Turkey and other European bases given the threat those missiles posed to the USSR (Kahan, 1972); thus negotiation would be loss minimization. The fact that Khrushchev sent out "feelers" regarding removal of the Turkey missiles suggests the USSR was concerned about American capabilities in Turkey and elsewhere (Kahan, 1972, p. 568); Khrushchev wanted to negotiate to avoid a situation with negative utility to the USSR. The one exception to loss minimization is that U.S. capitulation in Berlin would likely be seen as a gain to the USSR; positive utility would result from USSR dominance over the German capital without U.S. influence.

Additionally, it is possible the USSR sought to maximize gains in terms of establishing a greater foothold in Latin America when they considered placing missiles in Cuba (Kahan, 1972).

However, more often than not the USSR emphasized loss. RAND (1977) argues that Khrushchev weighed "the immediate risk of war much more heavily than the loss of political prestige" (p. 14); this argues for a general focus on loss. Soviet strategic culture, as shaped by the presumption of Soviet strategic inferiority and focus on unilateral damage limitation (RAND, 1977) suggests that emphasis would be placed on loss. Finally, RAND suggests that the USSR had been motivated to "deny the U.S. a low cost of enhancing credibility of its [U.S.] strategic commitment to Europe" (p. 39); the USSR thus wanted to avoid a situation which would have been to their detriment. Taken together, these statements suggest Soviet preoccupation with loss. However, utilities and preferences for major decision junctions for which the USSR estimated probability must be examined in more detail.

(i)   Junction 1: Deliberation over placing missiles in Cuba

With respect to deploying missiles in Cuba, the USSR emphasized loss minimization: the USSR's official rationale was to defend Cuba against a U.S. attack (Horelick, 1964); thereby avoiding a situation with negative utility to the Soviets. In Khrushchev's memoirs, he decided to place offensive missiles in Cuba to "(1) protect Cuba from a second 'counterrevolutionary invasion' by the United States; (2) to equalize what the West calls 'the balance of power', and (3) to protect 'Soviet prestige' in Latin America" (Absher, 2009, p. 24). All of these reasons, possibly with the exception of (3), reflect emphasis on loss minimization.

The USSR arguably analyzed costs and benefits of missile emplacement given U.S. threats that "the gravest issues would arise" if the U.S. acquired evidence of…offensive capability…under Soviet direction" (Lebow, 1983, p. 432). Despite such statements intended to deter the USSR, at this junction in the confrontation the USSR obviously determined that the high potential benefits of missile emplacement: (1) restoring the balance of power, (2) protecting Cuba from U.S. invasion, and (3) increased

likelihood of Khrushchev realizing key domestic objectives (Haas, 2001), including protection of "Soviet prestige" as documented by Absher (2009), outweighed the high potential costs of war with the U.S. (Haas, 2001) which could result from missile emplacement.

The utility of missile emplacement to the USSR is clear. Khrushchev believed that missile emplacement would protect Cuba from invasion because, for the immediate future,

> Only such measures [missile emplacement on Cuba] were capable of inducing U.S. statesmen 'to make a more sober assessment of the objective reality.' (Horelick, 1964, p. 369)

The USSR may have thought strategic weapons in Cuba served as a "quick fix" to achieve a substantial, though suboptimal, improvement in the balance of capabilities between themselves and the U.S. (Horelick, 1964, p. 375). While suboptimal, Cuban missile emplacement was arguably the most realistic given the circumstances; it is difficult to imagine any other measure which could produce such an increase in capabilities as quickly and as cheaply (Horelick, 1964). Additionally, installation of missiles in Cuba would have complicated a U.S. first strike, and reduced the credibility of the U.S. strategic deterrent against the USSR in Europe (Horelick, 1964, p. 375). Finally, the USSR hoped that missile emplacement would result in U.S. acceptance and contribute the solution of other military-political problems in the USSR (Horelick, 1964); thus, this notion added to the positive utility of missile emplacement. Haas (2001) concludes: "the benefits of a successful deployment of nuclear missiles to Cuba for the Soviet Union…were great" (p. 254).

Negation of the potential USSR benefits and death/destruction resulting from a war with a superior opponent would have meant negative utility for the USSR if the U.S. had invaded. In other words, if the U.S. had decided to invade Cuba, with potentially disastrous results to the USSR given the U.S. military superiority both conventionally and strategically, there would have been a negligible chance that the USSR could achieve any of its original loss-minimizing objectives. They would have been unable to (1) change the balance of power in their favor; (2) they obviously would

not have protected Cuba; and (3) Khrushchev's domestic objectives would surely have been disregarded as the USSR focused on war with the U.S. Additionally, Khrushchev believed that the U.S. Strategic Air Command (SAC) had targeted specific Soviet cities for immediate destruction in the even of war (Absher, 2009), a prospect of considerable negative utility for the Soviets.

The USSR also emphasized loss in assessing the alternative COA: restraint from emplacing missiles. For example, if Khrushchev were forced to back down, he would look weak before domestic and international audiences, which would likely significantly diminish the chances of realizing his foreign and domestic political objectives (Haas, 2001). These foreign and domestic objectives included leadership within the worldwide "communist camp" and domestic agrarian reform. Thus failure to assert himself by placing missiles would create negative utility to the USSR. There are some who believed the USSR feared U.S. invasion despite the presence of missiles. Prior to the crisis, Khrushchev had believed that Kennedy, and especially the American military, wanted to invade Cuba (Haas, 2001). Thus, restraint would have still had negative utility, as the U.S. was predetermined to invade anyway, further reflecting USSR emphasis on loss.

(ii)   Junction 2: Deliberation over whether to withdraw missiles

With respect to deciding whether to withdraw missiles from Cuba upon U.S. discovery, the USSR only decided to withdraw the missiles when Khrushchev received word that an attack on Cuba was imminent (Horelick, 1964). Thus, the USSR acted to avoid the disutility of a U.S. invasion of Cuba. Immediate actions were required in order to prevent an attack against Cuba (Horelick, 1964); thus the USSR withdrew missiles to prevent that undesirable outcome. The USSR arguably analyzed costs and benefits of withdrawing the missiles in the face of statements such as Kennedy's 22 October 1962 speech that:

> It shall be the policy of this nation to regard any nuclear missile launched from Cuba…as an attack by the Soviet Union on the United States requiring a full retaliatory response. (Horelick, 1964, p. 370)

The USSR was concerned that the U.S. might feel compelled to strike the emplaced missiles quickly to prevent them from falling into Castro's hands (Horelick, 1964); such a pre-emptive strike would have had negative utility to the USSR. Additionally, Horelick (1964) suggests that:

> The quick withdrawal of their [Soviet] missiles…may be interpreted as a decision to end the crisis quickly before it became necessary to accept even greater losses which could be avoided. (p. 379)

This supports both the theory that the USSR emphasized loss minimization and the theory that potential U.S. invasion had negative utility to the USSR. Given the U.S. ultimatums, Khrushchev had to choose between a "humiliating retreat or an increasing risk of confrontation with the world's strongest power" (Haas, 2001, p. 264). This choice emphasizes USSR focus on loss minimization. Furthermore, anticipated costs to the USSR of a U.S. pre-emptive invasion of Cuba to destroy the emplaced missiles were significantly high (Haas, 2001). Haas emphasizes "the enormity of the potential costs if Khrushchev were unsuccessful in his attempt to bluff Kennedy [as to the presence of missiles in Cuba]" as compared to the benefits of withdrawal: the possibility of a successful no-invasion pledge from the U.S. and U.S. removing their Turkish missiles (p. 265). Thus, the overall utility of withdrawing missiles was positive.

The USSR also emphasized loss in assessing the alternative COA: keeping the missiles in Cuba after U.S. discovery. Given that prior to the crisis Khrushchev may have been convinced that Kennedy, and especially the American military, wanted to invade Cuba (Haas, 2001), the USSR perceived that conflict with the U.S. was inevitable. This meant a negative outcome to the USSR, and though there were some potential political and domestic benefits if the U.S. capitulated and acceptable the presence of the missiles, earlier analysis of probabilities suggests only a fair probability that these outcomes would result from keeping the missiles intact. Thus, restraint (keeping the missiles emplaced) would have still had negative utility, as the U.S. was predetermined to invade anyway, further reflecting USSR emphasis on loss.

In summary, the USSR emphasized loss minimization rather than gain maximization as they escalated at their key decision junctions in order to avoid

undesirable outcomes, or those with benefits less than costs (negative utility). Taliaferro (1997) argues that potential losses and gains include territory, military capabilities, economic resources, reputation, and credibility (p. 4); the USSR stood to lose military capabilities and reputation if they failed to establish a military presence in the Western hemisphere. However, the USSR also stood to lose military capabilities if the U.S. attacked Cuba, so either outcome presented a potential loss. They escalated tensions by deploying missiles and then attempting to convince the U.S. that they had not done so; this is consistent with the hypothesis that loss minimizers tend to escalate rather than deescalate. Ultimately, the USSR did de-escalate to avoid loss, contrary to the theory that escalation is predicted for loss minimization.

(b) Probabilities and Utilities: SEU or Prospect Theory? Together, the probabilities of possible outcomes of USSR COAs at the decision points identified in this analysis, and the utilities of those outcomes, represent estimates of subjective expected utility to the Soviets. The Soviets were considerable loss minimizers as evidenced by their consistent framing of choices in terms of loss and actions to avoid loss, but if the probability of negative utility from any of their COAs chosen to minimize loss was high, and they nonetheless executed that COA, they were certainly risk prone as well. If the USSR chose not to pursue those COAs with potential for positive utility but with low likelihood of that positive utility occurring, or of low likelihood of negative utility, they were arguably risk averse. Figure 12 below summarizes the possible courses of action the USSR considered at key decision points leading up to the Cuban Missile Crisis, the probabilities (P: high or low) and utilities (U: positive or negative) of the possible outcomes of certain COAs, and their resulting risk propensities. The possible outcomes of restraint assume the USSR would have restrained from the course of action in the first column of the Figure 12. Overall, as predicted earlier, the USSR was predominantly risk prone throughout their confrontation with the U.S.

Decision Point COA	Possible Outcomes	P	U	Possible Outcome of Restraint	P	U	Decision	Risk Propensity	Reason
Placing missiles in Cuba	U.S. invasion/other aggressive action	High	-	U.S. invasion anyway	High	-	**Placed missiles in Cuba**	Slightly Risk Prone	High probability of negative utility, but also medium probability of resolution of various issues
	U.S. capitulation and negotiation for Turkey missiles, redress balance of power, facilitate protection of Cuba, and other foreign/domestic issues, reduce credibility of U.S. deterrent	Medium	+	Loss of face within communist camp	High	-			
				Internal political strife	High	-			
Withdrawing missiles	U.S. pledge not to invade Cuba	Medium	+	U.S. invasion/other aggressive action, including pre-emptive actions to eliminate missiles	High	-	**Withdrew missiles**	Considerably Risk Prone	Only a medium probability of positive utility for U.S. no-invasion pledge and restraint from war; combined with high probability of negative utility of other outcomes, yet USSR chose to withdraw
	Avoidance of war	Low	+	U.S. capitulation and negotiation for Turkey missiles, redress balance of power, facilitate protection of Cuba	Medium	+			
	Loss of face within communist camp	High	-						
	Internal political strife	High	-						

Figure 12.   Analysis of Key Decision Points, COAs, Probabilities, Utilities, and Ultimate Risk Propensities of the USSR leading up to the Cuban Missile Crisis.

Standard subjective expected utilities of the courses of action the USSR chose all left them with high probabilities of negative utility or medium/low probabilities of positive utility; thus SEU should have predicted they would not take these courses of action, as the overall balance would be negative utility. However, as the USSR was in the domain of loss as established earlier, prospect theory would predict their willingness to take greater risks and overvalue the utility of predicted outcomes. Their emphasis on loss minimization revealed a tendency to escalate. All of their decisions reflected escalation as they emplaced missiles within 90 miles from the U.S. coastline, lied about it, and then deliberated over whether to remove the missiles after U.S. discovery. Though at some points the USSR did negotiate with the U.S. (risk averse per Linnington model and suggestive of de-escalation), they simultaneously built up their offensive nuclear capabilities in Cuba and prepared for what some in the USSR deemed inevitable war with the U.S. Thus it seems prospect utility theory explains the USSR's decisions and actions in defiance of U.S. deterrence better than does SEU. Prospect theory accounts for the facts that SEU predicted the USSR should not have placed missiles in Cuba and should subsequently not have removed them upon U.S. discovery; yet they did the opposite of what SEU predicts at both decision junctions.

d. *Overall Analysis of the USSR's Risk Profile and Implications for Rational Deterrence*

Overall, the USSR viewed itself as expansionist but for extrinsic, strategic gains (although arguably less strategic and more intrinsic than those of Japan before Pearl Harbor) and with an inferior balance of capabilities to wit: their inferior strategic and conventional military capabilities. Their will to carry out their expansionist agenda seemed as though it should be less strong than that of a nation defending its intrinsic interests, though given the earlier argument that they could have conceived the U.S. as a threat to their intrinsic interests on their home soil, it would not be much less strong that the will of a nation directly threatened. Various Soviet reservations about their inferior balance of capabilities prior to the Cuban Missile Crisis, in addition to their strategic interests, suggested the USSR should have had a questionable unified national will.

Unlike Japan, who defied U.S. deterrence in spite of their inferior capabilities and theoretically questionable will, the USSR was deterred from attacking the U.S.

What caused the USSR to take the risks of putting missiles in Cuba and then attempting to bluff the U.S.? Why, after taking those risks, did they then succumb to U.S. pressure and withdraw the missiles? Their risk propensity and emphasis on loss minimization offer insights explaining why. Much of the current literature emphasizes that the USSR conceded their strategic imbalance and this motivated them to ultimately withdraw the missiles from Cuba, even though emplacement may have marginally closed the missile gap. Kahan (1972) offers, "perhaps all we can conclude from the episode is that reliance on strategic forces rises as nonnuclear alternatives diminish and that in a crisis the stronger nuclear power gains some form of advantage" (p. 585), suggesting that U.S. nuclear superiority ultimately deterred the USSR in the end despite Cuban missiles. Lebow (1983) suggests, "the most widely accepted interpretations of their actions attributed Soviet policymakers' action to their need to redress the strategic balance" (p. 453). However, if these were the primary explanatory variables, then why was the USSR ultimately deterred? The present author contends that Soviet decisions are better explained by their risk proneness and their emphasis on minimizing loss.

Throughout their confrontation with the U.S. prior to the end of the Cuban Missile Crisis, the USSR was a risk prone loss minimizer. As explored in analysis of Soviet strategic culture, the USSR's foreign policy would predictably (1) be characterized by an overall neutral risk propensity, (2) be developed and executed from a domain of losses, and (3) emphasize loss minimization. Based on analysis of the decision junctions, the USSR was slightly risk prone when it decided to place missiles in Cuba, but evolved to being considerably risk prone when it decided to withdraw the missiles. This latter point warrants clarification, as most observers would conclude that at this latter stage, the USSR became more averse to risk; surely withdrawing the missiles reflected a desire to take a less risky course of action and moved them away from the risk prone end of the Linnington (2004) spectrum. However, given the definition of risk prone proposed in this research (when consequences of actions have high probability of negative utility and the actor executes that action nonetheless), the evidence as summarized in the Reasons

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column of Figure 12 demonstrates that the USSR became more risk prone, rather than risk averse, when they decided to withdraw the missiles. Counterintuitive as this claim seems, it is supported by evidence and the framework analyzed herein. Given that the USSR feared a U.S. invasion regardless of missile presence, and that their original intent in placing the missiles was to defend themselves from this eventuality as Khrushchev noted in his memoirs, removal could have only increased the risk to the USSR. They removed their deterrent to the U.S., so to speak, and thus left themselves vulnerable if they truly believed a U.S. attack was imminent.

Soviet actions of placing missiles in Cuba despite assurances to the contrary suggested two possible explanations, as discussed earlier: (1) the USSR did not truly believe a high probability of U.S. aggression, or (2) they did believe a high probability but were not concerned; the costs of U.S. aggression may not have outweighed the perceived benefits of emplacing in Cuba nuclear missiles capable of destroying U.S. cities. After examining evidence that the USSR did indeed believe a high probability of U.S. aggression, it seems possible that the USSR may have indeed perceived that the benefits of placing missiles outweighed the costs. Thus, missile emplacement would have overall positive utility. However, analysis of the potential outcomes of their two major courses of action, placing the missiles and withdrawing the missiles upon U.S. discovery, both reveal negative utilities. Thus the USSR, like Japan, had to choose from two nearly equally undesirable options: "holocaust or surrender" (Kahan, 1972, p. 581). Therefore neither of these possible explanations for USSR is satisfactory.

The USSR was on the precipice of the domain of loss throughout the confrontation with the U.S.; prospect theory predicts that those in the domain of loss are more likely to take risks (Tversky, 1981). The USSR pursued various courses of action at specific key decision points, the preponderance of which had with possible outcomes with high probabilities of negative utility and/or medium/low probabilities of positive utility. Yet the USSR chose to act on these because they were risk prone. Furthermore, as with Japan, the USSR's loss minimization supports Lebow's (1989) assertion that not all

challengers to deterrence are risk prone gain maximizers. Though the USSR eventually did capitulate, they did initially challenge U.S. deterrence.

Prospect theory does not seem to adequately seem to explain the USSR's tendency to act contrary to what standard expected utility calculations would predict. The USSR was merely on the precipice of the domain of loss, yet they took gambles in the hope that some gain would come out of them, despite high likelihood of negative utility. This suggests that risk propensity and relative emphasis on loss/gain better explain Soviet actions, though it is not yet certain risk propensity and relative emphasis on loss/gain elucidate why these actions meant the USSR was ultimately deterred.

As with Japan, these findings suggest that those who *prefer loss minimization* (acting or not acting to avoid outcomes with negative utility) will act contrary to what SEU predicts. They will escalate despite the high probability of bad outcomes. Interestingly, in the case of the USSR they deescalated despite the high probability of bad outcomes (U.S. invasion and loss of political face); this only partially supports the theory that loss minimizers tend to escalate. They were loss minimizers through the conflict, yet escalated (defied deterrence) and then deescalated (succumbed to deterrence).

C.   IMPLICATIONS FOR DETERRENCE: REFINING THE THEORY OF RISK PROPENSITY/RELATIVE EMPHASIS ON LOSS/GAIN

At this point, the claim that a certain combination of risk propensity and relative emphasis on loss/gain predicts the efficacy of deterrence is not well supported: why was Japan not deterred from attacking the U.S. when the USSR was deterred? Both have been shown to be risk prone loss minimizers, both with inferior balance of capabilities relative to the U.S. (although the USSR arguably less inferior overall when respective Japanese and Soviet economic needs were considered) and both had expansionist ideologies. If the USSR was a risk prone loss minimizer and deterrence was successful, but Japan was also a risk prone loss minimizer and deterrence failed, the theory that deterrence efficacy can be predicted by risk propensity and relative emphasis on loss or gain is only partially explanatory.

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Japan was already in the domain of loss per Linnington (2004) as it was already at war with China; whereas the USSR was on the precipice of the domain of loss as argued earlier. This distinction can be reconciled with the USSR's risk-prone loss minimization to support the efficacy of deterrence as follows: a risk-prone loss minimizer opponent will be deterred when in the domain of gains or approaching the domain of losses on the Linnington scale, but not yet in the domain of losses. Given that all criteria for Japan in the Pearl Harbor case study and the ÚSSR in the Cuban missile crisis study are nearly equal—domain being the exception—domain must therefore be accounted for in addition to risk propensity and relative emphasis on loss/gain to predict the efficacy of deterrence.

Since the USSR was on the border between domain of loss and domain of gain, but technically still in the domain of gains per Linnington's model, it may have slightly overweighted probabilities of the U.S. attacking in response to missile discovery (in domain of loss probabilities are underweighted thus risk proneness is predicted). Thus, it gave more valence to the likelihood that the U.S. was going to invade after missile discovery and acted to minimize loss (removed the missiles to avoid negative utility); had it preferred maximizing gains, even if it believed high likelihood of U.S. invasion they would have focused on keeping the missiles in place to improve its standing in the world.

The fact that both options ("surrender or holocaust") were undesirable to the USSR is a testament to the credibility and signaling of the U.S. Both credibility and signaling are key deterrence concepts; the U.S. signaled its intent to act upon emplacement of missiles in Cuba, and the USSR obviously believed these threats to be credible. Lebow (1983) supports this notion:

> The cases [of brinkmanship] revealed that most brinkmanship challenges were initiated without any good evidence that the adversaries in question lacked the resolve to defend their commitment; on the contrary, available indications most often pointed to the opposite conclusion. (p. 452)

Lebow thus argues for challenges to deterrence even when the defender's threats are credible.

If instead a gain maximizer, the USSR might well have disregarded threats, no matter how credible, and instead focused on how the missiles could increase its strategic standing and facilitate the spread of Soviet influence in the Western Hemisphere, both of

which would have positive utility to the USSR. If risk averse, the USSR would have likely kept its missiles in Cuba past October 28, 1962, and possibly even fired them, because there was a high likelihood of negative utility if they withdrew them, yet they would have avoided withdrawal and thus been risk averse. Thus, when a loss minimizer in the domain of gains, but close to the domain of losses is presented with two undesirable outcomes from a deterrence game, and the deterrer's signals/threats of imposing loss are clear and credible, deterrence will be efficacious. This analysis offers a foundation for clarifying the distinction between domain of loss/gain and preferences for loss/gain.

Another explanation for the USSR's "surrender" and ultimate capitulation to U.S. deterrence is discussed in Lebow (1983): Defensive avoidance theory predicts that

> Policymakers who perceive that serious risks are inherent in their current policies but upon reflection are able to identify an acceptable alternative, experience psychological stress. They become emotionally aroused and preoccupied with finding a less risky but nevertheless feasible policy alternative. If, after further investigation, they conclude that it is unrealistic to hope for a better strategy, they will terminate their search for one, despite continuing dissatisfaction with the available option. (Lebow, 1983, p. 455)

Thus, the USSR was surely dissatisfied with its ultimate decision to capitulate, but thought it was unrealistic to hope the U.S. would simply accept the presence of offensive missiles in Cuba. This supports the notion that loss minimizing risk prone adversaries will succumb to deterrence when in the domain of gains; it would predictably choose a less risky outcome from among two undesirable outcomes, regardless of whether it was generally risk prone (preferred situations with high likelihood of negative utility). Just because an actor believes both outcomes have high likelihood of negative utility and thus acts anyway does not preclude that same actor from choosing one of the two—one which is relatively less risky.

D. QUANTITATIVE RISK ANALYSIS OF CASE STUDIES: APPLICATION OF GAME THEORETIC METHODS

1. Pearl Harbor Quantitative Analysis

a. General Unilateral Deterrence Approach

Berejikian presents a game theory deterrence game in which unilateral deterrence is presumed (one actor deterring another).
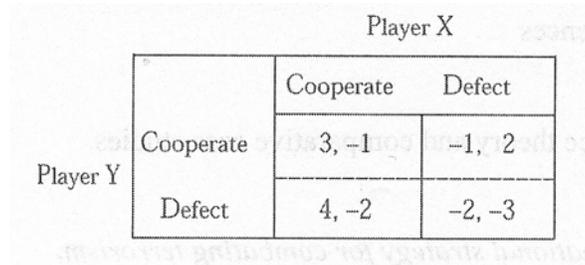
		Player X	
		Cooperate	Defect
Player Y	Cooperate	3, –1	–1, 2
	Defect	4, –2	–2, –3

Figure 13.   Unilateral Deterrence (From Berejikian, 2002, p. 177)

In Figure 13, irrespective of domain, assume player X is the challenger and player Y is the status quo state prior to a conflict. Cooperation for Y represents deterrence (threats, promises, or action), and defection represents attacking. Cooperation for X represents succumbing to deterrence and defection means attacking.

Assume the payoff values on the left side of each quadrant represent the payoff or subjective utility to player Y and the values on the right the same to X. In this case, this deterrence game has 2 pure strategy Nash equilibria: (1) Y defects and attacks X while X capitulates and does not attack (4,-2); and (2) the opposite: X defects (attacks Y) and Y capitulates (-1, 2). In both cases, neither X nor Y has any incentive to change their strategy; thus these two possible outcomes are both Nash equilibria. However, this suggests that deterrence does not work! If it did, the equilibria would be other than (cooperate, *defect*) and (defect, *cooperate*); indeed, Berejikian (2002) claims,

> Each [actor] has an initial incentive to move off the status quo [cooperate, *cooperate*]. This undermines the credibility of deterrence because 'having to carry out this [deterrence] threat if deterrence fails hurts the threatener [in this case status quo state], even though the threat itself is what is supposed to prevent deterrence from failing in the first place.' (p. 168)

The reality, however, is that deterrence does indeed work; but using Berejikian's unilateral deterrence framework above it can be suggested that subjective utility payoff values on their own do not adequately explain why this is so. Thus another theory of utility must be incorporated into the deterrence game analysis.

Before another theory is introduced, first the appropriate of unilateral deterrence to the Japan-U.S. relationship prior to Pearl Harbor must be elucidated. The Japanese goal in attacking Pearl Harbor was to cripple the U.S. capability in the Pacific in the hope of lasting longer in an inevitable battle. Taliaferro (1997) and Russett (1967) argue that Japan believed a low likelihood of a pre-emptive military strike weakening U.S. resolve, and a high likelihood that a protracted war would result; yet it believed a high likelihood that a pre-emptive attack on U.S. forces in the Pacific Ocean would weaken U.S. offensive capabilities. Thus, if Japan did not have confidence in a pre-emptive strike weakening U.S. resolve and that war was likely, their actions prior to Pearl Harbor do not amount to deterrence.

b. *Subjective Expected Utility Approach*

At this point, only subjective utility has been considered. To determine subjective expected utility, probabilities must also be considered. Probability and utility estimates as elicited from the qualitative analysis and summarized in Figure 11 gave overall higher subjective expected utility to Japan for cooperating (not pre-emptively attacking Pearl Harbor) than defecting. At the decision junction to execute a pre-emptive strike against Pearl Harbor, Japan believed a medium to low probability that they could elicit U.S. cooperation by weakening their resolve and their offensive capabilities in the Pacific Ocean. Thus they must have a believed a higher (medium to high) probability they would not be able to elicit U.S. cooperation and instead the U.S. would retaliate with its superior military capabilities supported by its economic power. An estimated probability of 1/3 will be assigned to the former scenario and 2/3 assigned to the latter scenario. Thus, Japan's overall SEU from attacking was:

$$(1/3)(2) + (2/3)(-3) = -4/3$$

where the utility of 2 represents Japan's payoff if they attacked and the U.S. capitulated (potential for unimpeded expansion into the Dutch East Indies and being in a better position to defend against the U.S. if the U.S. eventually attacked), and -3 represents their payoff if they attacked and the U.S. attacked as well: massive Japanese casualties and further economic setback (even less likelihood of access Dutch East Indies resources). It is important to note than in this analysis, the SEU payoff values represent an outcome relative to net assets, not an outcome relative to a reference point (as in prospect theory). Similarly, using the same probabilities for attacking, Japan's overall SEU from capitulating, or not pre-emptively attacking Pearl Harbor, was:

$$(1/3)(-1) + (2/3)(-2) = -5/3$$

where the utility of -1 represents Japan's gradual exhaustion due to increasing economic dependency on the U.S., and -2 represents Japanese losses suffered from a U.S. attack assuming Japan did not also attack (in addition to gradual economic exhaustion).

However, there is no evidence that the Japanese believed the U.S. was going to launch an attack if Japan did not; whereas it did have reason to believe an attack on the U.S. would provoke a retaliatory response. Previous statements by the U.S. indicated its willingness to take drastic measures in response to Japan's actions.

Roosevelt claimed:

If Japan attempted to seize oil supplies by force in the Netherlands East Indies, the Dutch would, without the shadow of a doubt, resist, the British would immediately come to their assistance, and, in view of our policy of assisting Great Britain, an exceedingly serious situation would result. (Russett, 1967, p. 94)

Roosevelt also stated:

If the Japanese government takes any further steps in pursuance of a policy or program of military dominance by force or threat of force in neighboring countries the Government of the United States will be compelled to take immediately any and all steps which it may deem necessary toward safeguarding the legitimate rights and interests of the

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United States and American nationals and towards insuring the safety and security of the Untied States. (Russett, 1967, p. 94)

Thus, the Japanese had no reason to fear unprovoked aggression from the U.S. and therefore the present author argues that the true probability of Japanese utility for the lower left quadrant of Figure 13 is 0, and the true representation of this SEU was:

$$(1/3)(-1) + (0)(-2) = -1/3$$

Since -1/3 exceeds -4/3, the overall SEU for not pre-emptively attacking exceeded that from attacking; Japan should have not attacked Pearl Harbor. Now SEU explains why deterrence should succeed where earlier simple subjective utility values failed. Yet Japan did indeed attack Pearl Harbor and deterrence failed. Thus, SEU also does not explain why deterrence failed against Japan.

c.   Prospect Utility Approach

Berejikian (2002) claims, "unilateral deterrence exists when one state is satisfied with the status quo and another is not" (p. 176). The state in the domain of gains will deter the revisionist state, or state in the domain of losses wanting to challenge the status quo. As has been shown, Japan was in the domain of losses prior to Pearl Harbor. Their envisioned reference point, a New East Asian Order, was slipping away from them and they increased their pressure on the Dutch East Indies to supply resources. Conversely, the U.S. was in the domain of gains.

		Player X	
		Cooperate	Defect
Player Y	Cooperate	3, −1	−1, 2
	Defect	4, −2	−2, −3

Figure 14.   Unilateral Deterrence, X in domain of loss, Y in domain of gain (From Berejikian, 2002, p. 177)

In Figure 14, the same subjective utility payoffs apply from Figure 13 but now Japan is in the domain of loss (dissatisfied with the status quo) and the U.S. is in the

domain of gains. The equilibria are still (defect, *cooperate*) and (cooperate, *defect*) as in Figure 13, but prospect theory now explains why deterrence would fail when subjective **expected** utility predicts it would not fail. Since Japan was a risk prone loss minimizer, per prospect theory it would have been likely to take greater risks to achieve its envisioned reference point, even with credible threats from the U.S. There is no indication Japan believed U.S. threats lacked credibility; indeed, per Figure 11, Japan believed a high probability of U.S. aggression in response to Japanese escalatory actions (attempting to secure resources from the Dutch East Indies, invading French Indochina, and entering the Tripartite Act). Berejikian (2002) argues that highly credible threats against an attacker will still fail to deter when that attacker is in the domain of loss per prospect theory (also called "cognitive deterrence"). The lower left quadrant of Figure 15 (deter, *war*) demonstrates this, where prospect theory predicts war resulting given highly credible threats against a challenger in the domain of losses. Social frame represents domain.

Italics represent predictions for cognitive deterrence.

Figure 15.   Will the Credibility of Deterrer Influence Efficacy of Deterrence? (From Berejikian, 2002, p. 181)

Notice that in Figure 14 Japan's payoff if it defects (attack) and the U.S. cooperates is 2. In this prospect theory application of the deterrence framework, a payoff represents a position relative to the actor's envisioned reference point. Japan thus valued a challenge to deterrence because it thought it might help bring it to its envisioned end state (ending U.S. influence in the SE Pacific?) or even above it (hence the positive value of 2). In contrast, if it accepted the status quo and cooperated, it faced a payoff of -1 if the U.S. also cooperated; it would continue to suffer material losses in China and with no prospect of gaining access to Dutch East Indies resources, it would slide further behind

its envisioned reference point. Thus defection, assuming U.S. cooperation, appealed to Japan. However, what if the U.S. also defected? The possible outcomes (either -2 or -3) for the Japanese would have put them even further from their reference point, given their inferior capability and inability to sustain war against the U.S. Japan certainty would have not been able to attain its New East Asian Order with an overwhelming defeat in war. However, because Japan was in the domain of losses and thus risk prone, it defected anyway. Japan was willing to risk much for the possibility of gaining, however slight.

d.   *Analysis*

Were SEU a more explanatory theory of deterrence efficacy, Japan would have not attacked the U.S. Instead of SEU, prospect theory explains why deterrence failed: Japan was in the domain of losses and thus more willing to take risks. Its subjective expected utility from attacking was less than was the subjective expected utility from restraint, regardless of the U.S.'s actions in either instance. Yet, because of its risk propensity, it saw a small possibility of producing gains (1/3 probability of utility 2) combined with a larger possibility of producing considerable losses (2/3 probability of utility -3), which would result from attacking Pearl Harbor, as a more attractive course of action than it did the certainty of smaller losses (no probability of utility -2) resulting from restraint. Put differently, attacking Pearl Harbor might have resulted in the best possible utility, but also the worst; whereas the range of utilities from restraint (cooperation) was smaller and thus had less variability. Though the present research does not use Taliaferro's (1997) definition of risk proneness for case study analysis: "Risk acceptant behavior occurs when decision makers select an option that has...extremely divergent outcomes" (p. 4). This definition offers some explanatory insight into this phenomenon. Japan could achieve either a 2 or -3; thus its range of utility:

$$\text{ABS } [2-(-3)] = 5$$

was a 5, greater than the range of utility if it did not attack:

$$\text{ABS } [-1-(-2)]) = 1$$

thus, they were more risk acceptant. Das and Teng (2001) also argue that risk represents uncertainty; "risk taking would be to consciously undertake tasks which are associated with uncertain consequences" (p. 517).

Thus, Berejikian's framework thus far is useful for supporting the Figure 4 qualitative case study elicitation framework to predict the efficacy of deterrence. The unilateral deterrence game of Figure 14, where the deterrer is in a gains frame and the deterree is in a losses frame, mirrors the conditions that existed prior to Pearl Harbor as elicited in the qualitative analysis. When a risk prone loss minimizer such as Japan, in the domain of losses, challenges the U.S. in the domain of gains with its general preference for risk aversion, domain predicts risk propensity and deterrence will be inefficacious because of the challenger's domain of loss. Despite the favorable balance of U.S. capabilities and credibility of their threats, deterrence failed. Japan's domain of loss relative to its reference point of a New East Asian Order drove them to attack Pearl Harbor despite a subjective expected utility calculation suggesting it should restrain from attack.

2. Cuban Missile Crisis Quantitative Analysis

a. *Subjective Expected Utility Approach*

For the Cuban Missile Crisis, Berejikian's unilateral deterrence game might not be the most appropriate game to use. Though the emphasis in this research is on U.S. deterrence of the Soviet Union, it can easily be argued that the Soviets were attempting to deter the U.S. as well, vis-à-vis their nuclear programme and influence in Cuba. The USSR was trying to dissuade any attack against USSR soil because USSR missiles in Cuba could easily destroy U.S. targets. Kahan (1972) argues that the USSR feared that the U.S. was developing first strike capabilities and made certain statements which the USSR interpreted as meaning the U.S. was preparing to execute those capabilities. At a minimum the USSR was trying to deter the U.S. from invading Cuba through missile emplacement, as it feared a U.S. invasion compensating for the Bay of Pigs failure. Thus, another Berejikian example in which a mutual deterrence model is presented is more applicable. In this game, both states are either in the domain of gains or

in the domain of losses. In the case of the Cuban Missile Crisis, both the U.S. and USSR were in the domain of gains (albeit the USSR was on the precipice of the domain of loss).

Figure 16.   Mutual Deterrence, X and Y in domain of gain (From Berejikian, 2002, p. 174)

In Figure 16, Player X (revisionist state) has a higher payoff for cooperating, for either action Y takes, because presumably X is in the domain of gains. Even though X wants to challenge the status quo, if they are not successful at doing so, they are still relatively better off than a state in the domain of loss which fails to bring about a desired revision in the status quo. Mutual defection (-1, *-1*) is the worst for both states because they are both in the domain of gains and this outcome would represent the greatest shift from their net asset positions. However, each is willing to unilaterally defect in the hope that their opponent cooperates; the equilibria are still (defect, *cooperate*) and (cooperate, *defect*). This game of mutual deterrence is often referred to as "chicken" or the "prisoner's dilemma" and is applied to arms races and brinkmanship games. At the decision junction to withdraw their missiles from Cuba, the USSR believed a low-medium probability of avoiding war (U.S. capitulation), and thus believed a medium-high probability of U.S. defection and consequently war. The USSR's overall SEU for capitulating and withdrawing the missiles is

$$(1/3)(3) + (2/3)(1) = 5/3$$

Their overall SEU for defecting and keeping the missiles in Cuba is

$$(2/3)(-1) + (1/3)(4) = 2/3$$

Thus, SEU predicts the USSR should have capitulated and deterrence should have been successful, which ultimately it was.

b.   *Prospect Utility Approach*

However, prospect theory in this mutual deterrence game also predicts deterrence should work. The U.S. and USSR were both in the domain of gains; thus, they should both be risk averse and thus willing to forego the possibility of greater gains (if each were to unilaterally defect) if that meant any possibility of greater losses, which would result from both defecting (Berejikian, 2002).

As was Japan, the USSR was a risk-prone loss minimizer; per prospect theory it would have been likely to take greater risks to achieve their envisioned reference point, even in the face of credible U.S. threats. There is no indication the USSR believed U.S. threats lacked credibility; as argued earlier the USSR believed a high probability that the U.S. would attack the USSR, given Kennedy's implicit threat that "it shall be the policy of [the U.S.] to regard any nuclear missile launched from Cuba… as an attack by the Soviet Union on the United States requiring a full retaliatory response" (Horelick, 1964, p. 370). However, unlike Japan, which was shown to have been in the domain of loss, Berejikian (2002) argues that highly credible threats against a challenger will deter when the challenger is in the domain of gain. The upper left quadrant of Figure 15 (deter, *deter*) demonstrates this, where prospect theory predicts deterrence will be successful.

Notice that in Figure 16, the USSR's payoff if it cooperated (restrained from attack) and the U.S. cooperated is 3. However, if the USSR defected and kept the missile in Cuba after U.S. detection, and the U.S. ultimately capitulated and the USSR achieved a fait accompli, the USSR could have achieved a higher payoff (4). To achieve this higher payoff, however, would have required the U.S. to cooperate. Otherwise, the USSR stood to lose the most: a payoff of -1 if the U.S. also defected. The USSR's risk proneness, per Taliaferro's concept of risk proneness, should have meant they ultimately defected and kept their missiles in Cuba, since they stood to gain much with a small probability but also faced the probability of their worst loss. Their possibly outcomes from defecting had the greatest range:

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$$\text{ABS}[\ 4\text{-}(\text{-}1)] = 5$$

whereas their possible outcomes from cooperating were:

$$\text{ABS}[3\text{-}1] = 2$$

The USSR did not believe a particularly high likelihood of U.S. restraint, further supporting the assertion (in the context of Taliaferro's definition) that they would be risk prone if they defected. Per the present author's definition, the USSR was also risk prone, so they should have defected, but were shown to be in the domain of gains, which may explain why they did not. Indeed, their decision to capitulate reflected their risk propensity (risk prone), but sometimes capitulating may actually be riskier than defecting. Berejikian's mutual deterrence game does not fully account for this; suggesting that domain is not always consistent with risk propensity.

c. Analysis

The challenge with applying the Berejikian game of mutual deterrence with both actors in a gains frame to the Cuban Missile crisis analysis is that Figure 4 qualitative elicitation shows the USSR was actually risk prone. Comparing the qualitative elicitation of the USSR's risk profile with the game theoretic analysis suggests either (1) a weakness in the theory that domain predicts risk propensity or (2) that Berejikian's mutual deterrence game requires modification to assume one state is in the domain of gains and other is in the domain of losses. To option (1), if the USSR were in the domain of gains as represented in Berejikian's mutual deterrence game, they should have been risk averse; ergo prospect theory correctly predicts that deterrence in this mutual deterrence game should hold. However, despite their domain of gains the USSR was willing to take great risks and not only place the missiles in Cuba, but also remove them even though they were convinced of the U.S. attack and removal would have left Cuba defenseless. Figure 12 demonstrates how their choices demonstrated risk proneness; but this is not consistent with their domain as evaluated earlier. Yet, domain seems to be the

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explanatory variable as to why the USSR was deterred and Japan was not. Analysis of option (2) is beyond the scope of this research.

3.   Applying Relative Emphasis on Loss/Gain to Berejikian Games?

It was qualitatively argued earlier that risk propensity and relative emphasis on loss/gain were only a partially satisfactory framework to explain deterrence efficacy, because both Japan and the USSR were shown to be risk prone loss minimizers in their respective analyses yet the former was not deterred and the latter was. Berejikian's framework claims that prospect theory and domain help predict the efficacy of deterrence in different deterrence games, and the comparison of the qualitative case studies of the USSR and Japan during their respective conflicts helped illustrate that domain may be more salient than preferences for gain or loss. Since relative emphasis on loss or gain (preferences) is not well defined in the literature, a definition is proposed in this research, and established research on domain supports risk propensity as a contributory variable to deterrence efficacy, this research has not shown that emphasis on loss or gain is sufficient to predict different outcomes of deterrence. This suggests further analysis of this concept and additional research is needed.

Is there additional evidence supporting the importance of domain in risk preferences and decision making? Experimental psychologists, including Amos Tversky, have argued that situational factors influence risk taking more than do dispositional traits (Das & Teng, 2001). In contrast, personality psychologists focus more on the importance of dispositional traits. It seems reasonable to suggest that if Tversky, the founder of prospect theory, believed situational factors were dominant in risk taking, then prospect utility approximates a situational explanation of utility calculations. It also seems reasonable that dispositional traits would inform subjective expected utility calculations, and thus might approximate preferences or emphases on loss or gain. Das and Teng (2001) argue that risk propensity is more responsive to decision situations, or frames of loss or gain, than to individual strategic positions (on the defensive or on the offensive). Further, Das and Teng (2001) add that longer-term decision making is less constrained by decision factors (prospect theory) and dispositional utility calculations are more prevalent

(p. 523). Returning to the qualitative study of Japan prior to Pearl Harbor, it is evident that Japan faced a sense of urgency: their vision of empire was rapidly slipping away as their resource deficiencies grew. They needed to make quick decisions and did not have time to deliberate long term strategy. Thus, prospect theory dominated their decision making; situational factors were prevalent and they took risks in the hope of achieving some possibility of positive utility. The situational factor describes people's responses to *immediate* needs and opportunities (Lopes, 1987). This dominance of domain over dispositional preferences for loss or gain suggests that the latter concept is not currently well enough defined to influence theoretical outcomes of deterrence.

Despite the evidence supporting domain as an explanatory variable and the difficulties with showing how relative emphasis on loss/gain helps predict deterrence efficacy, one potential way of incorporating the concept of minimizing loss into the mutual deterrence game is to consider that the USSR cooperated in the end, and ultimately minimized their probability of loss. Cooperating meant their worst possible outcome per Figure 16 was a 1; still ahead of their envisioned reference point. If they had ultimately defected and kept the missiles in Cuba, they might have realized a payoff of -1, the worst possible outcome, and thus would not have minimized potential for loss. They acted to avoid loss, rather than to obtain gain; were the USSR gain maximizers instead of loss minimizers they might have pursued the possibility of (cooperate, *defect*) where they kept their missiles in Cuba in hopes that the U.S. would back down, and that would have given the USSR their greatest gain. However, for Japan, in their unilateral deterrence game this logic is more difficult to apply. Qualitatively, Japan has been shown to be a loss minimizer. Yet, in Figure 13, defecting meant they faced their greatest potential loss (-3 payoff if the U.S. also defected). This questions whether Japan could be shown both qualitatively and quantitatively to be a loss minimizer, especially since the probability that the U.S. would defect and thus impose the greatest cost to Japan was high (2/3).

Finally, it is also suggested that losses are weighted twice as much as gains in psychological experiments (Das & Teng, 2001). Thus, people tend be risk averse in domains of gain to avoid possible loss (thus are loss minimizers), and they become risk

prone in domains of loss to recover the losses (again emphasizing loss). Hence, regardless of domain, loss is emphasized. This suggests that Lebow and Stein's (1989) suggestion of four different permutations of risk propensity and emphasis on loss or gain may not be given to elaboration and application to a comprehensive methodological study of deterrence cases until relative emphasis on loss/gain is further explained.

4.   Summary of Quantitative Analysis

Returning to the original framework for quantitatively analyzing deterrence games, it was proposed that in each game the subjective utility or value gained from a course of action (COA) would be either positive or negative for each player, and judgments would be made on whether each player is a gain maximizer or loss minimizer given their estimates of utility and choices made in the context of conflict. Analysis demonstrated that the game theory models did not offer insights into the relative emphasis of U.S. adversaries; rather only the qualitative analysis demonstrated this. Next it was proposed that the likelihoods of various courses of action would be quantified and would modify the subjective utilities from cost-benefit calculations to form subjective expected utilities (SEU). Likelihoods were estimated using 2/3 for high/medium probability of U.S. course of action and 1/3 for medium/low probability of U.S. course of action, and were applied to the subject utility payoff values to produce subjective expected utility payoff values for the adversaries. SEU for each course of action would then be compared to find the equilibrium solution and the ideal payoffs for the government and the adversary. However, there were two pure Nash equilibria in the unilateral deterrence game and no mixed strategy so this doesn't predict what outcome of the game would be. In one equilibrium, the challenger preempts; in the other, the defender deters. This solution set means that the efficacy of deterrence cannot be predicted and thus SEU is not useful. The prospect theory approach, however, reveals that risk preferences and domain would mean the adversary would either choose defect or cooperate in response to U.S. deterrence.

Finally, it was posited that the outcome of each game would show whether deterrence yields positive or negative utility to the U.S. when the U.S. and the adversary have certain risk propensities and relative emphases on loss/gain. If U.S. is presumed to be risk averse (domain of gain) and Japan risk prone (domain of loss), deterrence only

yields positive utility to the U.S. if Japan cooperates (doesn't defy deterrence and attacks anyway). But a pure Nash equilibrium existed if Japan defects and U.S. cooperates. The U.S. believed low probability of Japan defecting so deterrence was probably a reasonable choice under the circumstances, but Japan's domain of loss and risk proneness proved it was not the most prudent choice. This quantitative analysis would be able to offer insight as to whether prospect theory is more valuable to case study analysis than is SEU. For Pearl Harbor, the U.S.'s best outcome was if deterrence was successful (U.S. defects and Japan cooperates). This was a Nash equilibrium; but so to was Japan defecting and U.S. cooperating. This doesn't explain whether SEU is useful theory of utility for predicting deterrence efficacy as a function of risk profiles. There are two possible equilibria and there is no mixed strategy solution, so prospect theory explains unilateral deterrence in the case of Pearl Harbor better than does SEU.

E. POPULATION OF THE DETERRENCE EFFICACY MODEL

As was argued at the beginning of this research, a "deterrence efficacy model" can be created using the qualitative and quantitative analysis of this research. The initial argument was that risk propensity and relative emphasis on loss/gain can predict the efficacy of deterrence. However, this research and analysis has demonstrated that domain must also be accounted for in such a framework. Figure 1 can be modified to show that deterrence is predicted to be efficacious against a risk prone loss minimizer in the domain of gain, and is predicted to be inefficacious against a risk prone loss minimizer in the domain of loss. Thus, Figure 17 now appears as two different figures:

Adversary Domain		Adversary
LOSS		*Risk Prone Loss Minimizer*
Government	*Risk Averse Gain Maximizer*	Deterrence Inefficacious

Figure 17.   Deterrence Efficacy Model when Adversary in Domain of Loss

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Figure 17 reflects the findings from the Pearl Harbor case study. The Cuban Missile Crisis is represented by Figure 18.

Adversary Domain		Adversary
GAIN		*Risk Prone Loss Minimizer*
Government	*Risk Averse Gain Maximizer*	Deterrence Efficacious

Figure 18.   Deterrence Efficacy Model when Adversary in Domain of Gain

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IV. POLICY OPTIONS ANALYSIS: APPLICATION OF THE DETERRENCE EFFICACY MODEL TO CURRENT CHALLENGES

A. NORTH KOREA

1. Overview

It was proposed in this research that "deterrence risk analysis and management" would mean "interpreting the different attitudes towards risk of both the U.S. and various near and long term threats to the U.S., analyzing potential losses which these threats could inflict, and managing the challenges associated with deterring, dissuading, and/or defeating these threats to avoid the potential losses." In that spirit, Figures 4, 17, and 18 will be applied to current U.S. security challenges. First, given North Korea's recent demonstrations of its nuclear capability, analysis of whether deterrence would be effective against Kim Jong-Il's regime is critical to U.S. national security. These nuclear tests "pose one of the gravest threats to international peace and security" (UN Security Council, 2006) which the United Nations has had to deal with. North Korea has a history of defying sanctions against nuclear development, particularly the Agreement Framework of 1994 (Federation of American Scientists, n.d.) and more recently UN Security Council resolution 1718 (UN Security Council, 2006). The U.S. must find ways to deter North Korea from aggression. However, based on the deterrence efficacy model proposed herein, would deterrence be efficacious? If so, how would the challenges with managing deterrence against North Korea be handled?

2. North Korean Strategic Culture

North Korea emphasizes a military approach to conflict. Consequently, they do not emphasize compromise and negotiations (Jong-hwan, 2003). Rather, they tend to "get tough with their counterparts" even when negotiations do not favor them (Jong-hwan, 2003, p. 95). Jong-hwan also alleges that North Korea responds more favorably to intractability on the part of their counterparts (p. 96); thus, they back down in response to shows of strength and press further in response to weakness. North Korea views any concession it makes as surrender or capitulation; but if a small concession is made, then

the North Koreans try to compensate for their own compromise by pursuing greater compromises from their opponents in turn (Jong-hwan, 2003). Kim (2007) supports this view; North Korea defines concessions as "unconditional surrender to the opponent" (p. 91). North Korea, as a communist nation, views itself as founded upon the same revolutionary view as is the former USSR and China (Kim, 2007). It is a totalitarian nation engaged in the struggle against imperialism (Kim, 2007). This might support its militaristic attitude toward conflict and disdain for compromise; as Kim Il-Sung put it, "our goal of peaceful unification [of the Korean peninsula] has nothing to do with any kind of 'compromise' with the enemy" (Kim, 2007, p. 91).

Kim (2007) also alleges that central to understanding North Korea's recent international behavior is the extent to which policies of the U.S. have shaped that behavior (p. iii); thus, U.S.-North Korea interactions will help frame the North Korean strategic culture to some extent. Recently, North Korea has extended their inflexibility and militaristic attitude towards nuclear weapons development. Kim and Kim (2007) allege that North Korea has proceeded to develop nuclear weapons and has used provocative coercive diplomacy, but only to the extent that war will be avoided. However, when the U.S. has shown strength, consistent with Jong-hwan's assertion that North Korea responds more favorably to counterpart stubbornness, North Korea has returned to negotiations (Kim and Kim, 2007). This overall militaristic, non-compromising attitude suggests a risk prone disposition, but when it can be shown that North Korea has backed down in response to opponent shows of strength or intractability, this suggests they are only moderately risk prone, assuming an unfavorable balance of capabilities. Additionally, North Korea's traditional emphasis on loss can be estimated from its "struggle against imperialism" (Jong-hwan, 2003, p. 91) and various statements to the effect that it is acting to avoid undesirable circumstances. For example, North Korea recently claimed that it had "manufactured nukes for self-defense to cope with the Bush administration's evermore undisguised policy to isolate and stifle the DPRK" (Kim, 2007, p. 12). Additionally, Kim and Kim (2007) quote North Korea as claiming,

The United States disclosed its attempt to topple the political system in the DPRK at any cost, threatening it with a nuclear stick. This compels us to take a measure to bolster our nuclear weapons arsenal in order to protect the ideology, system, freedom, and democracy chosen by our people. (p. 63)

Finally, the North Koreans have a history of risk prone acts per the Linnington model-they have engaged in military conflict and other provocative acts of aggression prior to overt nuclear testing. Some examples are provoking conflict with South Korea when in 1968 the North Koreans invaded Seoul with intent to assassinate the South Korean President (Izumikawa, 2007). Two days later, the North Koreans seized a U.S. intelligence ship in the Sea of Japan. Also, in 1969, North Korea shot down a U.S. reconnaissance plane (Izumikawa, 2007). Thus, even though North Korea has only issued threats and tested missiles to this point, their history of provocation suggests they are on the precipice of the domain of loss.

3.   The Strategic Environment of U.S.-North Korea Relations

North Korea is viewed as the "longest-running political, military, and ideological adversary of the United States, and vice versa" (Kim, 2007, p. 56). North Korea's communist history has generally put it at odds with the U.S. Specific actions by the North Koreans have also served to deteriorate the relationship. For example, in 1993 North Korea withdrew from the Nuclear Non-Proliferation Treaty (NPT). Through the efforts of the Clinton administration, the U.S.-North Korea Agreed Framework was signed, which allowed some U.S. support for North Korean nuclear energy development in exchange for a guarantee of discontinuing its nuclear weapon program. However, the Agreed Framework fell through at the turn of the century (Kim, 2007). North Korea offered to revive this agreement at the first round of the "Six Party Talks" in 2003 but follow-on propositions from the U.S. were perceived by the North Koreans as one-sided denuclearization requirements on their part, without any guarantees of action by the U.S. in turn (Kim, 2007). Subsequently the relationship deteriorated into a "war of words" and various threats; for instance North Korea claimed, "we have strong war-deterrent capability to win any military confrontation with the United States" (Kim and Kim, 2007, p. 59). The U.S. increased military pressure on North Korea by announcing a plan to

boost their military presence in the demilitarized zone (DMZ) between North and South Korea (Kim and Kim, 2007). In response to this pressure, the North Koreans per their tendency to respond favorably to opposition pressure retuned to negotiations (Kim and Kim, 2007). However, when further negotiation attempts failed, the North Koreans tested nuclear missile launches in 2006. The U.S. response was diplomatic (Kim and Kim, 2007); it dispatched an envoy to South Korea to urge cessation of future launch plans. The U.S. also compromised: it retracted its stance that unacceptable North Korean actions included testing nuclear weapons and instead claimed that transferring nuclear weapons or materials to terrorists would result in "a grave consequence" (Kim and Kim, 2007, p. 67).

Economically, the strategic environment does not favor North Korea. With respect to the U.S., the multi-decade history of U.S. economic sanctions against North Korea has ensured virtually nonexistent trade with a major economic power. Such sanctions have denied North Korea access to the world's largest market (Kim, 2007). The U.S. cannot extend certain economic privileges such as the Normal Trade Relations status or Generalized System of Preferences inclusion (Kim, 2007). North Korea has some trade with China and Russia, but they are still dependent on handouts to an extent.

a. *North Korea Self Assessment and Analysis*

(1)   Identity. North Korea is experiencing an identity crisis; Kim (2007) describes a conflict between "centripetal forces of increasing economic interaction and interdependence straining against centrifugal forces tending toward protection of national identity and sovereignty" (p. 7). In other words, North Korea wants to open up to the world economically, but fears globalization in the process and thus the loss of their national identity. North Korea has tried to adjust their communist ideology rooted in their "struggle against imperialism" (Jong-hwan, 20043, p. 91) to the post Cold-War world, but this has been a great challenge (Kim, 2007). This transition into the post-communism reality may be facilitated by their reunification efforts with South Korea; in fact one of the three principles of reunification negotiations is national unity achieved through transcending differences in ideas, ideologies, and systems (Kim, 2007). However, another

view is that North Korea wishes to absorb the South and maintain communist principles in unification; North Koreans supposedly want to "nationally liberate" South Koreans and effect a "people's democratic revolution" (Jong-hwan, 2003, p. 92). Another feature of this identity crisis is that the traditional notion of *juche*, or self-reliance which North Korea has purported to espouse, belies North Korea's actual economic dependency upon Soviet and Chinese aid (Kim, 2007).

The transition of North Korea's identity is further reflected in its desired for "new thinking" and "state competitiveness" (Kim, 2007, p. 93) to compete in the twenty-first century. It has made unprecedented efforts to engage the West (Kang, 2003). Another relevant aspect of North Korea's national identity is the preferences of its leadership. Kim Jong-Il reportedly prefers to survive as the head of the North Korean ruling party, ahead of satisfying military needs, economic and the ultimate survival of North Korea as a state (Kim and Kim, 2007).

(2)   Will as a function of interests. Presumably, North Korea sees its challenges of maintaining its national identity whilst also reforming economically as challenges to survival and thus intrinsic interests, albeit less intrinsic than if directly threatened with war. There is little strategic/extrinsic gain to be had by internal reform. However, given that North Korea has existed in the nuclear shadow of a U.S.-supported South Korea for several decades, they must also have some trepidation over the likelihood of attack by the South. Furthermore, if Kim Jong-Il's political survival is his utmost priority, then he probably views potential conflict with intrinsic interests in mind. The one strategic interest North Korea seems to hold on to is the prospect of a unified Korea with predominantly communist/socialist reform over the entire peninsula; "the pursuit of absolute one-nation legitimation and Korean reunification on its [North Korea's] own terms" (Kim, 2007, p. 9) has traditionally been a North Korean national priority. The geopolitical scheme in which North Korea finds itself plays a key role in its foreign policy and interests (Kim, 2007); it is surrounded by several superpowers and is thus is forced into brinkmanship to compensate for its relative weakness. Hence, overall North Korea should have a credible will to defy deterrence if the object of that deterrence

is to threaten it or restrain its nuclear development initiatives, or to threaten it with other measures intended to delay economic reform while maintaining its national identity.

(3) Capabilities. Economically, North Korea is wanting. The decades-long U.S. economic embargo on North Korea, which has steadily expanded in scope and specificity (Kim, 2007), has restricted North Korean access to the benefits of trade with a superpower. Though recent developments have relaxed trade restrictions, North Korea has had only limited success in selling products in unencumbered markets (Kim, 2007). Thus, the economic balance of capabilities between North Korea and the U.S. certainly favors the U.S. Recent freezes of North Korean assets, including $24 million by China (Kim and Kim, 2007), certainly contribute to this imbalance. The defining features of the North Korea economy can be summarized as "(1) extreme market repression; (2) a chronic trade deficit; (3) a lack of access to international markets; and (4) unconventional financing to pay debts" (Kim, 2007, p. 91).

Militarily, while the balance of capabilities favors the U.S., North Korea is enriching uranium and has tested nuclear missiles. In 2002 North Korea announced its withdrawal from the NPT and acknowledged existence of its highly enriched uranium program (Kim and Kim, 2007). This unfavorable balance of capabilities is manifested in North Korea's propensity to return to negotiations when confronted with a show of force; presumably if their intentions were to defy deterrence and the military balance of capabilities was more equitable, they would not be so quick to return to the bargaining table. Kim and Kim (2007) give numerous examples of iterated negotiations in which North Korea left negotiations with the United States, who then made some display of military force and consequently North Korea returned to discussions with the U.S. While the North Koreans have claimed that they "have a strong war-deterrent capability to win any military confrontation with the United States" (Kim and Kim, 2007, p. 59), this may very well have been a bluff as they attempted to deter the U.S. In sum, North Korea views itself as a nation faced with an identity crisis, with unfavorable though gradually improving economic conditions and balance of military capabilities, and values self over strategic/extrinsic gain.

b. *North Korea Specific Factors*

(1)   Risk Propensity

(a)   Domain. Some view North Korea as a failed state: the collapse of the USSR left it without a major patron; Russia and China have since normalized with Seoul, industrial productivity is poor, food and energy are in short supply, and trade is suboptimal (Kim, 2007). By all accounts North Korea would seem to be in the domain of loss, thus predicting risk proneness. From one perspective, North Korea's envisioned reference point is a unified Korea dominated by North Korean communist or even socialist ideology. Since Korea is not unified, arguably North Korea is far from its reference point and thus would be in the domain of loss. However, per the Linnington model North Korea is not in the domain of loss as they have not engaged in military intervention of any sort. Testing nuclear missiles may be a prelude to military intervention, so North Korea is on the precipice of the domain of loss per Linnington, as was the USSR prior during the Cuban Missile Crisis. Furthermore, its threats and brinkmanship against the U.S. also suggest it is bordering on the domain of loss as such actions may be nearly tantamount to eventual hostilities.

Economically, North Korea's envisioned reference point may be a more robust economy and greater independence from foreign support. Kim Jong-Il appraised China's economic success during a recent visit, admiring their progress and thinking about how to implement similar reform in North Korea (Kim, 2007, p. 97). This desire to improve has been borne out to date by some initiatives over the most recent decades, notably the 1991 Rajin-Sonbong Free Economic and Trade Zone, and in 2002 North Korea enacted economic reform measures emphasizing decentralization and market economy (Kim, 2007). However, they are still in the domain of loss, though if their trends of modernization continue, they may approach that goal of economic sustainability and independence in the foreseeable future. Thus in sum, North Korea is technically in the domain of gains per Linnington, but in the domain of loss militarily and economically though they have shown an interest in reform. Overall, North Korea is in the domain of gains but on the precipice of domain of loss.

(b)   Likelihood of Certain Outcome. While evidence of North Korean thought processes and their estimates of the likelihoods of U.S. responses to certain North Korean actions is rare given their relative isolation, it is plausible that North Korea's perception of U.S. will is mixed. On one hand, North Korea has witnessed U.S. military buildup after leaving the bargaining table as explained in Kim and Kim (2007), so the North Koreans may estimate a high likelihood of aggressive U.S. action if they (North Korea) continue to withdraw and defect. The Bush administration (2001-2008) decried North Korea as an "outpost of tyranny"; this may have increased the North Korean estimates of the likelihood of U.S. hostility. In a statement released by the North Korean Foreign Ministry after a nuclear test, the test was justified given "the United States' extreme war threats and pressure maneuvers" (Pollack, 2007, p. 112). Furthermore, the North Koreans asserted,

> Our nuclear weapons will serve, to all intents and purposes, as a reliable war deterrent for protecting the supreme interests of our state and the security of our nation from the United States' threat of aggression and preventing a new war…on the Korean peninsula. We will always sincerely implement our international commitment in the field of nuclear non-proliferation as a responsible nuclear [weapons] state… Our ultimate goal [in advocating the denuclearization of the Korean peninsula] is not a denuclearization to be followed by our unilateral disarmament…but the denuclearization aimed at settling the hostile relations between the DPRK and the United States and removing the very source of all nuclear threats from the Korean peninsula and its vicinity. (Pollack, 2007, p. 112)

Actual U.S. hostilities against the North Koreans would have negative utility to the latter; the U.S. superior capabilities would outmatch those of North Korea. However, the U.S. has retreated from its stated positions and compromised; for example, the Bush administration compromised on its position that for North Korea to "cross the line" they would have to produce and test a nuclear weapon. Eventually, the U.S. claimed that exporting such a weapon to a hostile state or terrorist would instead constitute "crossing the line" (Kim and Kim, 2007, p. 67). Consistent with Kim and Kim (2007)'s theory, the North Koreans would view such U.S. weakness as an opportunity to continue pressing ahead. Furthermore, the U.S. has yet to take military action despite years of threats; thus the North Koreans may doubt U.S. resolve which means they would predict

a lower likelihood of U.S. aggression. Thus, North Korea can generally be characterized as slightly to moderately risk prone, because they continue to take actions in defiance of the U.S. which, if responded to with U.S. force, would result in undesirable circumstances for the North Koreans, but it is likely that North Korean confidence in the U.S.'s credibility of executing its threats is dwindling.

More evidence of North Korea's risk proneness can be inferred from North Korea's demonstrated willingness to escalate tensions when the U.S. seemed reluctant to improve bilateral relations (Izumikawa, 2007). Given North Korea's will to move forward and improve their economy, straining bilateral relationships with the U.S. would have low utility as the U.S. is economically superior and would present a lucrative market for trade; yet by escalating the North Koreans were effectively guaranteeing the U.S. would continue to deny them economic benefits, especially during the Bush administration (2001-2008). There was a high likelihood of negative utility; yet the North Koreans pursued this course of action nonetheless, demonstrating risk proneness. Furthermore, when North Korea withdrew from the NPT, it is likely that they knew that U.S. superior nuclear capabilities could inflict great damage on them, and statements to the effect that the U.S. considered North Korea part of the "axis of evil" (Izumikawa, 2007, p. 61) combined with the pre-emptive Iraq invasion likely created a perception of a high likelihood of a U.S. pre-emptive attack on North Korea. This meant that North Korea took a great risk if they exacerbated tensions and withdrew from the NPT but did so without the capability to inflict as much damage on the U.S. as the U.S. could inflict on them if the U.S. did pre-emptively attack.

A final point in support of North Korea's risk proneness is that when the USSR claimed they planned to normalize relations with South Korea, North Korea threatened the USSR by claiming they would recognize some parts of the USSR that were trying to claim independence, and would support Japan's claim to islands which Japan claimed the USSR was illegally occupying (Izumikawa, 2007). Finally, North Korea threatened to develop nuclear weapons. Given the high likelihood that the USSR would withdraw economic aid in response to such threats, and given the dependency of

North Korea upon Soviet economic assistance (Kim, 2007), making these threats seemed a highly risk prone thing for North Korea to do.

Since relative emphasis on gain or loss was not shown to be an explanatory factor (in deterrence efficacy in this research to the extent that risk propensity and domain were, it will not be elucidated in great detail for North Korea policy options analysis. However, North Korea generally tends to emphasize loss: a hallmark of their negotiating strategy as described earlier is that they tend to return to the bargaining table when their opponents show threat of force. In the case of recent U.S.-North Korea discussions, the U.S.'s military support to South Korea has on certain instances caused North Korea to return to talks (Kim and Kim, 2007); presumably to avoid a U.S. buildup and escalation to hostilities. Their public statements emphasize fear of the U.S.'s intentions and are tailored toward creating a perception of equal capability, or at minimum a capability to deter the U.S. from attacking. Thus, North Korea focuses on avoiding the negative utility of a U.S. attack.

North Korea has been shown to be a risk prone actor in the domain of gains, but on the precipice of being in the domain of loss. Thus, deterrence is predicted to be efficacious against North Korea, but the objectives of deterrence must be clear and must be precisely executed to ensure North Korea does not feel threatened enough to pre-emptively attack U.S. interests. As discussed in the literature review of deterrence theory, the first danger of stability in deterrence that if one party feels itself to be so vulnerable to a disarming pre-emptive strike by the other it might try to get its own blow in first (Cronin, 2007). Now that it has been shown using the Figure 4 framework whether deterrence would even predictably be effective, the Berejikian game theoretic analyses must be applied to see if they support the qualitative assessment of North Korea's risk profile before nuances of North Korean deterrence are discussed.

c. *Quantitative Analysis: North Korea*

As with the U.S. and USSR in the Cuban Missile Crisis, the mutual deterrence game is the most relevant Berejikian game to the U.S.-North Korea relationship. However, unlike during the Cuban Missile Crisis, the U.S. is currently in the

domain of loss per Linnington modeling. The U.S. is fully engaged in hostilities in Iraq and Afghanistan, which are risk prone actions from an actor in the domain of loss. The U.S. envisioned reference points for Afghanistan and Iraq, as outlined in the 2006 *National Security Strategy*, are not yet attained. Since the U.S. is in the domain of loss but North Korea is in the domain of gain per strict Linnington rules, a Berejikian mutual deterrence game with these conditions does not exist. If we instead assume that both the U.S. and North Korea are in the domain of loss without Linnington rules (U.S. in domain of loss given its failure to achieve its goals thus far in its present conflicts, and North Korea in the domain of loss given its economic and military inferiorities and also failure to achieve its reference points), we can model a mutual deterrence game where both are in the domain of loss.

		Player X	
		Cooperate	Defect
Player Y	Cooperate	−1, −1	−2, 1
	Defect	1, −2	−3, −3

Figure 19.   Mutual Deterrence, X and Y in domain of loss (From Berejikian, 2002, p. 174)

In Figure 19, both the U.S. and North Korea are dissatisfied with their respective status quos. Thus the status quo (cooperate, *cooperate*) reflects this dissatisfaction (-1, *-1*). However, if North Korea defects (defies deterrence) and the U.S. capitulates, the U.S. remains even further behind its envisioned reference point, and North Korea gains some towards their envisioned reference point by removing U.S. influence in their affairs. Conversely, if the U.S. was to deter North Korea and North Korea was to capitulate, the U.S. would gain because North Korean threat would be reduced, and North Korea would fall further behind their reference point. Finally, if both defect, it escalates the conflict further for both and each actor's worst possible shift further from their respective reference points would occur (-3, *-3*). The U.S. would now

be engaged in yet another conflict, further expending its already thinly stretched economic and military resources, and North Korea would be hampered by a war with the U.S.

North Korea (player X) has the possible SEU outcome of

$$1/3(-1) + (2/3)(-2) = -5/3,$$

for cooperation, given that they generally believed a high probability of U.S. pre-emptive attack (defection) regardless of their own actions. For defection, North Korea has the possible outcome of:

$$1/3(1) + 2/3(-3) = -1$$

Thus, SEU predicts North Korea, if truly in the domain of loss, will defect. This suggests that deterrence would not be efficacious against a risk prone North Korea in the domain of loss. Prospect theory also predicts North Korean defection; if they defected the range of possible outcomes is:

$$ABS[1-(-3)] = 4$$

whereas the range of possible outcomes for cooperation is

$$ABS[-1-(-2)] = 1$$

Since defecting has a wider range of outcomes, this reflects risk proneness per Taliaferro (1997). It follows that if North Korea were risk prone, as this research has qualitatively estimated, they would choose defect. Thus it seems the conclusion derived

from this quantitative analysis as to the predicted efficacy of deterrence conflicts with the conclusion derived from the qualitative analysis, if the Linnington restrictions are relaxed slightly. Since the Linnington model is oversimplified, and a more rigorous analysis of domain is offered in this research, it makes sense to relax the Linnington restriction and we are consequently left with the inconclusiveness of the qualitative-quantitative model predicting the efficacy of deterrence against North Korea. If we remain with Linnington, however, there still exists no mutual deterrence game where one nation is in the domain of loss and other is in the domain of gain. Development of such a game might offer insights to support the qualitatively derived conclusion that deterrence would be effective against North Korea.

d.   *Policy Implications*

Assuming such a game would support this claim, the U.S. must ask what it is they seek to deter. Nuclear testing? Exportation of nuclear capability to rogue states and or terrorists? A pre-emptive nuclear strike on South Korea or another U.S. ally? Counterstrike capability against the U.S.? The U.S. has already failed at deterring North Korea from developing and testing nuclear weapons. North Korea views itself as a nation faced with somewhat of an identity crisis, with unfavorable though gradually improving economic conditions and balance of military capabilities, and self preservation valued over strategic/extrinsic gain. They are risk prone and approaching the domain of loss. Thus they are willing to take risks to achieve their goals, or act when the chance of success is low or chance of failure is high, but not at the risk of Kim Jong-Il having to relinquish control. How is deterrence tailored to this sort of opponent? North Korea's risk taking depends in part on whether the U.S. threatens Kim Jong-Il's survival (Kim and Kim, 2007); evidence supports this theory and thus one deterrence tailoring option is that the punishment for acting against U.S. wishes would be to ensure the non-survival of Kim Jong-Il's regime. As Cronin (2007) claimed, "deterrence…cannot work unless both sides are convinced of the credibility of threat" (p. 26). Another theoretical concern raised by Berejikian (2002) is that participants which are risk prone may find deterrent threats less credible, and are willing to challenge even if costs exceed benefits (p. 175). Thus, as a risk prone actor, North Korea would theoretically find U.S. threats less

credible, especially over a period of repeated inaction on the part of U.S. Eventually the U.S. may lose all credibility if it keeps making threats but fails to act on them and instead relaxes its stance. The U.S. would also benefit from pursuing a strategy of deterrence by denial: denying North Korea the benefits they seek by increasing U.S. support for South Korea.

One concern with attempting to deter North Korea is that just as Japan was expansionistic under the guise of a certain ideology, with a more immediate goal of gaining economic resources to facilitate that longer term ideological expansion (New East Asian Order), North Korea is expansionistic under a certain ideology and also economically wanting. One reason that deterrence failed against Japan is because they were so far behind their reference point and any likelihood they had of achieving their reference point (per prospect theory) was slipping away as they desperately attempted to gain resources from the Dutch East Indies. That economic want led them to two unfavorable alternatives: "surrender or suicide." They knew they couldn't defeat the U.S. militarily in a prolonged war, but couldn't achieve their goals, albeit strategic/extrinsic goals, for want of unattainable resources; thus they chose the lesser of two evils and defied deterrence. North Korea is making progress economically but instead of attempting to control resources of another country, they are attempting modernize their economy. Still, they envision a peninsular takeover with a socialist/communist ideology for all of Korea, and capitulating if this outcome is thought to be unattainable may not be a realistic option for North Korea, as it wasn't for Japan. North Korea could never defeat the U.S. in conventional combat, but such confrontation may be the lesser of two evils for them if they are faced with the prospect of failing to achieve their goals. Their risk proneness predicts that they would consider a pre-emptive strike on the U.S. or its allies. Thus, the lesson learned from Japan's defiance of deterrence is that the U.S. should deter North Korea but should concurrently provide North Korea a desirable alternative to capitulation or fighting the U.S. in direct combat. This way, we don't back them into a corner forced to choose between bad and worse.

The advantage the U.S. has vis-à-vis North Korea which it did not have vis-à-vis Japan, and that could be a deciding factor in the ultimate efficacy of U.S.

deterrence, is that North Korea is not currently engaged in overt conflict with another nation, and also has chosen a more internationally acceptable means of attaining their envisioned reference point with respect to economic well-being. That means is pursuit of international trade and opening to free markets, rather than unilaterally pressuring a sovereign nation to cede resources as Japan did. Recalling Juliusson's (2003) sunk cost effect, in theory an actor is likely to continue a course of action which initially produced losses in the hope of recouping those losses. Japan was already at war with China when they began to expand their quest for economic resources. Hence per Juliusson, Japan would continue to minimize their current losses in the hope of recouping via great gains when they ultimately gained access to Dutch East Indies resources and began laying the groundwork for the New East Asian Order. To do that, they needed to use aggression and thus deterrence failed. In contrast, North Korea is not presently already at war, and thus the sunk cost effect on their propensity to initiate new hostilities seems less likely. The U.S. should be cautious, however as the North Koreans develop their missile capability; this may lead to conflict with a U.S. ally in the East Asian region. In that case, the sunk cost effect would increase the likelihood that the North Korea might initiate hostilities against the U.S. in the hope, as Japan had, of a highly effective, pre-emptive tactical strike to debilitate certain U.S. war fighting capabilities and/or civilian/economic targets, and consequently reduce U.S. capability and will to fight in response.

Though not shown to be explanatory in predicting the efficacy of deterrence in this research, relative emphasis on loss/gain may play a role in determining how to tailor deterrence to a risk prone adversary in the domain of gains but bordering on the precipice of loss. Once deterrence is actually implemented, this aspect of Lebow and Stein's (1989) theory may be useful after all. It is hypothesized that loss minimizers (who avoid situations that would bring negative utility) would respond best to deterrence by punishment, as minimizing punishment would be minimizing loss, whereas deterrence by denial (deny benefits or that which would bring gain to the adversary) is predicted to have the greatest effect on gain maximizers. North's Korea's emphasis on loss would suggest, consistent with this theory, that deterrence against North Korea must be at least in part predicated upon clear signals that they would be utterly ruined in a nuclear or

conventional conflict with the U.S., thus punishing them for their defiance. To minimize their potential losses, they might ultimately capitulate despite their risk propensity and declining confidence in U.S. credibility. However, while communicating this message, the U.S. must leave a desirable option open for North Korea-continuing economic aid and encouraging other nations to continue their aid, facilitate development of economic westernization, and other similar assistance might convince North Korea to abandon its aggressive missile testing. In other words, help bring North Korea farther into the domain of gain rather than push them towards loss. Finally, given that risk-acceptant decision makers might well interpret such ambiguity as a sign of weakness and as an opportunity to exploit rather than as a risk to be avoided (Chilton, 2009, p. 32), our communication to North Korea must be as explicit and unambiguous as possible.

In the section on Implications for Deterrence: Refining the Theory of Risk Propensity/Relative Emphasis on Loss/Gain in this research, qualitative analysis of the historical case studies demonstrated that when a loss minimizer in the domain of gains, but close to the domain of losses is presented with two undesirable outcomes from a deterrence game, and the deterrer's signals/threats of imposing loss are clear and credible, deterrence will be efficacious. North Korea, similar to Japan, is in the domain of gain but on the precipice of loss, risk prone, and has currently faced two undesirable outcomes: give up its nuclear ambitions or face hostility from the U.S. Thus, deterrence must be clear and credible against North Korea to ensure its efficacy.

B.   IRAN

1.   Overview

Just as North Korea has demonstrated its nuclear potential, so too has Iran. Iran has likewise defied UN sanctions, for example UN Security Council Resolution 1737 (UN Security Council, 2006b) and the Nuclear Non-Proliferation Treaty (NPT). Iran's anti-U.S. rhetoric combined with its nuclear potential warrants consideration of all options: the efficacy of deterrence through denial of benefits and/or imposition of costs

must be considered among these options. The U.S. must find way to deter Iran from aggression. However, based on the deterrence efficacy model proposed herein, would deterrence be efficacious in the first place?

2. Iranian Strategic Culture

Iran has a history of upheaval-despite accepting ruling classes for pragmatic purposes, there has been a threshold for grievances that when crossed, results in government overthrow and replacement with a new regime—which will eventually become intolerable as well (Interdisciplinary Center Herzliya Institute for Policy and Strategy, 2004). This cycle means the Iranians have propensities for risk prone actions per Linnington, as these changes in government have not been without violence. Iran also is certainly recently willing to engage in hostilities; the Iraq-Iran war is a clear example of this risk propensity. In terms of strategic planning, Iran is not proficient; it tends to improvise and adapt (Chubin, 2009). It is also distrustful; similar to the Soviet strategic culture Iran prefers not to place faith in the inhibitions of its opponents (Chubin, 2009). Conspiracies theories and distrust of adversaries are widely believed. Thus, the belief in conspiracies renders Iranians receptive to implicit threats that are beyond the actual credibility of the threat (Interdisciplinary Center Herzliya Institute for Policy and Strategy, 2004) and hence they overvalue the opposition's threats.

One challenge that Westerners experience when negotiating with Iranians is that the latter prefer "high context" language or ambiguity, a distaste for committing to agreements in writing, and a tendency to divert on tangents during negotiations (Interdisciplinary Center Herzliya Institute for Policy and Strategy, 2004). Threats and bluffing are accepted, and Iranians may appreciate when their opponent interlocutors use similar tactics (Interdisciplinary Center Herzliya Institute for Policy and Strategy, 2004), but as a matter of professional respect, not necessarily because they are conceding to their opponents.

Iran does not embrace the concept of mutual nuclear deterrence in the traditional Western sense; rather they aim to deter via exploiting their control over oil and via other asymmetrical means (Cronin, 2007). This preference for asymmetrical influence was

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reflected in lessons learned from recent conflicts; after the Iraq-Iran war the Iranians realized it was to their advantage to find short cuts or equalizers in military capability, and to pursue indirect approaches to war fighting via militias and proxies such as Hezbollah. Iran is believed to be indifferent to promises of reward for compliance, and consistent with the notion that it does not embrace mutual deterrence, it is indifferent to threats of punishment. Rather, only deterrence by denial is thought to deter Iran (Yost, 2009). Thus, if the U.S. is attempting to deter Iran from, for instance, testing a nuclear missile, the U.S. must convince Iran that it does not have the expertise to do so, and must develop policies to prevent trained scientists from traveling to Iran. Threatening sanctions or more aggressive actions against Iran would presumably not have a deterrent effect; in fact it may have the opposite effect; Iran may very well continue its nuclear program development. However, Iran is thought to be pragmatic in response to threats (Interdisciplinary Center Herzliya Institute for Policy and Strategy, 2004); thus they would predictably yet grudgingly acquiesce to a credible threat of force. The Iranians are thought to be pragmatic (Interdisciplinary Center Herzliya Institute for Policy and Strategy, 2004); though initially insistent and stubborn in negotiations in the hope of gaining advantage, they are not irrational and are though to have "an inherent pragmatism regarding force superiority" (Interdisciplinary Center Herzliya Institute for Policy and Strategy, 2004, p. 19).

3. The Strategic Environment of U.S.-Iranian Relations

Iran and the U.S. have been at odds for some time; Iran retains a deep hostility towards the United States, and is pursuing weapons of mass destruction and supports international terrorism (Interdisciplinary Center Herzliya Institute for Policy and Strategy, 2004; Giles, 2005). Iran envisions conflict with the U.S. as inevitable (Giles, 2005, p. 3) and their strategic cultural trait of asymmetric warfare is being used for that purpose; indeed their former defense minister claimed, "can our air force…take on the Americans, or our navy take on the American navy?...the way to go about dealing with such a threat requires a different solution entirely" (Giles, 2005, p. 3). In pursuit of such asymmetric capabilities such as nuclear and chemical warfare, Iran is in defiance of

various conventions and treaties, including the Nuclear Non-Proliferation Treaty, the Chemical Warfare Convention, and the Biological Warfare Convention (Giles, 2005).

Consistent with assessment of Iranian strategic culture, Chubin (2009) claims that a risk inherent in the Iranian-Israeli relationship is that there is no mutual comprehension of shared risks because there is no communication. This introduces uncertainty into tense situations. It follows that Iran also does not communicate with the United States; the U.S. has little diplomatic repertoire with the Iranians and thus communication of shared risks between the U.S. and Iran is difficult to establish.

a.   *Identity*

Iranian national culture is supposedly characterized by a sense of grievance, entitlement, and destiny (Cronin, 2007; Chubin, 2009; Interdisciplinary Center Herzliya Institute for Policy and Strategy, 2004). Thus, Iran traditionally believes external influences to be corrupting (Interdisciplinary Center Herzliya Institute for Policy and Strategy, 2004). It believes in a superior "Aryan" culture that has been suppressed by external forces (Interdisciplinary Center Herzliya Institute for Policy and Strategy, 2004). Iran is trying to gain status in the Middle East; they desire self sufficiency and modern military capabilities, and nuclear power and weapons will help them achieve that goal (Cronin, 2007; Chubin, 2009; Giles, 2005). Furthermore, Iran view themselves as a champion for Palestinian and more generally Muslim causes in the Middle East (Chubin, 2009). Iran wants to become a leading power in the Middle East and replace the existing order (Chubin, 2009; Giles, 2005).

b.   *Will as a Function of Interests*

To an extent, Iranian interests are strategic per the Lieberman (1995) concept. Iran is not trying to gain strategic territory per se, but is trying to become a prime mover in Middle Eastern affairs. This is arguably a strategic goal. However, when one considers the threat they feel from the West, perhaps to that extent their motivation is intrinsic in nature. Thus it is not straightforward to describe their will. Since both strategic and intrinsic interests are at stake, they would predictably have high will to

resist deterrence, though not as high as the USSR might have had when directly confronted with nuclear brinkmanship by the U.S. Again, Iran's pragmatic inclinations and respect for force balances support this claim.

c.   Capabilities

While North Korea has admitted to developing nuclear weapons and has overtly tested missiles, Iran remains tight-lipped vis-à-vis its nuclear ambitions. Intelligence estimates predict it is developing nuclear weapons despite claiming its nuclear agenda is for energy and other peaceful purposes. A basic Iranian negotiating assumption is that their opponents have a favorable balance of capabilities and thus delay in the negotiations will be to Iran's favor; new opportunities which benefit Iran may arise during such a delay (Interdisciplinary Center Herzliya Institute for Policy and Strategy, 2004). Thus, Iran is delaying and creating a sense of confusion over their true intentions, possibly in the hope that they will either have their weapons fully operational to deter threats against them, to use them for offensive purposes, or simply delay to create fear and uncertainty, thus hoping to extract bargaining concessions from their adversaries re: other issues of significance.

Specifically, Iran has completed uranium enrichment up to 20% at its nuclear plants, thus having achieved the enrichment level necessary to quickly develop weapons-grade uranium. Despite International Atomic Energy Association (IAEA) efforts to compel Iranian compliance with the Nuclear Non-Proliferation Treaty, Iran has not complied (IAEA, 2010). Thus many believe that Iran is indeed developing nuclear weapons, but presumably the nuclear balance considerably favors the U.S. Conventionally, Iran has the largest potential manpower capability in the Middle East; they have over 50,000 active duty military personnel, approximately 350,000 reservists, and a paramilitary force of nearly 1 million (Taylor, 2009). Iran is strategically in the domain of loss, and despite their large conventional force, is still inferior in size and capability to the U.S. armed forces (McInnis, 2005). In sum, Iran views itself as a nation with an expansionist agenda (though not necessarily strategic expansion for territories),

with favorable economic and military conditions, but behind the curve in nuclear development, and has a moderately strong will to resist efforts to dissuade it from its intentions.

4. Iran Specific Factors

a. *Domain*

Economically, Iran is in a domain of gain due to their oil revenues. However, U.S. economic sanctions have had a deleterious effect on the Iranian economy, though those effects have attenuated as Iran has found alternative trading partners (Torbat, 2005). Militarily, they are in a domain of gain as well; their military is the largest in the Middle East in terms of sheer manpower. Strategically, they are in the domain of loss vis-à-vis their alleged nuclear ambitions, and per strict Linnington rules, they are technically in the domain of gain, though developing nuclear weapons, if they are indeed doing so, may be a prelude to slipping into the domain of loss vis-à-vis military aggression. They have not achieved their reference point of becoming the primer mover of Middle Eastern affairs. Thus Iran is in the domain of gain given their aggregate capabilities, but on the precipice of loss given their failure to achieve their strategic goals, perception of hostility and threat from external influence, and a culture of grievance and "permanent sense of inferiority" (Interdisciplinary Center Herzliya Institute for Policy and Strategy, 2004, p. 42).

b. *Likelihood of Certain Outcomes*

As with North Korea, Iranian thought processes and their estimates of the likelihoods of U.S. responses to certain Iranian actions are rare given their relative isolation, and similar to North Korea, it is plausible that Iran's perception of U.S. will is mixed. The U.S. makes threats but takes no actions; it vies for economic sanctions against Iran but overall these sanctions reflect risk aversion on the part of the U.S. (per Linnington) and have little political effect on Iran (Torbat, 2005). This does not help the U.S. in terms of projecting credible deterrent. Thus, it is likely the Iranians believe a low probability of U.S. aggression. However, the counterargument is that the Iranians, due to their inherent distrust of external influences and hostility towards the U.S., believe a high

probability of U.S. aggression. Further, the belief in conspiracies renders Iranians receptive to implicit threats that are beyond the actual credibility of the threat (Interdisciplinary Center Herzliya Institute for Policy and Strategy, 2004); thus they overvalue the opposition's threats. Since U.S. aggression would certainly have negative utility to Iran, given the U.S. force balance advantage, provoking such aggression would certainly reflect risk proneness if a preponderance of the Iranian leadership subscribed to the theory of high probability of U.S. aggression.

Given that Iranian negotiators are typically focused on short term, immediate gains (Interdisciplinary Center Herzliya Institute for Policy and Strategy, 2004), prospect theory (situational) may be more useful in explaining a deterrence outcome of an Iran-U.S. confrontation than is SEU (dispositional) per Das and Teng's theory (2001). Also supporting the notion that prospect theory would be somewhat explanatory in the case of Iran is the Iranian culture of grievance; their history of (perceived) oppression likely factors into their present day loss minimization during negotiations. Hence, Iranian risk propensity is alleged by the Interdisciplinary Center Herzliya Institute for Policy and Strategy (2004) to be high; as Iran is generally in the domain of loss relative to their opponents, they tend to minimize losses. Prospect theory predicts those in the domain of loss are risk prone; thus Iran would take significant risks in pursuing high probability/negative utility solutions if they believed in some small possibility of benefit. Yet Iranians do respect force balances and are to an extent pragmatic in negotiation; thus slight to moderate risk proneness seems an appropriate characterization. Hence, per the Interdisciplinary Center Herzliya Institute for Policy and Strategy's (2004) characterization of Iranian risk propensity, the Iranians would continue to provoke the U.S. and allies by providing misinformation concerning its nuclear ambitions and capabilities, at the calculated risk of escalating tensions.

As with North Korea, since relative emphasis on gain/loss was not shown to be an explanatory factor in deterrence efficacy in this research, it will not be elucidated in detail for Iranian policy options analysis. Generally, Iran emphasizes both loss and gain; their antagonism towards and fear of the U.S. (Chubin, 2009) drives them to minimize losses and thus their nuclear program may be a means to this end; but also their

ambitions to become a regional power and their negotiation tactics of holding out for better options (Bar, 2004) reflects emphasis on pursuit of outcomes with positive utility to them. In sum, Iran has been estimated to be a slightly risk prone actor in the domain of gains, but on the precipice of being in the domain of loss. Thus, deterrence is predicted to be efficacious against Iran, but as with North Korea the objectives of deterrence must be clear and it must be precisely executed to ensure Iran does not feel threatened enough to pre-emptively attack U.S. interests.

5. Quantitative Analysis

The same conclusions from North Korea deterrence can be drawn for Iranian deterrence using Berejikian game theoretic analyses. The assumptions are, once again, that the U.S. is in the domain of loss and Iran is in the domain of gain per strict Linnington rules; thus either a new Berejikian mutual deterrence game must be created, or relaxing Linnington rules, the quantitative framework is not entirely explanatory in its ability predict the efficacy of deterrence against Iran.

6. Policy Implications

As with North Korea, assuming the quantitative analysis can be remedied, what should deterrence against Iran focus on? The U.S. has failed at deterring Iran from noncompliance with international obligations, but unlike North Korea, it is not confirmed that Iran has operational nuclear weapons, and in the assumption they do not indeed have them, perhaps the U.S. has less urgency than in the case of North Korea.

Short term gains should be credibly denied; more vigorous efforts via the IAEA to ensure Iranian compliance with the Nuclear Non-Proliferation Treaty's obligations might deny Iran the nuclear weapon benefits it may very well be seeking. Longer term and more general negotiations (i.e., over long term stability of the region, recognition of Israel's right to exist, etc) will predictably be less effective in compelling compliance; Iranians are arguably focused on remedying their capability gaps and addressing their grievances against their "oppressors," though not at extreme risk to their survival. The Iranian ambition for predominant regional influence suggests the U.S.'s credibility is essential to contain such influence which may be counterproductive to U.S. interests in the region. As

with North Korea, per Berejikian (2002) Iran as a risk prone actor would *theoretically* find U.S. threats less credible, especially over a period of repeated inaction on the part of the U.S. Furthermore, the salience of Iran's domain, per Das and Teng's (2001) emphasis on correlation between short term thinking and prospect theory, will mean the U.S. must deter in a way that keeps Iran from slipping towards domains of loss economically and militarily. Thus, if we are to deny them gains of regional power facilitated by nuclear weapons, we must ensure they maintain the capability to develop nuclear power for peaceful purposes, so as to not enter the domain of loss with respect to economic ambitions. The ideal way to ensure they do not cross the line into nuclear weapon development is to ensure denial of that capability vis-à-vis the IAEA and other relevant organizations. The United Nations also might play a role in offering benefits to appease Iran's gain-maximizing proclivities; for example, the Security Council might extend positive security assurances to all states in the Middle East (McInnis, 2005).

Iran is not necessarily expansionistic in terms of gaining territory as is North Korea, but rather in terms of wielding influence. One way for the U.S. to counteract that ambition is via extended deterrence. Consistent with the theory that deterrence by denial will be efficacious against Iran, extended deterrence should deny Iran benefits it seeks. This would require continuing and likely increasing U.S. support to Israel and moderate Arab states to deny Iran the regional influence it desires. This support would take the form of the "nuclear umbrella," extending our deterrent capabilities to our allies as well as deterring attacks on ourselves. Denying benefits that Iran might seek might be accomplished by the knowledge that Israel and moderate Arab allies would counter their influence, backed by U.S. and their own nuclear weapons.

Kugler (2009) offers some recommendations consistent with these notions: "deter Iran from using, or threatening to use, nuclear weapons against its neighbors, and from other predatory behavior, e.g., conventional aggression and political coercion…reassure friends and allies of their safety and promote common security policies" (p. 17). Deterring Iran would be facilitated by denying them their benefits they seek, this denial would take the form of the U.S. reassuring and supporting allies. Kugler (2009) additionally offers, "as a general rule, historical experience shows that even nation-states

with extremist ideologies tend to value their interests and survival enough to act prudently when faced with credible guarantees that they will be frustrated in pursuing their goals and/or punished severely if they commit aggression or otherwise behave in menacing ways" (p. 22). This is consistent with Iran's respect for force balances and the notion they should be deterred by denial-"frustrating them in pursuing their goals"; however, threats of punishment might not be best included in extended deterrence strategies per Yost's suggestion (2009).

Just as in the case of North Korea, an advantage the U.S. has (as compared to Japan prior to Pearl Harbor) is that Iran is not currently engaged in overt conflict with another nation. The lack of sunk cost effect (Juliusson, 2003) suggests their propensity to initiate new hostilities seems less likely. The U.S. should be cautious, however, as Iran develops its nuclear capabilities; it is defying U.S. deterrence and the IAEA, and statements to the effect that Israel should not exists may lead to conflict with Israel, a staunch U.S. ally. In that case, the sunk cost effect would increase the likelihood that Iran might initiate hostilities against the U.S. in the hope, as Japan had, of a highly effective, pre-emptive tactical strike to debilitate certain U.S. war fighting capabilities and/or civilian/economic targets, and consequently reduce U.S. capability and will to fight in response. This possibility underscores the importance of extended deterrence vis-à-vis support for Israel.

Given the earlier hypothesis that loss minimizers would respond best to deterrence by punishment, as minimizing punishment would be minimizing loss, whereas deterrence by denial is predicted to have the greatest effect on deterring gain maximizers, Iran's emphasis on both gain and loss would suggest that deterrence against Iran must be at least in part predicated upon clear signals that they would be utterly ruined in a nuclear or conventional conflict with the U.S., thus punishing them for their defiance. This is recommended despite the theory that Iran would not respond to threats of punishment. However, the U.S. must concurrently deny Iran the benefits it seeks to counter Iran's attempts at gain. Thus, under this framework, a combination of tactics to both threaten denial of benefits and imposition of costs might be the most effective against Iran. To minimize their potential losses, Iran might ultimately capitulate despite their risk

propensity and declining confidence in U.S. credibility. However, while communicating this message, unlike with North Korea, some mixed messages may be prudent. Given Iran's appreciation for skill in negotiation, and their preference for high context language and ambiguity, the U.S. might find ways to adapt its negotiation style to that of Iran's to create confusion on the part of the latter. Risk-acceptant (risk prone) decision makers might well interpret such ambiguity as a sign of weakness and as an opportunity to exploit rather than as a risk to be avoided (Chilton, 2009, p. 32), but since Iran is only slightly to moderately risk prone, our communication to Iran must be need not necessarily be as explicit and unambiguous as possible.

In the section on Implications for Deterrence: Refining the Theory of Risk Propensity/Relative Emphasis on Loss/Gain in this research, qualitative analysis of the historical case studies demonstrated that when a loss minimizer in the domain of gains, but close to the domain of losses is presented with two undesirable outcomes from a deterrence game, and the deterrer's signals/threats of imposing loss are clear and credible, deterrence will be efficacious. Iran is in the domain of gain but on the precipice of loss, risk prone, and currently faces two undesirable outcomes: give up its nuclear ambitions and desire for regional influence or face hostility from the U.S. However, given Iran's culture of ambiguity, the theory that deterrence will be efficacious if clearly and credibly communicated does not necessarily apply. This is supported by the theory that the belief in conspiracies renders Iranians receptive to implicit threats that are beyond the actual credibility of the threat (Interdisciplinary Center Herzliya Institute for Policy and Strategy, 2004) and hence they overvalue the opposition's threats. Ergo, a threat not communicated explicitly may be overvalued and interpreted as explicit by virtue of the Iranian propensities. Interestingly, this does not support Berejikian's (2002) theory that a risk prone adversary would by default find threats less credible (thus undervaluing threats).

V.   CONCLUSIONS

A.   OVERALL FINDINGS FROM CASE STUDY ANALYSIS

At this point, the original research questions, argument, and other issues raised in the introduction to this research should be summarized and addressed. To the research questions posed in the introduction, the efficacy of deterrence can indeed be predicted using the Figure 4 qualitative case study elicitation framework, using risk propensity and the quantitative Berejikian games, but only to a certain extent. Adversary domain per the Linnington model must be considered as well. There are some weaknesses in the Linnington model, but it is still useful to establish basic domain, which predicts risk propensity per prospect theory. The methodology used in this research provides a more comprehensive explanation of risk propensity which can supplement the Linnington model.

Berejikian's quantitative framework is partially useful for supporting the qualitative case study elicitation framework to predict the efficacy of deterrence. Japan's domain of loss relative to their reference point of a New East Asian Order drove them to attack Pearl Harbor despite a subjective expected utility calculation suggesting they should restrain from attack. However, the USSR-U.S. mutual deterrence game of Figure 16 suggests that more analysis in this vein is needed; a risk-prone loss minimizer in the domain of gains capitulated to U.S. deterrence. Berejikian's mutual deterrence game with both states in the domain of gains demonstrates that deterrence should hold but that is assuming the domain of gain predicts the challenger will be risk averse. Qualitative analysis has shown that the challenger, the USSR, in this case was instead risk prone. Thus, a game of mutual deterrence between a status quo state in the domain of gains and a revisionist state in the domain of losses must be created and analyzed. The qualitative solution may not always be supported by the quantitative solution proposed herein. Hence, eliciting risk profiles qualitatively using the Figure 4 framework, and comparing those results to those of quantitative game theory analyses wherein conditions similar to those of the qualitative study exist, is only partially explanatory in predicting deterrence efficacy. Finally, as to whether prospect utility is more useful in predicting deterrence

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efficacy than is subjective expected utility, this analysis has suggested that prospect utility is not necessarily more explanatory in predicting deterrence efficacy than is SEU; both predict deterrence will be successful in the case of the Cuban Missile Crisis, but only prospect theory predicted deterrence would fail in the case of Pearl Harbor.

As to the risk propensies and relative emphases on loss/gain of the U.S., these were not fully elaborated upon. The present author proposes that the adversary perceptions of the U.S. are salient to their decision making, but detailed analysis of the U.S. risk propensity and relative emphases on loss/gain (i.e., Figures 11 and 12) is not necessary to predict an adversary's actions in a simple deterrence game. At a minimum, the overall perception of U.S. balance of capabilities, will/interests, and domain may sufficient to inform adversary decision making in addition to the adversary's own capabilities, interests, domain, risk propensity, and relative emphasis on loss/gain. Adversary perceptions of the U.S. are implicit in the qualitative estimates of adversary likelihood calculations for various outcomes in the case studies. In short, such detailed analysis of the U.S. might predict their reaction to actions taken by the adversary, and an iterated game theoretic approach or an extended game would be necessary. This is beyond the scope of this research but is recommended for future study.

As to the impact of the strategic environment on risk profiles and thus on the efficacy of deterrence, strategic environment included identity, wills as a function of interests, and capabilities. Japan was expansionistic, but with a less than ideal will (as a function of strategic interests) and inferior economic capacity and unsustainable military capabilities. Their environment was one of diminishing resources and thus this put them in the domain of loss economically and military. Per the Linnington model, Japan was already in the domain of loss given their ongoing protracted war in China. Thus, their strategic environment was a desperate one and likely contributed in some part to the inefficacy of deterrence: Japan had an unattainable goal but saw the alternative as equally undesirable-surrender to the U.S. demands. One theory is that America's deterrent policy failed not because Japan's leaders really expected to win, but because they saw no alternative to war (Russett, 1967). This research has demonstrated that Japan's risk proneness and domain of loss were due in part to their strategic environment and thus the

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environment proved influential in their decision to defy deterrence. As to the USSR in the Cuban Missile Crisis, the strategic environment was one of distrust of the West, ambitions to be strategically equal to the west, and a struggle of ideology, but the USSR did not want for resources to the extent that Japan did, and thus was not nearly economically in the domain of loss that Japan was. The interesting point is that while the USSR had a more favorable capability gap (conventional superiority though nuclear inferiority) and a theoretically greater will to defect, they ultimately did not defy deterrence and capitulated. Thus, it is posited that the strategic environment (identity, wills/interests, and capabilities) is generally not a major factor in determining the efficacy of deterrence.

To the implication in Lebow and Stein (1989) that there are four permutations of risk propensity and relative emphasis on loss/gain, this analysis elaborated on two: both Japan and the USSR were shown to be risk prone loss minimizers in their respective conflicts using the Figure 4 case study elicitation framework. Furthermore, the U.S. was estimated to be a risk averse gain maximizer. That deterrence was shown to be inefficacious against a risk prone loss minimizer (Japan) supports Lebow and Stein's claim that the assumption that risk prone gain maximizers are the greatest threats to deterrence "ignores three other logical possibilities: initiators [of challenges to deterrence] could also be risk prone loss minimizers, risk averse gain-maximizers, and risk-averse loss minimizers" (p. 210).

To the hypothesis that loss minimizers tend to escalate and gain maximizers tend to deescalate, in general this theory was supported by the qualitative case study analysis of Japan and the USSR but with a noteworthy exception. Japan was assessed to emphasize loss and continued to escalate throughout their confrontation with the U.S.; a couple of their decisions reflected attempts to maximize gain but one was escalatory in nature, thus challenging the theory than gain maximization predicts de-escalation. This was one choice in a series of many and did not change the overall loss minimization emphasis. The USSR was also assessed to emphasize loss and continued to escalate via brinkmanship, but ultimately did capitulate and deescalated. This suggests a weakness in the theory that loss minimizers tend to escalate. It is possible that Soviet preferences changed as the U.S.

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refused to back down and responded to Soviet brinkmanship. The USSR may have started to prefer maximizing their gains; they may have realized that their communist influence would continue to spread even if they stood down from the Cuban missile crisis; a sympathetic government was already in place in Havana. Otherwise, the theory needs more research to support the assertion that loss minimizers will escalate.

Ultimately, risk analysis, game theory, and deterrence were integrated to create this qualitative-quantitative methodology. This research and analysis has provided a rigorous methodology for eliciting risk profile information of various deterrence case study actors (the U.S., Japan, and the USSR) and extrapolating risk propensity and relative emphasis on loss/gain attributes of these various actors. This methodology and findings augment the Linnington concept of domain of loss/gain specifically, and prospect theory generally. However, using these findings to predict the efficacy of deterrence has some limitations, as relative emphasis on loss/gain was not shown to be a decisive factor, but rather this analysis revealed that domain is salient and possibly the deciding factor in deterrence efficacy.

It was proposed earlier that if deterrence is efficacious in the case study to nearly the same extent as it is in theoretical analysis, consistent with Cronin's (2007) assertion that a combination of qualitative case study analysis and quantitative game theory analysis is appropriate, this increases the credibility of the deterrence as an acceptable or undesirable strategy for government use in similar conditions, against adversaries with similar risk profiles. This was done in one case study- Pearl Harbor, as deterrence was ineffective against a risk prone loss minimizer in domain of loss (Japan). However, the credibility of deterrence efficacy in the qualitative Cuban Missile Crisis case study was not well supported by the quantitative methodology. Finally, it was posited that analysis will reconcile any discrepancies between risk propensities 1) inferred from application of the Linnington model and 2) inferred from likelihood of certain outcomes after cost-benefit analysis of possible outcomes was performed. Overall, Linnington is a useful but oversimplified model that suggests domain predicts risk propensity. The present research

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argued that domain does not necessarily predict risk propensity; in the case of the USSR, they were in the domain of gains but were shown via this research's methodology to be risk prone.

B.   IMPLICATIONS FOR US SECURITY STRATEGY AND POLICY

Ultimately this research has theoretical and practical policy implications. For theory, consistent with Cronin's (2007) assertion that a combination of historical analysis combined with a scientific method would lend credibility to strategic policy, this research has presented a rigorous qualitative and quantitative framework to elicit risk profiles of the U.S. and its adversaries, both historical and present. This framework has elicited information about strategic culture and environment of conflict; identities, capabilities and wills/interests of U.S. adversaries per Bar (2008) and Lieberman (1995) theories; estimated adversary perception of the likelihood of outcomes of various courses of action, estimated adversary preferences/utilities for these outcomes; attempted to define risk propensity and relative emphasis on loss/gain as introduced in Lebow and Stein (1989); derived risk propensity from the combinations of likelihood and subjective utility to create subjective expected utilities; elucidated relative emphases on loss or gain of these adversaries, and developed and applied a deterrence efficacy model from this data to predict under what conditions of risk profile deterrence might be effective against certain U.S. adversaries.

This predictive value of this qualitative framework and methodology was shown to be partially supported by Berejikian's (2002) quantitative game theoretic deterrence analysis, though more work is needed in this area. Also, this analysis has contributed to the debate over the predictive power of prospect utility theory as compared to subjective expected utility theory: which better explains deterrence outcomes. Hence, this research has synthesized risk concepts, rational deterrence theory, and game theory into a comprehensive framework that has shown risk propensity and domain are influential in predicting the efficacy of rational deterrence, though risk propensity does not necessarily depend on domain as posited by prospect theory. Risk propensity must be elicited from study of likelihood and utility.

The chief policy implication from this analysis is that the risk profile of a U.S. adversary against whom the U.S. would implement deterrence strategy/tactics must be analyzed in depth, with special emphasis on understanding risk propensity and domain. The case study elicitation and definitions of risk propensity proposed herein are useful for eliciting risk profiles. Furthermore, the Berejikian games could be used to predict the equilibrium solution in a deterrence game, but with caution because it is still unknown which theory of utility is more explanatory. In the case of Japan, prospect theory explains deterrence failure, but in the case of the USSR, both SEU and prospect theory predict deterrence success. Given these general recommendations, the synthesized methodology of Figure 4 case study elicitation framework, Berejikian quantitative analysis, and deterrence efficacy model can generally be applied to current case studies.

Rational deterrence is influenced by various factors. Nation states must consider a multitude of criteria in attempting to influence the decision making calculus of their adversaries. The U.S. attempted to deter Japan, but as Japan was already in the domain of loss and risk prone, deterrence failed. The USSR, in contrast, was also risk prone but in the domain of gains. They had a lot to lose if the U.S. attacked with nuclear weapons or even just with conventional forces; the USSR's ultimate capitulation counter intuitively epitomized their risk proneness as they believed the U.S. would attack pre-emptively but still decided to withdraw missiles from Cuba. Currently, North Korea does not have much to lose, and has overtly tested nuclear weapons. Regardless of the capability of these weapons, the fact that a risk prone expansionist state bordering on the precipice of domain of loss is developing nuclear weapons requires extraordinary attention to calculating precisely what deterrent strategies and tactics should be used. Likewise, Iran is risk prone and in the domain of gains, but just barely. Their economic advantages notwithstanding, they believe they are entitled to Middle Eastern dominance and their potential pursuit of nuclear weapons may be a means to that end. Both Iran and North Korea are revisionist states looking to challenge the status quo, and thus in theory should be risk prone, or willing to take chances on high probabilities of low utility if even a slight possibility of positive utility exists from their decisions. The U.S.'s ambivalence

about enforcing their threats and rhetoric is certainly raising the possibility of outcomes that would favor North Korea and Iran in their respective situations. More effective deterrence is needed.

Ultimately, deterrence may be the result of mutual perceptions—"self-image and the image of the enemy. These perceptions are laden with cultural and psychological overtones and passed through overlapping prisms of history, culture, language, and ideology" (Interdisciplinary Center Herzliya Institute for Policy and Strategy, 2004). But, in addition to perception, adversary risk propensities and domains arguably influence the outcome of deterrence. Finally, the U.S. must beware of escalation which is believed to be characteristic of loss minimizers. Escalation to the point of initiating hostilities with a third party could introduce a sunk cost effect which may lead to pre-emptive hostilities towards the U.S. by either North Korea or Iran. Generally, prospect theory predicts adversaries will challenge deterrence when they are in the domain of loss and thus risk prone. In the domain of gains, they are risk averse. Though case study analysis does not reveal that domain necessarily predicts risk propensity, insofar as this research's definition of risk propensity is valid, prospect theory still generally holds true.

C. FUTURE RESEARCH

Future research on these topics should apply the deterrence efficacy model proposed herein to the remaining permutations of risk propensity and relative emphasis on loss/gain, specifically gain maximizer and/or risk averse adversaries. Lebow and Stein's (1989) assertion that risk prone gain maximizers are generally though to challenge deterrence can be empirically validated via this methodology. All situations analyzed in this research were for risk prone loss minimizer adversaries. Predictably, actors in the domain of gains should be risk averse and thus not likely to challenge deterrence or status quo states, but this is surely not the case borne out by empirical evidence. If defying deterrence brings greater utility to the revisionist state than does acquiescing to deterrence, and if there is a likelihood that the deterring status quo state will not respond

with force and/or that state does not have a superior balance of relevant capabilities, then by defecting the revisionist state is not risk prone, but rather risk averse and likely a gain maximizer.

There are other concepts synthesized in this methodology that warrant further study. It has been shown that the concept of relative emphasis on loss/gain as posited in Lebow and Stein (1989) needs further exploration and analysis; this metric as defined by the present author was not especially useful for predicting the efficacy of deterrence. Some such as Juliusson (2003) implicitly equate emphasis/preferences with domain, e.g., loss minimizers do so because they are in the domain of loss, not necessarily because they prefer to avoid situations with negative utility rather than pursue opportunities for positive utility. Furthermore, the quantitative aspect of this analysis only considered probabilities and utilities at one specific decision junction for each conflict studied. Game theory offers extended games wherein the players act and react to each other, with changing utilities and probabilities, and equilibria and payoffs change as the conflict progresses. Such application of risk profiles can rigorously be applied to extended games, with the intent of demonstrating how changes in risk propensity and/or domain would change the predicted outcome of rational deterrence. Conversely, deterrence efforts may change the risk propensity of the target of deterrence, and the deterrent target's response may in turn influence the status quo player's risk propensity and/or domain. Berejikian (2002) offers that "defection in a unilateral deterrence game can therefore pitch the status quo state into a losses frame and induce risk-acceptant behavior" (p. 177). Furthermore, Cronin (2007) proposes that "lack of thinking about what happens after the opening stages of a conflict is a legacy of deterrence theory still seen today" (p. 6). Accordingly, it is further proposed that the risk profiles of various adversaries may vary throughout the course of a conflict in response to external stimuli. The external factors influencing risk profiles include the interactions between these players in the strategic games. The U.S. may able to influence the risk profile of an adversary, just as an adversary may be able to influence the risk profile of the U.S., as would be demonstrated in such extended analysis. These dynamics may have implications for the efficacy of deterrence in extended, drawn-out confrontations.

In the same vein, game theory assumes intentionality and utility of multiple players, requiring elucidation of multiple participants' preferences, attitudes, risk tolerance, and other characteristics. This research made broad generalizations about U.S. risk propensities and domain during conflict; future research should attempt to elaborate on the nuances of U.S. risk profiles and analyze U.S. attitudes in a game theoretic format against historical and current adversaries to expand the scope of this framework's applicability.

Also, the Linnington model of domain could benefit from elaboration. The standard risk equation as applied to expected utility,

SEU = likelihood x subjective utility

should be used to estimate risk propensity independent of domain, even though prospect utility theory predicts risk propensity.

Another point to consider is that if domain does not necessarily predict risk propensity, perhaps the right side of the Figure 4 case study elicitation framework is more valuable in understanding deterrence efficacy. As this side focuses on SEU factors, perhaps this argues that SEU is more salient in predicting conflict outcomes than is prospect theory. However, if indeed decision makers are shortsighted in conflict, as Iranians are thought to be, then the Figure 4 case study elicitation framework is not supported by Das and Teng's (2001) theory that short term strategy is dominated by prospect theory. This is a potential area for future research and analysis.

Finally, one theory from this analysis proposed for further study is that the extent and level of precision/detail to which a deterrent strategy must be developed and executed is proportional to the number of factors (economic, military, strategic, etc) for which a risk prone adversary in the Linningtonian domain of gains has an unfavorable balance of capabilities. The more unfavorable balance of capabilities, the farther toward domain of loss and thus the less efficacious deterrence is expected to be; the U.S. could compensate for this shift by more precise deterrence. For North Korea and Iran, militarily

and strategically both are in the domain of loss, and per Linnington they are in the domain of gain. However, Iran is in the domain of gains economically, especially compared to North Korea. Both have been estimated in this research to be risk prone adversaries; thus deterrence against North Korea would have to be more precisely planned and executed in order to have a chance of efficacy than would deterrence against Iran. Iran's propensity for ambiguity and overvaluing threats supports this notion. Reiterating Chilton's (2009) claim, "our deterrence strategies and operations need to take our potential opponent's risk-taking propensity into account" (p. 32).

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